formation System (ISA) this approach has taken over the common principle in official statistics, where each accident sequence is registered as a one and only accident type. The sequential registration method of ISA and its tables for activity, events, and agency groups are presented and applied to one example of an accident.

More exhaustive product safety analyses are exemplified with a causal model (fault tree), system dynamics models, and checklist procedures. These description models are probably too complicated for the large amount of data treated by ISA's sequential model, covering more than 100 thousand occupational injury reports each year. However, when applying the three mentioned models to individual accident cases they simplify identification of alternative genesis sequences and more general needs of prevention, because more than one course of events can be considered. The aim of generalization is essential to the "safety oriented investigation" and is probably more pronounced than in the "responsibility investigation", which is designed to identify the individual to blame starting from the one and only accident course, which actually occurred.

Vehicle accidents are used for a discussion of different phases of the safety oriented investigation: accident analysis; risk analysis; product improvements; safety measure follow up. The basic idea is that of a technical system not allowing serious injuries to occur as a result of common "human errors".

While the **quantification** of different risk factors and of intended countermeasure effects needs well-defined description models, the **identification** is usually an unstructured and creative process more depending on the investigators' experience and on the investigation procedure's capability to stimulate accident prevention.

75 pp, 119 refs.

Method Reports

METHOD REPORT NO. 1026

Standard Methods Development Group

Determination of aromatic hydrocarbons in air (benzene, toluene, xylene, trimethylbenzene (or other polyalkylbenzenes), styrene, vinyltoluene) Gas-chromatographic method.

METHOD REPORT NO. 1027

Determination of polychlorinated aromates in air (Polychlorinated biphenyls, polychlorinated naphthalenes, tri, tetra and pentachlorophenol) Gas-chromatographic method.

Foreign Visitors

From the Board's foreign visitors file:

January 9
Mr. **Mohamed Arsalane El Jadifi**, the Ministry of Labour, Morocco et al.

January12
Mr. **Noel W. Arnold**, Western Region Health Center Ltd, Victoria, Australia

January 22
Mr. **Jacques Dunnigan**, Institut de Recherche & de Développement sur l'Amiante, Sherbrooke, Canada et al.

January 30
Mr. **Errki Reinikka,** National Board of Occupational safety and Health, Tammerfors, Finland

February 5–6
Dr. **Pétur Reimarson,** Administration of occupational safety and health, Reykjavik, Iceland

ORDER FORM

Please send me the following material:

Pamphlet about the National Swedish Board of Occupational Safety and Health
☐ in English ☐ in Finnish ☐ in French ☐ in German
☐ in Spanish ☐ in Swedish
☐ Ordinance No ..... ☐ Arbete och Hälsa No .....
☐ Investigation Report No ..... ☐ Method Report No .....
☐ Catalogue of Research Projects 1979. In English
Work Environment Act and Work Environment Ordinance.
☐ in English ☐ in German (new)
☐ List of Ordinances, Directions and Notices

PLEASE note that, if not otherwise indicated, the publications exist in Swedish only!

Signature, name .....
Name of Institution .....
Address .....

To be sent to: National Board of Occupational Safety and Health, Arbetarskyddsstyrelsen. Publikationsservice S-171 84 SOLNA, Sweden

Borgströms Motala -81

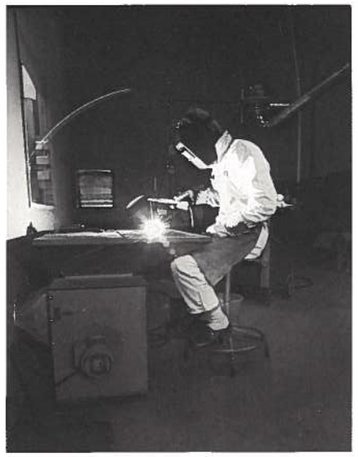
NEWSLETTER

National Board of Occupational Safety and Health · Arbetarskyddsstyrelsen · Sweden 1/81

Limit values in Sweden

The most important regulation in the field of occupational hygiene is that concerning maximum permissible concentrations or threshold limit values, TLVs, for air contaminants at places of work.
A new Swedish list of limit values will be published during 1981. The revision work is discussed by Dr L W Holm, Head of the Board's Chemistry Division.

See article on page 4!



Welding Photo: D. Lorentzen.

Newsletter – news to use

Newsletter from the National Swedish Board of Occupational Safety and Health has been published since 1976. Newsletter appears four times a year and is distributed free of charge. Newsletter should be seen as an effort to satisfy a demand for regular written information in English about the Board's activities and to promote the exchange of information with other institutions.

During these first five years Newsletter has met with a steadily increasing demand and with very positive response from its readers. Among the subscribers to Newsletter are to be found occupational safety and health authorities, occupational health institutions, occupational safety and health experts, companies, universities, embassies, and international organizations.

This first issue 1981 of Newsletter was preceded by a reorganization in the production of Newsletter. The reorganisation will somewhat change the appearance of Newsletter, hopefully facilitate the reading and result in improved regularity in the distribution.

Newsletter will still contain items about
- new regulations of the Board
- new issues of the Board's scientific series "Arbete och Hälsa" and other new research reports
- new supervision and research projects of the Board
- other questions connected with occupational safety and health in Sweden deemed to be of international interest.

Load limiting devices on cranes

The National Board of Occupational Safety and Health has issued Ordinance AFS 1980:19 concerning Load Limiting Devices on Cranes.

New Ordinance

The new rules have been prompted by the serious accidents and near-accidents which have occurred and are still occurring due to excess loads. More than fifty such accidents and near-accidents have been noted in the course of a ten-year period in Labour Inspectorate reports, newspaper articles etc. Often the crane has tipped over. This can happen, for example, when truck-mounted cranes, tower cranes and portal cranes are overloaded. Roughly a third of the accidents have caused injuries, which in four cases proved fatal. The material damage caused has usually been considerable.

Large cranes, such as portal cranes in harbours and shipyards, truck-mounted cranes and many overhead travelling cranes, cover large working areas. For this reason, cranes of these kinds are liable to cause extensive personal injuries and damage to property if they tip over or break down. But even an accident to a small crane can have grave consequences.

Up till now, load limiting devices have only been stipulated for tower cranes and truck-mounted cranes in the building and construction industries. The Ordinance which has now been issued also applies to most types of cranes with powered lifting movements in other sectors of enterprise.

continued on page 2

continued from page 1

An exception is made, however, for non-capsizable cranes with a maximum load of 1 ton, and also for cranes which are capsizable and whose maximum load moment is 2 tm.

The rules specify the type of load limiting device with which cranes of different kinds are to be equipped. A distinction is made between four devices, viz automatic cut-out devices, load moment indicators, load indicators and load signal devices. Automatic cut-out devices to stop a dangerous crane movement in the event of excess loading are to be fitted to all cranes covered by these rules. Exceptions are made for truck-mounted cranes with lattice booms and in certain special instances.

Load moment indicators

Load or load moment indicators are needed for all truck-mounted cranes and also for cranes of other types which can tip over and whose load moment exceeds 60 tm.

Load signal devices must be fitted to all cranes with load or load moment indicators.

Certain special rules apply to lorry-mounted cranes with hydraulically operated booms and with load moments not exceeding 25 tm, and also to lorry-mounted cranes with luffing booms. These cranes may have relief valves in their hydraulic systems instead of automatic cut-out devices and indicators.

Furthermore, powered travelling pulley blocks may be fitted with a dependable slip clutch instead of an automatic cut-out device to prevent overloading. If so, the pulley block must be designed for the increased forces which are set up in structural parts when the slip clutch comes into operation.

The Ordinance includes detailed structural stipulations, as well as rules concerning the setting of load limiting devices, installation, use, maintenance etc.

The new Ordinance applies to most types of cranes with powered lifting movements. Photo: D. Lorentzen.

The provisions enter into force for new cranes on 1st January 1983. Certain exceptions and respites are allowed for older cranes until 1986, depending on the sizes and types of cranes concerned. □

New Ordinances

AFS 1980:17 Blasting operations (Amendment to Directions No. 3)

AFS 1980:19 Load limiting devices on cranes (See separate article!)

NEWSLETTER

Newsletter is a quarterly review from the National Swedish Board of Occupational Safety and Health, S-171 84 Solna, Sweden. Telephone: + 46-8-730 90 00. **Publisher:** Gunilla Warnbeck. **Editor:** Göran Palmgren. Subscriptions free of charge on request to the Board's International Secretariat.
ISSN 0348-7598.

Arbete och Hälsa

Scientific Series

ARBETE OCH HÄLSA
1980:17

Friberg, L.

Criteria document for Swedish occupational standards: Cadmium

Exposure to cadmium can have acute as well as chronic effects. High intake of cadmium via food or water can give gastroenteritis and lower intake during a longer time can induce kidney injury. High short-term exposure by inhalation of cadmium fumes may cause lung injury whilst lower exposure over a longer time can cause kidney injury and chronic lung disease. The first sign of cadmium induced kidney injury is excretion of low molecular weight proteins (tubular proteinuria). With more pronounced kidney injury increased excretion of amino acids and glucose is seen. The kidney injury may result in changes in the mineral metabolism and a later development in advanced cadmium poisoning is osteomalacia.

Subcutaneous injection of rats with cadmium or its compounds gives rise to local sarcomas. Some data indicate that high and long-term cadmium exposure is associated with an increased risk of cancer of the prostate in man. Animal experiments show a teratogenic effect at high dose levels.

Cadmium occurs in food, water and in the industrial and ambient air. Poisoning may thus be produced by contamination in the general as well as the industrial environment. Tobacco as a cadmium source is important due to the facts that tobacco contain large amounts of cadmium.

Absorption of cadmium through the GI-tract is low, only about one percent in experimental animals and on an average 5 % in humans. Low intake of calcium, iron and protein increases the cadmium absorption in animals. Iron deficiency increases the absorption considerably in humans.

During long-term exposure to small amounts of cadmium around 50 % of the absorbed cadmium is deposited in liver and kidneys. One third of the body burden is present in the kidneys with 1.5 times the average kidney content present in cortex.

At higher exposures the cadmium concentration in the liver increases relative to the kidney. When kidney damage occurs, the cadmium excretion increases at the same time as proteinuria occurs. Thus, during cadmium poisoning the kidney content of cadmium may be low or normal but liver values are high.

The accumulation of cadmium in the kidneys increases with age up to around age fifty. The cadmium concentration in the kidney cortex varies between 20 and 50 μg/g wet weight, with higher values among smokers than among non-smokers. In Sweden the kidney cortex concentrations are usually around 20 μg/g wet weight. The individual variation is so great, that more than 5 % of the population would exceed 200 μg/g if the average concentration in the population increased to 50 μg/g. The critical level at which kidney injuries occur is probably about 200 μg/g.

The elimination of cadmium is around 0.01 % of the body burden per day, giving a biological half-life around 20 years.

In groups of exposed people the cadmium content in urine may be used as an index of the body burden. Normal values are age-dependent but are usually less than 1 μg cadmium per g creatinine. This is only valid for low exposures. At high exposures the eliminated cadmium cannot be used as an index of the body burden.

The cadmium content in blood among non-smokers is usually below 1 μg/l and among smokers between 2 and 3 μg/l. The biological half-time of cadmium in blood is much shorter than the half-life in kidneys.

Effects and dose-response

Acute cadmium poisoning due to inhalation of cadmium particles (smoke) may be lethal at 1–5 mg/m³ during 8 hours.

The concentration of cadmium in water giving rise to vomiting is around 15 mg/l.

Long-term inhalation of cadmium dust or fumes results in lung emphysema and kidney injury with the kidney as the critical organ.

The first sign of kidney injury is excretion of low molecular weight proteins, particularly 2-microglobulin.

An increased incidence of renal calculus is typical of kidney injury and has been observed in Sweden as well as in other countries.

Osteoporosis and osteomalacia are secondary to cadmium induced kidney injury. Osteomalacia has occurred in industry and as a consequence of cadmium exposure via food (itai-itai).

Animal experiments show that local sarcomas develop at the site of injection. A small number of epidemiological studies indicate that at long-term industrial exposures to high amounts of cadmium, this metal may contribute to the development of cancer in the prostate.

Some animal studies indicate that cadmium exposure induces chromosomal aberrations and that cadmium may be teratogenic. The validity of these studies for human exposure is, however, not known.

Autopsies from industrially exposed workers showed that the cadmium content in the kidney cortex varied between 150 to 450 μg/g wet weight among individuals with no or only slight kidney injury. In animal experiments protein excretion and morphological changes occur at cortex concentrations of 200 to 400 μg/g wet weight. Some results indicate effects already at 100 μg/g.

continued on page 6

Limit values in Sweden–targets and means

by Dr L W Holm, Head of the Chemistry Division, Supervision Department, National Board of Occupational Safety and Health

The most important regulation in the field of occupational hygiene is that concerning maximum permissible concentrations or threshold limit values, TLVs, for air contaminants at places of work.

The latest issue of the Swedish list of limit values was published in 1978. That edition is now being revised and a new list will be issued during 1981. The revision work is continuous and is characterized by tripartite co-operation.

The basis of the activities of the Swedish National Board of Occupational Safety and Health is the Work Environment Act, which is a new law that has been effective since 1st July 1978.

The general character of the Act may be illustrated, in the field of occupational health, by a section (Chap 2, sec. 6) which provides that substances liable to cause ill health or accidents may only be used in conditions affording adequate security. Thus, the law is intended to be a starting point or framework for the more detailed regulations concerning work environment issued by the National Board of Occupational Safety and Health.

It is the principle of the Board that the requirements in the regulations should as a rule be fairly broad and flexible, that is, exact measures should normally be avoided. If possible functional or performance conditions should be used instead of conditions stipulating details of design for a piece of equipment or details of operational procedure for a manufacturing process. When particularly necessary for the sake of health and safety at work the Board is empowered by the Work Environment Act to prohibit the use of a particular work process, working method, technical device or chemical product. Asbestos and certain other carcinogenic substances constitute examples of chemical products the use of which is highly restricted in the working environment.

Product control and the Swedish Cadmium Ban

In the field of chemical products the Work Environment Act is co-ordinated with a general Product Control Act which covers all segments of society and aims at protecting both humans, workers as well as consumers, and the environment. This Act is administered by the Product Control Board, which decides about general conditions such as the labelling of products, the acceptability of pesticides and general restrictions on the use of certain products. The Product Control Board has suggested a general ban on the use of cadmium, with only some minor exceptions. Thus the intention is to ban its use in paints, as a colouring and stabilizing agent in plastics, for surface treatment against corrosion (except for some sophisticated applications in aircraft), etc. A great problem in this connection is of course that you cannot prohibit the cadmium in fallout from the atmosphere. The cadmium content of fertilizers is also a matter of concern. At present the Swedish Government has decided that the regulation will come into force on 1st July 1982.

TLVs and the Board

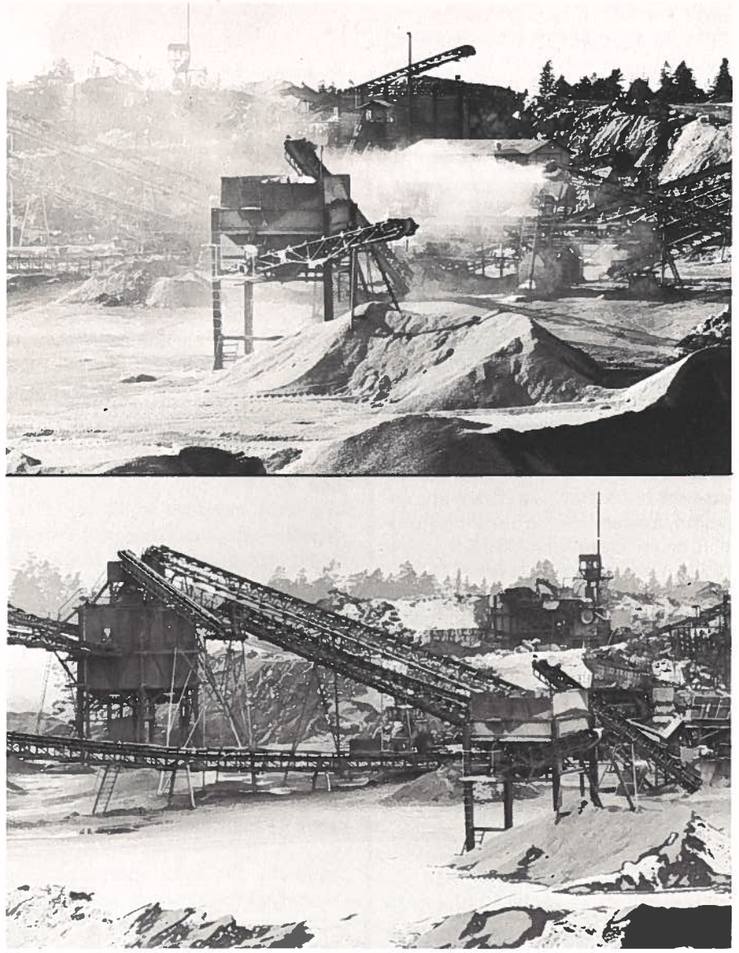
The most important regulation in the field of occupational hygiene is the regulation concerning maximum permissible concentrations or threshold limit values TLVs, for air contaminants. The limit values can be regarded as quantified minimum provisions on the work environment, and when planning new plants and processes they should thus be included in the specification of provisions. Due to the great importance of TLVs from the point of view of the health of the workers, as well as from the point of view of the cost of complying with them, the Board of Occupational Safety and Health puts great effort into the task of establishing limit values. To give you an idea of this work I will start with the organization of the Board.

The Board is headed by a Director General who is also Chairman of the Directorate of the Board. The Directorate includes representatives of trade unions and employers' associations and Members of Parliament. The three departments of the Board are the Supervision Department, the Occupational Health Department and the Administrative Department. The main activity of the Occupational Health Department is research in the field of occupational health, whereas the Supervision Department exercises the directive and supervisory authority of the Board. It also directs and co-ordinates the activities of the Labour Inspectorate, which comprises 19 regional districts and comes under the jurisdiction of the Board.

The criteria group

For the discussions on proposed regulations on limit values for air contaminants the Supervision Department has called together a reference group comprising representatives of labour unions and employers' organizations.

The scientific background is produced by a criteria group convened by the Occupational Health Department. In the criteria group the labour unions and employers' organizations are represented by their specialists in occupational hygiene. Other members of the criteria group are several scientists from the field of occupational hygiene both from the Occupational Health Department of the Board and from the universities. The group has also observers from the Supervision Department. The criteria group produces short criteria documents, which to the best of its members' knowledge represent the present state of the art. Great help is of course obtainable from the international literature on the subject, such as criteria documents from the US National Institute of Occupational Safety and Health (NIOSH). Nowadays the products of a very active Scandinavian limit values group are of great importance. The criteria group presents its results as dose-effect and dose-response data but does not make any recommendations as to the actual magnitude of the limit value.



The limit values can be regarded as quantified minimum provisions on the work environment, and when planning new plants and processes they should be included in the specifications.
A quarrying plant, above without moistening and below with moistening.

The regulations group

The criteria document is handed over to the Supervision Department. Here it becomes part of the background for the discussions with the labour market parties in the reference group on limit value regulations. Other documentation for these discussions is produced by a subgroup to the limit values regulations group. This subgroup, which is also tripartite, collects written evidence and opinions, through the employers' organizations and trade unions, from companies and their employees about a conceivable decrease in the limit value of a substance handled in their activity. In this manner the general background concerning the subjectively felt need for a lowering of a limit value, as well as the techno-economic feasibility of such a reduction is illustrated. Based on the discussions in the limit values regulations group, the Supervision Department makes a proposal which is remitted to labour unions, employer organizations, other concerned organizations and authorities. Considering the opinions so obtained, the Supervision Department makes a definite proposal which is passed on to the tripartite Directorate of the Board, where, after any adjustments that may be found necessary, the final decision is taken.

New TLV list

The details of the background and of the discussions on a limit value vary of course a lot from one substance to another. In some cases the lowering of a limit value may be techno-economically impossible in an existing facility without the use of personal protection devices, which are not considered a very good working environment if in everyday fulltime use. On the other hand the same value may be easily satisfied if considered already in the planning of a new facility. This has led us to propose in the new TLV list, at present being revised, that the TLV for toluene, for instance, should remain at 80 ppm (300 mg/m^3) except for new plants and when reconstructing old ones, where the value should be 50 ppm. The same is true for cadmium, where the TLV for respirable dust, e.g. fumes, for new plants etc. is reduced to 0.01 mg/m^3 as compared to the present value of 0.02 mg/m^3, the latter still being acceptable in existing plants.

Biological limit values

For some substances, like lead and cadmium, it is possible to get information on the amount of the substance taken up in the body by analysis of biological sample from the exposed person. Take lead as an example. Blood samples analysed for lead give the total uptake, not only from the working environment but also from drinking water, food, street dust, tobacco etc. The individual variation

➔

here can of course be very great. The World Health Organization (WHO) has recommended a level of the lead concentration in blood of 40 μg/100 ml. An occupational exposure of 0,01 mg/m^3 of air will contribute about 5 μg of lead per 100 ml of blood.

As a consequence of this, and of the knowledge that the average lead concentration in the blood of the non-occupationally exposed Swedes is around 10 μg/100 ml, the Supervision Department has suggested a limit value of 0.05 mg/m^3 for respirable lead dust in air. Considering non-occupational uptake and the fact that the occupational uptake varies among other things with the type of lead compound handled—the uptake of lead fumes, i.e. lead oxide, and lead sulfide especially when swallowed will be quite different—we have stated that if biological tests show that the exposure is acceptable when considering the biological limit value, less importance may be attributed to the air concentration limit value when analysing the exposure situation of the individual. The regulations concerning medical control of lead exposure provide that if the periodic control shows a blood lead content of more than 2 μmol/l (= 40 μg/100 ml) the employer should investigate the matter further and take the necessary steps to reduce exposure. If the content exceeds 3 μmol/l the employee shall be medically examined and must not be engaged in work with lead until the blood value has decreased below 2 μmol/l.

In connection with the establishment of criteria for TLVs it is often found that the historical picture, especially regarding exposures to air contaminants, is very poor, which makes retrospective epidemiological work very hard and often too much a matter of a guess work. Partly for this reason, the Swedish Board of Occupational Safety and Health has started some exploratory work in utilizing EDP in establishing an exposure register on individual lead exposures for workers in those companies for which a compulsory medical lead control has been provided.

TLVs in practice

The TLVs are not to be considered as very strict numerical values. The provision in this case is that the concentration of an air contaminant in the inhaled air shall be as low as possible and always be acceptable with regard to the TLVs listed by the Board. Judgement as to what is acceptable in a certain case lies with the employer. The safety delegate appointed by the local trade union can challenge this judgement by calling in the Labour Inspectorate. The main task of the Inspectorate is to enforce the regulations issued by the Board. Of course there may every now and then be different opinions on how the regulations should be applied in the individual case. Most of the regulations issued by the Board are not directly combined with penal sanctions. Also the Labour Inspectorate gives advice and instructions when inspecting a workplace. If these instructions are not followed or an acceptable working environment obtained in some other way, the next step will be an announcement that a prohibition or injunction is being considered. If the necessary arrangements to improve the working environment are still not made, the next step will be the issue of a prohibition or injunction that may carry penal sanctions. Against such a decision by the Labour Inspectorate the employer or, on behalf of the employees, the safety delegate may appeal to the Board. Appeals against the decisions of the Board may be made to the Government.

The limit values are of course not the only means by which the hygiene on the working site is regulated. Regulations on the selection of working methods are another example. Furthermore information and education about the regulations of the Board as well as fundamentals of occupational hygiene are very important to make employer-employee co-operation, both in the safety committee and in everyday work, sensible and productive, considering both occupational health and techno-economic aspects. □

(Also presented at the 7th Conf. on Occupational Health and Safety, Intern. Wrought Copper Council, Sept. 23–24 1980, Brussels.)

Change of address:
Write to
International Secretariat,
Arbetarskyddsstyrelsen,
National Board of
Occupational Safety
and Health,
S-171 84 Solna
Sweden

continued from page 3

Estimates of the critical cadmium level in kidney cortex give values between 100 and 300 μg/g, with the most probable value around 200 μg/g. Using a metabolic model it has been calculated that at an absorption of 25 % via inhalation and a biological half-life of 19 years 200 μg/g would correspond to 13 μg/m^3 during 25 years of exposure.

Long-term cadmium exposure to 50–100 μg/m^3 results in a 20–50 % prevalence of cadmium induced tubular proteinuria. In one study 20 % of the workers exposed to 50 μg/m^3 during 6–12 years had tubular proteinuria. Another study indicates a prevalens of 50 % had proteinuria after long-term exposure to 20 μg/m^3 respirable cadmium. Empirical data indicate that a daily intake via food of about 300 μg cadmium increases the frequency of tubular proteinuria in Japan.

Although the kidney is the critical organ at industrial exposure levels, lung emphysema may also be induced by cadmium inhalation. Some data indicate that a time weighted average of 20 μg/m^3 during many years may produce changes in lung functions.

Standards for both short-term and long-term exposures are needed in order to prevent acute and chronic lung changes. Both biological values and air standards should be used in parallel.

In order to prevent acute effects in the lungs a short-term value of 250 μg/m^3 for cadmium smoke and respirable dust is recommended. To prevent lung and kidney injuries at long-term exposure a TWA below 20 μg/m^3 of cadmium smoke and respirable dust is recommended. WHO has proposed 10 μg/m^3, which seems reasonable.

A biological value of 10 μg/l blood is proposed as a critical level.

The amount of cadmium in urine should not reach 10 μg/g creatinine.

The levels in blood and urine are effect levels, and it is thus recommended as soon as individual cadmium concentrations reach 5 μg cadmium/g creatinine and/or 5 μg/l whole blood.

23 pp, 34 refs.

ARBETE OCH HÄLSA 1980:18

Nordic Expert Group for Documentation of Occupational Exposure Limits:
Isopropanol
Survey of literature on isopropanol to be used as a background for discussion of occupational exposure limits. Skin and mucous membrane irritation should be taken into consideration in the establishment of the standard.
27 pp, 44 refs.

ARBETE OCH HÄLSA 1980:19

Nordic Expert Group for Documentation of Occupational Exposure Limits:
Hexane
A survey of the literature on n-hexane valuable as a basis for occupational exposure limits. Recommendations on effects to be used in this discussion (polyneuropathy and maculapathy as well as subclinical effects e.g. functional disturbances (MCV and SCV).
42 pp, 87 refs.

ARBETE OCH HÄLSA 1980:20

Nordic Expert Group for Documentation of Occupational Exposure Limits:
1-butanol
Relevant literature on 1-butanol is surveyed and critically evaluated as a background for establishing an occupational exposure criterion (TLV value). Eye irritation and mucous membrane irritation should be applied as a basis for the establishment of a TLV.
23 pp, 37 refs.

ARBETE OCH HÄLSA 1980:21

Nordic Expert Group for Documentation of Occupational Exposure Limits:
Copper
A survey is given of literature on copper to be used as a background for discussion of occupational exposure limits. It is recommended that the biological effect to be used in this discussion should be irritations of the upper respiratory tract and "metal fever".
44 pp, 116 refs.

Investigation Reports

INVESTIGATION REPORT 1980:24

Tillman, C & Lundgren, L
Determination of certain optical properties of fibres in a quantitative interference contrast microscope.
20 pp, 6 refs.

INVESTIGATION REPORT 1980:28

Blomquist, G, Ström, G & Strömquist, L-H
Determination of atmoshpheric diaspore content at a number of ship combustion plants.
11 pp, 4 refs.

INVESTIGATION REPORT 1980:33

Karlberg, A-Th.
Copper and skin.
40 pp, 124 refs.

INVESTIGATION REPORT 1980:35

Gamberale, F et al.
An empirical examination of the capacity of the dB (A) scale to predict sound pressure experience of low frequency noise.
14 pp, 8 refs.

INVESTIGATION REPORT 1980:36

Strandberg, L
Accident investigation for safer products. A pilot study: Severe vehicle occupational accidents.

Vehicles exemplify products that are overrepresented among severe occupational accidents. Official statistics state that vehicles have "caused" less than 10 % of all registered occupational accidents. This should be compared to 30–50 % vehicular involvement in approximately 200 fatal occupational accidents occurring in Sweden each year. Most of the fatal accidents occurred while the vehicle was in motion, and were primarily striking persons inside the vehicle. The relatively large number of road vehicles involved in fatal occupational accidents encourages more substantial occupational safety measures for professional drivers and for work vehicles in general.

About 90 case descriptions of fatal occupational accidents involving vehicles are used to illustrate some tangible needs for technical facilities, not possible to specify from statistical surveys. More concealed dangers related to the vehicle design, e.g. rear wheel steering in fork-lift trucks or adverse length ratios in truck-trailer combinations, are identified through system dynamics analysis.

The models of investigation and analysis, that are discussed in the report, are primarily intended for mass producing enterprises and safety service institutions rather than for consumers and local safety organizations. The possibilities to effect changes in product design lie with these producing enterprises and with national or international institutions. In addition, local data from severe accidents related to one type of product only, are mostly too limited for systematic product improvements.

Each accident is here considered a sequence of events with **multiple causes.** Thus several needs for countermeasures can be identified from the data of one accident. In the new Swedish Occupational Injury In-

➡

NEWSLETTER

National Board of Occupational Safety and Health · Arbetarskyddsstyrelsen · Sweden
Mailing address: Fack, S–100 26 Stockholm · Telephone: 46-8-54 02 60 Publisher: Gunilla Warnbeck

No. 1 1977

ALLOCATIONS FOR THE FISCAL YEAR 1977/78

The allocations granted to the National Board of Occupational Safety and Health and the Labour Inspectorate for the fiscal year 1977/78 amounts to Skr 131 million or close to US $ 31 million. In comparison with the fiscal year 1976/77 this is an increase of Skr 20 million or US $ 4.7 million.

Of the total sum of Skr 131 million the Board is granted Skr 69 million, which is an increase from last year's budget of Skr 12 million. The Labour Inspectorate is granted Skr 62 million, an increase of Skr 8 million.

Of the 85 new posts granted, 45 are intended for the Board and 40 for Labour Inspectorate.

THE SWEDISH COUNCIL OF ENVIRONMENTAL INFORMATION

At the request of the Swedish Goverment, a preparatory study of a national environmental information system was undertaken in the early seventies by an ad hoc Goverment Committee for Environmental Control. The investigation involved over seventy agencies and organizations - mostly in the public sector - concerned with matters related to environment control.

It was concluded that there was a general need for a coordinated system of information on environmental facts and basic data regarding:

1. Products and chemical substances subject to control

2. Major sources of pollution and the pollution caused by them

3. Air, water and ground quality both in polluted and relatively unpolluted areas and also the state of the flora and fauna

4. Research and data collection activities of environmental interest.

An Environmental Information System was proposed, designed to furnish goverment agencies, research organizations and other bodies in society with information about the state and development of the environment.

The Swedish Government approved the proposals for the Environmental Information System and the Swedish Council of Environmental Information was set up in the middle of 1974 to direct the development of the system. The Council was to be assisted in its work by two other governmental agencies, namely the Swedish Agency for Administrative Development and the Central Bureau of Statistics.

The development activities of the Environmental Information System are organized in projects. A complete list of the projects of the Swedish Council of Environmental Information is given in the panel on next page. Those projects in which the Board is taking part are marked with a B.

Highlights are given below of some of the projects in which the National Board of Occupational Safety and Health is directly involved.

Study of information concerning occupational safety and health -MI - 08

In project MI - 08, the Swedish Agency for Administrative Development (SAFAD) has carried out a systematic survey of information concerning the occupational environment. This work has primarily focussed on the possibilities of simplifying the activities of the National Board of Occupational Safety and Health and the Labour Inspectorate by developing routines based on a joint register of work places.

In the light of this survey, in January 1976, SAFAD proposed measures designed to simplify the collection, storage and compilation of information concerning occupational safety and health. The proposals thus made can be summarized in the following three points.

1) The Labour Inspectorate's manual registration of firms and work places should be co - ordinated in an ADP based company registration system for occupational safety and health enforcement purposes.

2) Registration should be expanded to include information concerning the occupational environment within the firm.

3) Information should be compiled concerning connections between the occupational environment and ill health.

In its survey report, SAFAD particularly underlines the need for a comprehensive view of the chemical health hazards existing at different work places. SAFAD's proposals lead up to a recommendation in favour of experiments within two or three Labour Inspection Districts, involving the introduction of computer - based work place registration and the charting of certain risk factors.

The Swedish Council of Environmental Information has resolved in favour of undertaking the activities advocated by SAFAD. The present fiscal year is being devoted to system construction and testing, and the work place registers of the two Labour Inspection Districts concerned are being converted for ADP.

The experimental use of ADP routines in the inspection of work places will continue for the whole of the fiscal year 1977/78 and will be evaluted during the fiscal year 1978/79.

The experience accruing from this experimentation will help to show whether ADP routines should be introduced in the inspection of work places in all Labour Inspection Districts.

In November 1976, while preparations were being made for the experimental activities, a special survey was begun

concerning information on health and the occupational environment, i.e. the third point in SAFAD's proposals. This survey is being carried out at the National Board of Occupational Safety and Health with assistance from SAFAD. One of its aims will be to try to devise system models for data elucidating the connection between environmental conditions and health conditions and which can be collected by statutory authority. Attention will also be given to the registration of data in response to the Recommendation (No. 147) concerning the prevention and control of occupational hazards due to carcinogenic substances and agents adopted by the ILO Conference in 1974.

The survey findings will form the subject of a report later in 1977, to be circulated to the relevant authorities and organizations for comment. The development work which the survey may lead to should start in the spring of 1978.

Swedish Register of Environmental Research - MI-20.

The Swedish Council of Environmental information has a pilot project which concerns the development of a national database for Swedish on - going environment research projects. The system has two prinicipal objectives, i e to enhance communication among scientists concerning Swedish on - going projects and to provide an effective information base to managers of Swedish research and development.

In a first phase a limited number of Swedish government authorities and organizations are contributing material to the database. Some projects have also been reported from the industry.

The database, called MI - 20, covers both the external environment and occupational safety and health. References to on - going research projects and to research projects completed after July 1, 1973, and to reports emanating from these projects have been registered. References including abstracts and keywords are registered in the database. The language is Swedish and to some extent English.

The output from the project is a magnetic tape copy and a printed catalogue in two parts, one for each of the covered areas.

To facilitate an international exchange of information internationally developed classification systems have been used, i e for occupational safety and health a scheme developed by Centre information de Securite (CIS) at the international Labour Office (ILO), and for the external environment a classification scheme developed by the United Nations in their International Referral System for Sources of Environmental Information (IRS).

The database is working on - line. The search programme used is the ISIS programme developed by the International Labour Office (ILO).

In the future now archived material will be microfilmed to facilitate a distribution service.

Database with information regarding the teratogenic effects of selected chemical substances - MI - 10

The Swedish Council of Environmental Information is sponsoring a three - year project aiming at building a database with information on the teratogenic effects of selected substances. The purpose is to facilitate access of this type of information for governmental agencies research institutions and other interested parties. One particular field of utilization is the products control executed by governmental agencies in Sweden.

The work - literature searches, data extraction and database building - will be carried out at the Medical Information Center at the Karolinska Institute in Stockholm. The European Teratology Society has agreed to participate in the evaluation of the data extracted. A committee with scientists and representatives of the major Swedish governmental agencies engaged in products control and products evaluation will function as a steering committee for the project.

For the initial stage of the project the following chemicals have been selected by the steering committee:

- Benomyl
- Beta - carotene
- Bytulated hydroxyanisole
- Captan
- Carbaryl
- Diazepam
- Halothane
- Lead
- Metronidazole
- Methylene di - para - phenylene isocynate (MDI)
- Norethisterone
- Ochratoxine Ochratocine
- Oxyphenbutazone
- Pentachloronitrobenzene (PCBN)
- Potassium nitrite
- Pyrimethamine
- Saccharin
- Sodium nitrite
- Styrene
- Toluene - 2,4 - diisoccyanate (TDI)
- Trichloroacetic acid (TCA)
- Vinyl chloride

Activities at Swedish Council of Environmental Information

Project code	Project name
MI - 01	Processing of information from industries and sewage treatment plants according to the Environment Protection Act
MI - 06[B]	Processing of information concerning products hazardous to health and to the environment
MI - 06	Processing of information about pharmaceuticals
MI - 06	Study of solid wastes and solid waste handling
MI - 06	MI - KOM Environmental Information Services
MI - 07	Processing of information about foodstuff
MI - 08[B]	Study of information concerning occupational safety and health
MI - 09[B]	Study of routines for retrieval of information in cases of acute poisoning
MI - 10[B]	Study of building a database with information regarding the relationship between substances and teratogenic effects
MI - 20[B]	Register of Swedish environmental research and surveys
MI - 21[B]	Register of environmental information in documents at agencies, organizations etc
MI - 22	Support to International Referral Service UNEP
MI - 30[B]	Study of identification and characterization of chemical substances
MI - 33	Study of a national programme of environmental control
MI - 40	Study of methods in environmental statistics
MI - 41[B]	Study of statistics on products hazardous to health and the environment
MI - 42	Study of statistics on installations engaged in activities injurious to the environment
MI - 43	Study of statistics on emissions from industrial and municipal installations
MI - 44[B]	Publication of Environmental Statistics, a year - book
MI - 49[B]	Study of statistics on solid waste

NEW DIRECTIONS OF THE BOARD

Woodworking machines, general directions

The Board's **Directions No. 51:0 Woodworking Machines** apply to general safety measures to be taken at woodworking machines. They are not applicable to portable machines except when mounted on a frame.

The directions were published in August 1976. When they enter into force on 1 st July 1978 these directions will supersede certain parts of older directions No. 51, issued in 1963.

The main features of Directions No.51: 0 are the following.

The operating point shall permit good working conditions and shall allow relevant machine or machines to be satisfactorily overlooked.

Any starting switch shall be easily accessible though protected against inadvertant operation.

Stopping devices shall be easily accessible.

Any machine or production line shall be equipped with an easily accessible safety switch device, enabling the main power supply to be kept safely shut off in case repair, adjustment or any other work has to be done within the danger zone of the machine or production line.

Any machine, the sudden start of which might involve danger, shall be equipped with a device preventing automatic restarting when, following an interruption, the supply of power is restored.

Any machine, the running of which might involve danger, shall either be designed to stop within 10 seconds of switch-off or it shall be equipped with a brake to be used by the operator to stop the machine before leaving it. In the latter case there shall be a sign obliging the operator to do so.

There shall be a suitable support (floor or platform) to facilitate the exchange of tools. If necessary the machine shall be equipped with a device to prevent shafts etc from moving during such work.

Any tool, when duly mounted, shall be so fastened that it cannot work loose when running or as a result of a change of speed or direction of movement. When fitting a tool any instructions given by the tool manufacturer shall be followed.

Any clamping device shall be so arranged that there is no risk of pinch.

Any counterbalance weight shall be so arranged that there will be no danger because of its movements or in the event of its suspension breaking.

Concerning noise, reference is made to Directions No. 110. A noise test report schould be available for all new machines. At delivery, any machine with dangerous noise emission shall be accompanied with instructions for suitable noise reducing measures to be taken.

Unless otherwise decided, any machine, except very small ones, must be equipped with a dust extraction device or be able to be connected to such a device.

Concerning conveyors, reference is made to Notice No. 1974: 1. Any machine with a conveyor shall be so arranged that nobody can pass between the machine and the conveyor. If passage across the line is necessary, a safe passway shall be arranged above or below the line. An infeed conveyor must not be able to operate when the machine is at rest.

In the case of combined machines, i.e. two or more different machines built together into one unit, each machine must fulfil the relevent requirements.

At delivery every machine shall be accompanied by adequate instructions for its safe use and maintenance.

Debarking machines

The Board's **Directions No. 51: 2 Debarking Machines** apply to safety measures to be taken at non-portable debarking machines.

The directions, entering into force on 1 st July 1978, were issued in August 1976. The main features are the following.

The machine shall be so arranged and installed that nobody runs the risk of coming in contact with dangerously moving parts of the machine. Two alternative guarding methods are indicated to this end.

The first alternative guarding method is to surround the machine with a strong guard or hood which, when closed, also prevents any passage across the line between the machine and an adjoining conveyor. An interlock is supposed to be arranged in such a way, firstly, that the hood cannot be opened until the power supply to infeed rollers and conveyor has been switched off and, secondly, that rollers and conveyor can be started only when the hood is shut.

The second alternative guarding method is to build the machine, including the nearest parts of adjoining conveyors, within a separate room with a service door, interlocked in the same way as the hood in the first alternative.

For testing purposes guarding may be dispensed with under certain conditions, one of them being that a special deadman's control is used close to the machine.

The machine shall be arranged in such a way, that any log or part of it flung away by the machine cannot cause injury.

Measures shall be taken to prevent injury in case a log should whirl. For that purpose conveyors should be surrounded by a suitable guarding framework running a sufficient distance from the debarking machine along the conveyor.

In case a passway runs along a conveyor, measures shall be taken to prevent inadvertent leaning over the conveyor.

In case conveyors are not delivered together with the debarking machine the contractor delivering the machine shall provide necessary instructions for the installation of guarding frameworks along the conveyors.

When necessary the infeed conveyor should be equipped with a device warning the operator or stopping the conveyor in case a log of critical width should approach the machine.

When infeed rollers are at rest, the infeed conveyor must not be able to run in the infeed direction.

To admit passing from one side of the machine to the other a safe passway shall be arranged above or below the conveyor.

A safety switch device shall be provided, enabling the main power supply to the debarking machine and the infeed conveyor to be shut off simultaneously.

In case the machine is not installed by the contractor delivering the machine, he shall provide the necessary instructions for that work.

In case different parts of the entire debarking installation are delivered by different contractors, each one of them shall provide necessary instructions for the use and maintenance of the relevant part. If necessary the different instructions shall be compiled and completed by the employer.

Only employees with the necessary training and chosen for the purpose may be allowed to work at a debarking machine.

Chlorine

The Board's **Directions No. 112 Chlorine** concern protective measures against fire, explosions, poisoning or other occupational hazards for the manufacturing, storage, carriage and use of chlorine.

The Directions deal closely with safety precautions to be observed during work with storing as well as filling and emptying of transport containers for chlorine.

Protection against sudden leakage (emergency plan, personal protective equipment, relief actions) are regulated in detail.

Travelling cranes

In mid-November 1976 the Board issued **Directions No. 113 Travelling cranes.**

Among other things these directions stipulate that all electrically powered overhead travelling cranes, transporters and trackbound cantilever walking cranes (bracing cranes) must undergo official testing as from 1 st January 1977. This testing will comprise an initial inspection followed by recurrent annual inspections.

Several new rules apply to the design of new cranes supplied after 1 st January 1979. These are contained in the specifications issued by the Crane and Hoisting Devices Committee. (The specifications No. IKH 6. 31. 06. can be ordered - in Swedish - from Sveriges Standardiseringskommission, Box 3295, S-103 66 Stockholm).

Cabins should be designed in accordance with specifications (No. IKH 7. 30. 01.) from the Crane and Hoisting Devices Committee.

Please note that all the directions mentioned in this issue are published in Swedish only.

Radio-operated hoisting devices

The Board's new **Directions concerning Radio-operated hoisting devices, No. 114,** contain stipulations concerning the design, inspection, supervision, maintenance and use of radio-operated hoisting devices. The directions will came into force on 1 st July 1977. Design is governed by the specifications for radio-operated hoisting devices (No. IKH 8. 00. 08) published by the Crane and Hoisting Devices Committee which have now been issued in a second edition.

Hairdressing

The Board's **Directions No. 115 Hairdressing** concerning measures for the prevention of injuries and ill health in hairdressing came into force on 1 st February 1977.

Principal content

In a bid to solve the problem of incorrect working postures, it has now been stipulated that all hairdressers must install vertically adjustable chairs for customers.

To avoid eczema etc., certain stipulations are made concerning the selection and use of chemical compounds. Plastic protective gloves are recommended. Meticulous personal skin hygiene must be observed.

Stipulations are also made concerning the size of hairdressing premises and concerning their ventilation, air temperature, illumination, hygiene and electrical installations.

A personnel room and cleaning facilities must be provided.

Single copies of the publications of the Board mentioned in this Newsletter are submitted free of charge to foreign addresses on request. See order form.

Other directions published by the Board since the previous issue of Newsletter.

Notice No. 1976:27 Directions concerning record of overtime for certain civil servants bound by collective agreement with the National Swedish Collective Bargaining Office

Notice No. 1976:28 Welding licenses and testing of the competence of welders

Notice No. 1976:29 Application of the Digester Code issued by the Pressure Vessel Commission. (The Digester Code is available in English and can be ordered from Tryckkärlskommissionen, Publication Department, IVA, P.O. Box 5073 S- 102 42 Stockholm at a price of Skr 56.)

Notice No. 1976:30 Date for periodic inspection of pressure vessels, lifting devices, conveyors and hoisting gear

Notice No. 1976:31 Competence to carry out inspection and testing of pressure vessels, lifting devices, conveyors and hoisting gear

Notice No. 1976:32 Ladders in working pits

Notice No. 1976:33 Bracing of framework in buildings during construction

Notice No. 1976:34 Application of Supplement 1 to the Pressure Vessel Code issued by the Pressure Vessel Commission

Notice No. 1976:35 Minimum age, etc. for minors at work

Notice No. 1976:36 Vibrations in crosscutters, skidders and other forestry machines

Notice No. 1976:37 The use of ear protectors or respiratory protective equipment with spectacles

Notice No. 1976:38 Ventilation in anaesthesia rooms

Notice No. 1976:39 Asbestos in floor and wall covering

Notice No. 1976:40 Modified regulations for periodic inspection of excavators

Notice No. 1976:41 Inspection certificate for pressure vessels, lifting devices, conveyors and hoisting gear

Notice No. 1976:42 Inspection of single, series-produced pressure vessels

OTHER NEW REPORTS PUBLISHED BY THE BOARD

Investigation report AMMD 101/76, 20 pages.

Jan E. Wahlberg and Gun Johansson: Skin cancer of the hand and arm in Sweden 1966-70 in relation to previous occupational exposure. *In Swedish.*

Investigation report AMTG 104/76, 21 pages.

Ingvar Skare and Bo Dahlner: Evaluation of indicator tubes. Part III: Formaldehyde. *In Swedish.*

A summary in English is found below.

This report — the third in a series concerning the evaluation of indicator tubes — deals with those tubes for formaldehyde which are available on the Swedish market.

Four types of indicator tubes from three manufacturers (Dräger 0,002, Dräger 0,5/a, Gastec No 91 and MSA No 93 963) have here been tested for accuracy and the effects of temperature, humidity and some gases.

The tubes appeared not to be influenced by moderate changes of the temperature but at lower sampling temperatures the volatilization of xylene in the prechamber could be affected. Hence to be safe the tubes should be tempered before analysis.

The influence from variations of the humidity of the air sample was most apparent for the Gastec-tube and the MSA-tube. An increase of the water content appeared at first as an extension and fading of the coloured area which at higher levels of humidity gave a break-through of the front. Because of the weak colour intensity tube analyses then could be evaluated as zero readings.

The Dräger-tube No 0,002 and the Gastec-tube were here regarded as semiquantitative analytical tools for the control of working places. The Gastec-tube seems to be the best choice if its systematic pluserror and influence from variations of the humidity is payed attention to.

Investigation report AMMF 104/76, 73 pages.

Walter Ruth, Mats Levin and Bengt Knave: An occupational hygiene evaluation of infra - red radiators for drying of car paint. *In Swedish.*

Investigation report AMMF 108/76, 23 pages.

Olof Östberg and Ewa Gunnarsson: Review of ergonomic problems in the reading of microimages. *In Swedish.*

A summary in English is found below.

Microfilm techniques have become an important tool in the rationalization of information handling routines, and there is rapid development of system solutions, applications, job routines, viewing apparatuses, index systems film format, etc. Consequently, the need for standardization is strongly felt - especially concerning ergonomic topics such as workplace layout, design of viewers, and microimage quality. It has also been observed that the reading of optically displayed images is often carried out under viewing conditions that differ considerably from those related to the reading of printed documents. Changed viewing conditions are for example found as regards viewing time, line of sight, viewing distance, luminance ratios, picture layout, and image focus. Unconsidered design of microfilm systems may thus result in operator complaints (" eye fatigue" etc) and demands for shortened working hours, regular ophthalmologic check-ups, and free-of-charge working spectacles. In order to overcome these drawbacks and to guide the technical development, more research is needed in the sphere of the ergonomics of display reading.

Investigation report AMMF 109/76, 20 pages.

Nils Bjerker, Gunnel Hagelthorn and Ing-Marie Lidström: Measurements of power spectral density from various types of vibrating hand tools. *In Swedish.*

Investigation report AMMF 110/76, 31 pages.

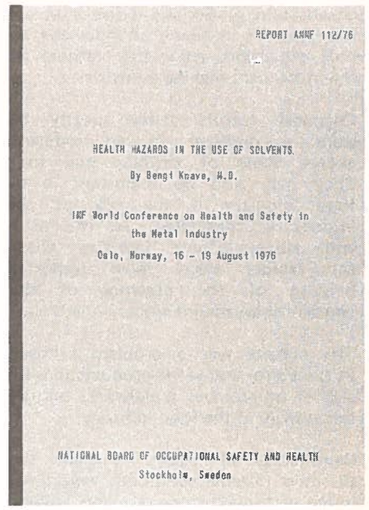
Mats Levin: Measurement and occupational health assessment of optical radiation. II. Plasma flame spray at Sandvik Ltd, Coromant-factory. *In Swedish.*

Investigation report AMMF 111/76, 19 pages.

Mats Levin: Measurement and occupational health assessment of optical radiation. III. Plasma cutting in stainless sheet. *In Swedish.*

Investigation report AMMF 112/76, 17 pages.

Bengt Knave: Health hazards in the use of solvents. IMF World Conference on Health and Safety in the Metal Industry, Oslo, Norway 16 - 19 August, 1976. *The whole issue is in English.*



Investigation report AMMF 113/76, 10 pages.

Bengt Knave and Gösta V Hultgren: Daylight glare in the use of between-glass window - blinds. *In Swedish.*

Investigation report AMT 106/76, 109 pages.

Ulf Ulfvarsson: The working environment in small enterprises. *In Swedish.*

A summary in English from the report is reproduced below.

During the years 1969 to 1974 investigations of the working environment were made at more than a hundred small enterprises, generally with less than 100 employees within various industries in Sweden. The sampling of firms for the study was done with the goal of obtaining variation as well as representativty within each industry. Whenever possible at least six firms within each industry were chosen. This report presents data collected at 113 firms from 25 different industries including the food, clothing, graphical, timber, chemical, metal and earth- and stone-products industries and also including workshops such as those used in car repair services.

All firms were investigated with a battery of methods to assess illumination, noise, air contamination, climate, safety and ergonomic conditions. The aim of the study was to provide a basis for assessing the need for safety and health programmes within small enterprises.

On average, illumination was worst in the timber industry, the earth- and stone-products industry and non-ferrous metalworks. The variations were of course appreciable but the conditions as regards illumination were, with the exception of only a few firms, rather

unsatisfactory. Serious noise problems were present in nearly all industries, the only exceptions being the clothing and the instrument-making industries.

Chemical factors varied greatly but were a problem in all industries except those of clothing and food. They may also be important in the food industry if the risk of skin injuries is considered. In the earth- and stone-products industry chemical factors were most important because of the presence of dust containing crystalline silica.

The climate was a problem primarily in the earth- and stone-products industry and in non-ferrous metalworks but also secondarily in the food industry.

Considering all factors, it seems that the most notable conditions were found in the earth- and stone-products industry and next in non-ferrous metalworks and sawmills and planing-mills. Comparing the factors with each other, it appears that notations concerning illumination and noise were more frequent than those for chemical factors and climate. This alone can not be a basis for priorities since the various factors do not have comparable effects on health and working environment. This investigation gave no evidence of any correlation between the age of the buildings and the conditions regarding illumination, noise, chemical factors and climate. On the other hand the factors noise and climate seem to be more favourable in small enterprises than in large.

This investigation was performed several years ago and therefore does not reflect the present conditions absolutely. Enterprises may since have closed, productions methods may have changed and improvements in bad conditions may have occurred. However since changes on a large scale are generally slow, the types of problems reported are probably still in existence.

Investigation report AMT 108/76, 18 pages.

Jan Rudling:
Determination of chlorine and chlorine dioxide in air. *In Swedish.*

Investigation report AMA 011/76, 39 pages.

Jan - Erik Hansson, Anders Gullander and Nils F Petersson:
Work load, noise and vibration during work with power sanders. *In Swedish.*

A summary from the report is reproduced below.

The investigation comprised a field study and a laboratory study of power sanders. The field study was performed at 19 different work sites in shipyards, foundries and engineering plants. Noise, vibration and work load were investigated. In the laboratory study, 8 power sanders were examined with respect to ergonomic design, handiness and no-load noise level. The investigation disclosed that:

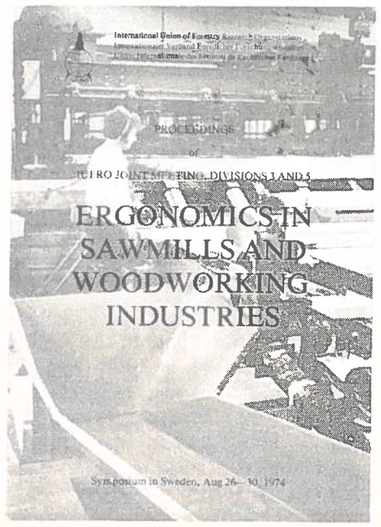
The noise level found in the field study was often very high and always greater than 90 dB(A). Approx. 40% of the measurements ranged from 100 - 105 dB(A). Major differences in noise level were found in different work phases. The laboratory study disclosed that the no-load noise level exceeded 85 dB(A) for most machines.

There were only minor variations in the vibration level of the various units. An assessment, made on the basis of the ISO proposal, disclosed that the level of acceleration at the resonance frequency was decisive in determining the permissible duration of exposure. With an exposure time less than one hour, as is common, most of the machines complied with the recommendations in the ISO proposal. However, three machines produced far more vibration than the others.

Initial acceleration forces for four electric sanders were so great that there was a risk of dropping them. This risk would be diminished in all the machines if motor revolutions were increased gradually.

The pulse rate of subjects during sanding work was higher than in other jobs performed by the same workers. Five subjects had a mean heart rate exceeding 125 beats/min. This type of work must be regarded as very heavy.

The weight of the different machines varied but was usually lower for compressed air units than for the corresponding electric machines. The 6 - 7 kg (13 - 15 lb.) weights of the machines in the study were regarded as being too heavy for work above waist height. However, a heavy machine may be appropriate in work with the machine resting on a bench or the like.



The handles of the machines were often felt to be too thick. On some machines, the support handles were mounted for right-handed people so that they could not be used conveniently by left-handed people. The report suggests that the machines be fitted with support handles attachable on either side or with a loop handle.

Most of the machines had poorly designed triggers in locations so awkward that they were occasionally inoperable by left-handed people. There was no automatic shut-off. A maximum trigger pull of approx. 20 N (one trigger finger) and a "dead man's trigger" control is proposed.

Investigation report AMP 101/76, 128 pages.

Klas Göran Lindström and Carin Sundström - Frisk.
Unsafe behaviour in the felling operation. Prevalence and influencing factors. *In Swedish.*

A summary in English is found below.

A high rate of industrial accidents in forestry has given rise to several different approaches to research on accidents and their causes. In this investigation 500 cutters have, via interviews and questionnaires, described their working behaviour in work situations that are especially critical from a safety point of view. They have been asked which methods they choose from several available, ranging from very safe to more risky and which factors influence their choice. The results show that unsafe methods are used more or less frequently by the majority of cutters, although the individual knows that they are unsafe. Factors that influence the tendency to unsafe behaviour were found to be the design of the remuneration system, the physical exertion required, lack of equipment required and the attitude of the supervisor on safety matters. In the report the influence of training and experience of accidents is also described.

Investigation report AMP 102/76, 36 pages.

Ivar Bengtsson and Kurt Baneryd: Work organization in sawmills. *In Swedish.*

OTHER PUBLICATIONS OF THE BOARD

Ergonomics in Sawmills and Woodworking Industries.
Proceedings of IUFRO Joint Meeting Divisions 3 and 5. Symposium in Sweden Aug 26 - 30, 1974. *The whole issue is in English.*

Olof Östberg:
Towards a circadian phase typology. The working out of a practical chronohygiene. Reprint from "Biologische Rhytmen und Arbeit". *In German.*

FROM THE BOARD'S FOREIGN VISITOR'S FILE

27 - 28 Sept 1976
Mr Vähäpassi, Engineer, National Board of Occupational Safety and Health, Tammerfors, Finland.

29 Sept
Mr Kioysada Tanaka, Ministry of Labour, Japan

29 - 30 Sept
Professor Konrad Szymcykiewicz, Director of the Institute of Occupational Medicine in the Mining and Metallurgical Industries, Poland.

12 - 13 Oct
Dr Rifaat Mahmood, Ministry of Health, Bahrain.

2 Nov
Mr J. Rubens, Minister of Agriculture
Dr A. Tistchenko, USSR.

12 Nov
Dr Eiben, Hungary.

15 - 16 Nov
US Work Environmental Study Group, Participants:
Ms Peggy Taylor, Senate Labour Committee, Ms Susan Nelson, Writer for Government Research, Inc. Mr Jack Sheehan, OSHA, Dr Peter Infante, NIOSH, Mr Georg Cooling Exec. Dir. of Urban Environment Conference, Art Keys, Ms Lael Stegall, Ms Andrea Hricko, Institute of Industrial Relations, Berkeley, Pat Maher, Ms Catherine Lerza, Editor for Urban Environment, Mr and Mrs Frank Wallick, UAW (United Automobile Workers).

7 - 9, 13 Dec
Mr Doron Gunzburg, Psychologist, Australia.

THE NORDIC COMMITTEE OF OFFICIALS FOR QUESTIONS CONCERNING THE WORKING ENVIRONMENT

The Nordic Committes of Officials for Questions Concerning the Working Environment, which comes under the Nordic Council of Ministers, has now been active for a number of years, as witnesses the growth of its budget from Nkr 240,000 in 1975 to Nkr 341,000 in 1976 and about Nkr 900,000 for 1977. In principle these resources supplement national efforts in fields where Nordic co-operation is expected to serve a useful purpose.

Measures concerning research and training are drafted by a working group for occupational health. Another important task has been to subsidize the publication of the Scandinavian Journal of Work, Environment and Health, and additional resources have been given to the annual Nordic meetings on occupational health, the twenty-fifth of which was held in Norway last autumn. The support given to the meetings has helped to finance administrative assistance, the publication of proceedings and meetings of various study groups between annual conferences. Study groups now exist on the subjects of chemical analyses, dust, physical occupational hygiene and occupational medicine. One very useful project has concerned the standardization of response registration methods in connection with exposure to solvents. Another has concerned co-operation and the interchange of information regarding problems of the working environment in the woodworking industry. Among other things this has led to a subsequent project whereby the feasibility of Nordic co-operation on the epidemiology of occupational cancer is being tested with reference to nasal cancers. Several projects are in progress in the field of psychosocial occupational health, among them a project on conditions in processing industry and a project for elementary school teachers. An important project concerning Nordic co-operation on the documentation of MAC values in occupational hygiene will be starting in 1977. Other new projects are concerned with advanced working environment training for occupational hygienists and other categories.

In the enforcement sector, co-operation is organized via a steering group on occupational safety regulations. A documentation centre for these regulations was established in Copenhagen in 1975.

Change of address:

Write to

International Secretariat,

Arbetarskyddsstyrelsen,

National Board of

Occupational Safety

and Health,

Fack,

S-100 26 Stockholm,

Sweden.

No. 1 . 1977

Please note that, if not otherwise indicated the publications exist in Swedish only.

ORDER FORM

To be sent to

National Board of Occupational Safety and Health
Arbetarskyddsstyrelsen
Publication Service
Fack
S- 100 26 STOCKHOLM SWEDEN

Please send me the following material

Pamphlet about the National Occupational Safety and Health Administration:

☐ in English ☐ in French ☐ in German

☐ in Finnish ☐ in Swedish

☐ Direction No. .....

☐ Notice No .....

☐ Arbete och Hälsa No .....

☐ Methods Report No. .....

☐ Investigation Report No .....

☐ Training Report No. .....

☐ List of publications and duplicated reports from the Board's Occupational Health Department. In English.

☐ List of research projects in progress at the Board's Occupational Health Department. In English.

Signature, name _____

Name of Institution _____

Address _____

_____

NEWSLETTER

National Board of Occupational Safety and Health · Arbetarskyddsstyrelsen · Sweden
Mailing address: Fack, S–100 26 Stockholm · Telephone: 46-8-54 02 60 Publisher: Gunilla Warnbeck

No. 3 October 1976

THE NEW WORK ENVIRONMENT ACT CALLS FOR INCREASED RESOURCES

The National Board of Occupational Safety and Health and the Labour Inspectorate today employ 901 persons. The allocations granted to the Board and the Labour Inspectorate for the fiscal year 1976/77 amounted to Skr 111 million or close to US $ 27 million.

In the applications for grants for 1977/78 the Board proposes an increase of more than Skr 50 million and 221 new posts, i.e. a total budget of Skr 161 million or close to US $ 40 million and a total staff of 1 122 persons.

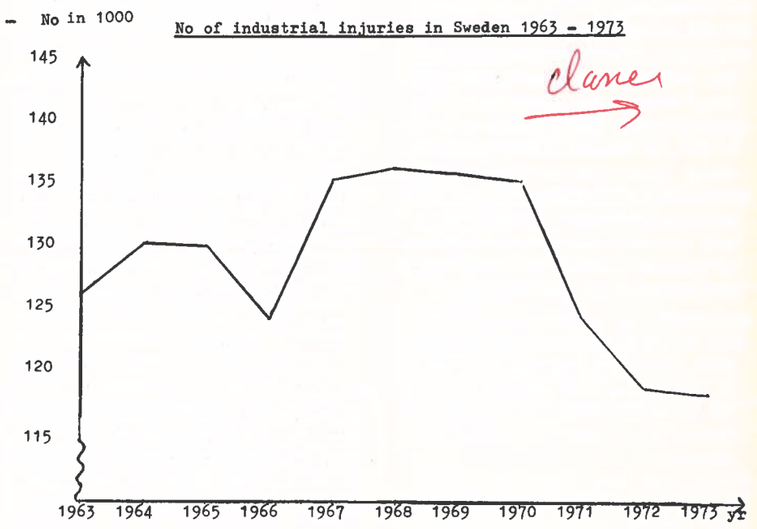
A sum of Skr 32.5 million is referred to the Board and Skr 17.6 million to the Labour Inspectorate of the requested budget increase. Of the 221 posts requested 121 are intended for the Board and 100 for the Labour Inspectorate.

The request is largely based on the proposals of the Commission on the Work Environment. If enacted, the new Work Environment Act will make considerably advanced demands on the Board and the Labour Inspectorate.

In the budget proposals the Board also stresses that a five-year period of extension is needed to reach the capacity expected and that the fiscal year 1977/78 is the first step in this five-year plan.

PROPOSALS FOR A NEW INFORMATION SYSTEM ON OCCUPATIONAL INJURIES

The present Swedish occupational statistics are based on two functions, namely to serve as an aid in the setting of national industrial injuries insurance fees for different branches according to the risks involved and to serve as an aid in the work concerning occupational safety.



As in 1972 the system with riskrelated insurance fees was abandoned the use of the statistics for insurance purposes has decreased. Instead interest has focused on the use of statistics as an information base in the prevention of occupational injuries. Therefore, a Committee on Occupational Injuries Statistics was appointed in Dec., 1972, to prepare a body of occupational statistics that was adapted to safety at work. The Deputy Director General of the National Board of Occupational Safety and Health was the government expert appointed to investigate. The Committee presented its report at the beginning of this year. After it has been circulated to the relevant organizations and authorities for comments, the report is intended to form the basis building up a new information system covering occupational injuries. Today, the data on occupational injuries, which are collected by means of the national insurance scheme, constitute the only assembled material dealing with accidents that have occurred in the working environment.

The new information system on occupational injuries is proposed to encompass (1) a central EDP-based register to be chiefly used for occupational injuries statistics and to contain in concentrated form those data which have been taken from notices of claims filed for such injuries; and (2) a register containing the claim forms. The same identification concepts for the injury cases shall be used in both registers.

As the goal of the information system on occupational injuries is to create a data base or input medium for the preventive safety work the Committee suggests that the National Board of Occupational Safety and Health should be held responsible for keeping the occupational injury register and for laying down the conditions to govern the statistical content (this is now done by the National Social Insurance Board). This presupposes setting up a statistics unit on the Board's premises. The National Central Bureau of Statistics (SCB) is proposed to have the production of the statistics.

It is proposed to have the information system on occupational injuries come into force on January 1, 1978. Before then the statistical unit at the National Board of Occupational Safety and Health must have been established and work have commenced on planning

and structuring the information system (not later than July 1, 1977).

According to a constraint given in the original terms of reference for the Committee the statistics should chiefly encompass the same population and nomenclature as the occupational injuries insurance scheme. That means, i.a. that only those accidents which lead to an absence from work more than one day have to be reported.

The Committee is of the opinion that the information system on occupational injuries shall encompass all injuries which have befallen persons in the job world. Therefore, a wider scope than that in the insurance scheme is proposed, namely that also accidents among self-employed persons (one-man business) and conscripted personnel within the armed forces should be brought into the system.

The Committee proposes that the same form shall be used as at present to file occupational injury claim both for the insurance scheme and for the information system on occupational injuries.

Further, the Committee proposes certain changes in the claims-filing procedure. It is proposed to set a time limit for submission of claim at 14 days from the occurrence of injury. The safety delegate and/or the injured person should take part in the investigation and sign the form to prove they have done so.

A change-over to Swedish Industrial Classification (SNI)[1] is proposed, which would provide capabilities for drawing comparisons with other official statistics. Data on economic branch or industry division at "establishment" (arbetsställe) level within different firms can be obtained from the central business register on file with SCB.

Further, information can be obtained about time worked, which makes it possible to devise an input medium for working out ratios at "establishment" level.

But since SNI is built up to classify economic production units it sometimes becomes too coarse for work safety purposes. As a result data also need to be collected to permit a classification by type of activity.

1 SNI is based on the international Standard Industrial Classification of All Economic Activites.

Another need from the occupational safety aspect is to be able to distinguish normal operation and production on the one hand from repairs, servicing, fitting etc. on the other hand. The data collected should make it feasible to account not only for employment levels but also for the kind of work and for the specific operations that go into certain jobs. These data should be seen as an adjunct to the occupational datum, an item of information that must also be obtained.

The most important safety function envisioned with the proposed information system is to shed light on the number of occupational injuries and their causes. Hence a description of the occupational injury for its origin, course and sequelae will also be needed. The Committee proposes to collect these data by means of an "open-end" descriptive technique and also by asking questions which provide for "closed-end" response alternatives. The questions will be concerned to find out about such things as where the injuried person was at the time of accident, his employment, which machines, tools, chemical substances and other factors influenced the course of events, etc.

The Committee proposes obtaining data on the injured person's type of work, method of wage payment, hours of work and work-hour scheduling, as well as the point in time when the injury occurred. Even data on the injured person's experience is of interest, namely (1) his experience of the activity generally; and (2) his training for and experience of the work at which the accident occurred. It is also proposed to find out about whether or not instructions and information have been issued for the particular job.

The Committee means that the production time can be shortened considerably. A complete volume of annual statistics with analyses and comments should be publishable within 15 to 18 months after the injury year expires. Raw tables can be made available about 12 months after the injury year expires. (The publishing time now takes 2 1/2 years).

Provision for such shortening to the contrary, there is still need for a body of rapid statistics covering, say, a quarter. The quarterly statistics should be publishable about 3 months after the quarter expires.

The leading idea behind the Committee's proposals is to have the official statistics output consist of tables of a more conspectus character, in order to give a general overall view of the accident situation. In addition, the different parties at interest should be enabled to obtain special extracts from the occupational injuries register based on their needs for information.

NEW DIRECTIONS OF THE BOARD

Electromagnetic radiation

New Directions No. 111 from the National Swedish Board of Occupational Safety and Health, *Radio frequency radiation,* are to apply to work involving exposure to electromagnetic radiation in the radio frequency region between 10 MHz and 300 GHz. The directions are not to apply in cases connected with the treatment of patients or in other cases covered by the Hospitals Act. They shall, however, apply in such cases with regard to the protection of medical personnel from injury due to radio frequency radiation.

The directions, which come into force on 1st January 1977, specify maximum permissible levels of radio frequency radiation, and they also include general direction concerning the precautions to be taken to prevent injury resulting from such radiation.

The radiation protection guides for exposure to radio frequency radiation are 10 W/m^2 for the *microwave region* (300 MHz - 300 GHz) and 50 W/m^2 for the *short wave region* (10 MHz - 300 MHz). These maximum levels refer to mean values for a six-minute period. The maximum permissible radiation density in the 10 MHz - 300 GHz frequency region is 250 W/m^2 (ceiling value). For intermittent radiation, the reference here is to mean radiation density per second. These maximum permissible levels are based on a maximum exposure period of 8 hours per day and refer to both whole body and partial body irradiation.

The directions stipulate that the supplier of equipment which emits radio frequency radiation must among other things ensure that when delivered the equipment offers adequate safeguards against injury resulting from irradiation. If there is any danger of the equipment emitting radiation whereby workers are liable to suffer irradiation above the permissible levels, the supplier must furnish the necessary safety instructions for the management of the equipment.

Work must be arranged and conducted in such a way that the worker's exposure to incident and/or reflected radiation is kept as low as possible and does not on any account exceed the maximum permissible levels. Employers must draw up the safety instructions appropriate to work involving exposure to radioactive radiation. It is also recommended that persons fitted with pacemakers should not be employed on work which can involve their exposure to radio frequency radiation, without the doctor responsible for the pacemaker treatment being consulted first.

In areas where workers are liable to be unintentionally exposed to radio frequency radiation of a density exceeding the stipulated maximum permissible levels, warning signs must be clearly displayed. In certain cases prohibition signs must be displayed, as for instance at the entrance to premises accommodating apparatus which can emit radiation of high intensity and access to which therefore entails a special hazard. The designs to be used for these signs and symbols are illustrated in a special appendix to the directions.

Microwave ovens have been dealt with in a special notice published previously **(Notice No. 1976: 10, Microwave ovens).**

Asbestos cement pipes

During a succession of years 75 % of the asbestos imported to Sweden has been used for the manufacturing of asbestos cement products such as sheets and pipes. For many years close to a thousand persons have been employed in the business.

The result of the asbestos cement production and the handling of the finished products was i.a. that groups of factory workers, construction workers, locally employed workers were exposed to asbestos. To pursue the objective given in the Board's **Directions No. 52, 1975,** to replace dust-emitting material containing asbestos by less hazardous material where possible the Board issued directions on February 26, 1976, according to which asbestos cement products might not be used in working life as from July 1, 1976. Roof sheets, water and sewage pipes as well as district heating pipes were exempted and were permitted to be used until the expiry of 1977.

The restrictions against asbestos cement products have since been modified - **Notice No. 1976: 21** - inasmuch as asbestos cement pipes of a certain type may be used until further notice, provided that the pipes comply with certain requirements and that a special working method be used when installing the pipes, whereby dust emittance is essentially prevented. High velocity cutting of pipes is prohibited. It is also presupposed that the efforts to develop a new fibre for the reinforcement of the pipes will continue at the factory producing the pipes. In addition, the preventive work at the factory will go on so that the dust content be further reduced there.

Single copies of the publications of the Board mentioned in this Newsletter are submitted free of charge to foreign addresses on request. See order form.

Other directions published by the Board since the previous issue of Newsletter.

Directions No 64 Protective measures while working with chlorpromazine. Issued in February, 1968. Revised in May 1976.

Notice No. 1976: 14 Application of the Hot Water Code issued by the Pressure Vessel Commission

Notice No. 1976:15 Change of paragraph II C in the Board's building directions

Notice No. 1976:16 Electric bi-manual control of presses

Notice No. 1976:17 Electric equipment for cranes and similar lifting devices

Notice No. 1976:18 Ropes straps and slings made by natural or synthetic fibre

Notice No. 1976:19 Protective measures in connection with sawing machines put into work before July 1, 1976

Notice No. 1976:20 Crosscutting asbestos cement pipes

Notice No. 1976:21 Installation of asbestos cement pipes

Notice No. 1976:22 Fall safety device on hydraulic concrete bins

Notice No. 1976:23 Pickling of stainless steel

Notice No. 1976:24 Supplement to item B 25 in the Directions No. 90 Excavators concerning line ruptures in the hydraulic system.

Notice No. 1976:25 Moveable gate-shield in power presses.

Notice No. 1976:26 Notes about stand-by duty and overtime.

Please note that all the directions mentioned in this issue are published in Swedish only.

NEW ISSUES OF "ARBETE OCH HÄLSA"

The Board's scientific series "Arbete och hälsa" contain results of the research carried out within the Board's Occupational Health Department. As a rule the issues *appear in Swedish with a summary in English.*

Summaries of the latest issues follow below.

Arbete och hälsa 1976:5

Ulf Hallne and Arne Erlandsson: 2. Survey on welding, cutting and soldering methods in Swedish manufacturing industry.

This report presents data collected pertaining to welding and soldering activities in Sweden. The work was carried out as a part of a larger project *"Work environmental problems in connection with welding and similar methods"* run by the National Board of Occupational Safety and Health.

Data was collected by means of a questionnaire which was sent to 5 018 production companies which, according to the National Central Bureau of Statistics, were places where welding material was in use. The presented data, which covers 96% of the surveyed companies, shows that in April

1974 there were 3 608 places of employment where welding/soldering was carried out. Among these were 32 469 people at 3 370 places of employment engaged in welding activities and 5 399 people at 2 057 places of employment engaged in soldering activities, all on a full time basis.

The collected data is presented here in 30 tables, and is classified according to type of company (International ISIC Classification System), region of Sweden and methods and materials used.

Arbete och hälsa 1976:6

Jan-Erik Hansson, Lars Klusell, Gerd Svensson and Bengt-Olof Wikström:
Working conditions for truck drivers - a hygienic and ergonomical survey.

The report deals with ergonomic and work hygienic conditions for truck drivers. Measurements and assessments were performed on 17 different trucks manufactured 1974 - 1975. The trucks carried out distribution, sanitation, route traffic, long-distance traffic, oil transport, forestry haulage and gravel haulage assignments. A questionnaire study comprising 122 drivers was also conducted. This study covered drivers of both old and new vehicles.

The questionnaire study disclosed that all the drivers were most irritated by the noise, dust and climate in the cab and with provisions for getting in and out of cabs. In view of the importance of these matters to them, measures are required to improve the climate (too warm in summer and too drafty in winter) and noise level in cabs, followed by measures to make getting in and out of cabs safer and more convenient. The drivers were very particular about the driver's seat, seating position, visibility and having no exhaust fumes in the cab. But these conditions were felt to be less of a problem than the four factors cited earlier. However, 43% of the drivers were dissatisfied with the standard lighting on their trucks, especially with dipped beams. In a number of cases, the problems perceived varied with the driving assignment.

The ergonomic and work hygienic measurements and assessments disclosed major differences between different truck types and driving assignments. Measures should be adopted in a number of respects in order to improve trucks. Proposals for such measures are suggested and explained in the report.

The main results for the different study subjects are summarized below.

- Facilities for getting in and out of cabs were regarded as being unsatisfactory in most cases. Radical changes should be made in the design of trucks used for distribution and sanitation.

- The headroom in cabs was regarded as being too low to allow a tall driver to sit at a comfortable height. It is proposed that headroom be increased to a minimum of 150 cm (59 inches).

- The driver's seat is too close to the door and the rear cab wall (cab too short) in certain trucks so that the driver is exposed to drafts in winter. Certain minimum measures are proposed in the report.

- Trucks should be fitted with seats which can be raised and lowered simply (45±5 cm, i.e. 17 3/4 inches ± 2 inches).

- In respect to design, location and operation, controls were regarded as being satisfactory. High control resistance was found within a number of older vehicles. An adjustable steering wheel would be desirable to enable both tall and short drivers to find comfortable position.

- Visibility to the front was judged to be good. Visibility to the right of the truck was found to be poor and should be improved. The windscreen wipers on certain trucks impaired visibility. Further studies are proposed.

- The strength and spread of dipped headlamps were found to be poor in most cases. This could have an adverse effect on safety and high speeds. Further studies are proposed.

- The heat in many cabs in summer is a major loading factor, as are drafts in winter.

- In most cases, the noise level in the vehicles studied was under the level producing damage to hearing but should still be reduced for the sake of greater driver comfort. Improved maintenance of the trucks in this respect and continued improvements in design were felt to be urgent.

- Vibration loading of drivers was greatest in semitrailer tractors and tank trucks. On the basis of the ISO 2631 standard, the exposure was in most cases not regarded as being deleterious to health but was creating "fatigue - decreased proficiency". Driver's seats should be used which reduce vibration loading of drivers. A test procedure should be devised for studies of the vibration-damping properties of seats in trucks.

- Dust measurements in trucks hauling gravel to and from a quarrying plant disclosed high levels in cabs. Drivers working under such conditions for many years run the risk of contracting pneumoconiosis. Further studies are recommended.

Arbete och hälsa 1976:7

Ulf Ulfvarson and Per Övrum:
Partition of solvents between blood and air.
I. Determination of the partition coefficient between blood and air for some volatile solvents.

The partition coefficient between human blood and air and between water and air (solubility coefficient) for styrene, 1,1,1-trichloroethane, toluene, methylene chloride, trichloroethylene, white spirit and perchloroethylene have been determined in vitro by conducting air containing a known concentration of the solvent above the surface of the liquid at 37°C. After saturation the liquid phase was analysed for solvent by gas chromatography. These in vitro values have been compared with in vivo values which were determined in man at the Department of Occupational Health and for which the same techniques for the mixing of the solvent and the air and for the analysis of the liquid phase were used. A fairly good correlation between the in vivo results and the in vitro results has been obtained. The observed differences may partly be due to different fat content in blood in the different experiments. Blood and water behave differently for some solvents and it is assumed that this is due to the fat content in blood.

An experiment with toluene and milk showed a linear relationship between fat content and solubility coefficient. The solubility coefficient of toluene in milk can be estimated quite accurately from the fat content together with the partition coefficient of toluene between water and fat and the solubility coefficient of toluene in water.

Ulf Ulfvarson:
Partition of solvents between blood and air.
II. Absorption of gaseous air contaminants in human beings as a function of the partition coefficient between blood and air. Confirmation of a model.

The values of the solubility coefficients of various solvents in human blood at 37°C, determined in part I, have been used to calculate the absorption of solvents in the human body using the simple physiological model of Henderson and Haggard. This monocompartment model simulates the human body by a volume of blood with the same weight as the body weight. At equilibrium the body concentration of solvent is the product of the solubility coefficient and the air concentration of the solvent. The time taken to attain equilibrium depends upon the exchange of air with the surroundings and upon blood circulation e.g. respiration rate and heart pumping rate. The data obtained from the model has been compared with data obtained from human experiments performed at the Department of Occupational Health. Absorption after various times, during both relaxation and work, can be calculated (with fairly good accuracy) using the model. The determination of solubility can be performed more rapidly and more cheaply than human exposure experiments. The solubility coefficients can then be used at least for preliminary discussion of various exposure situations. The monocompartment model can not describe the excretion phase after completion of exposure since this demands a more complex kinetic model. However, in this study of absorption this limitation is of no practical importance.

Solubility data for a total of 38 substances of different types has been collected from the literature. In some cases data was directly available in the form of the solubility coefficient in water or blood at different temperatures. In other cases the solubility coefficient in water could be calculated from the available data by means of simplifications and assumptions. The collected data has made it possible to compare different types of substances in a broader discussion of exposure and threshold limit values.

As can be expected, volatile, non-polar substances, e.g. light aliphatic hydrocarbons, have low solubility coefficients. Aromatic, chlorinated aromatic and aliphatic hydrocarbons have medium solubility coefficients, while polar substances with some water solubility such as alcohols, esters, phenols etc., have very high solubility coefficients. The above model predicts that at low solubility coefficients equilibrium will be attained rapidly (within less than an hour) and the total body concentration will be low. At high solubility coefficient equilibrium will be attained slowly (after 10 hours or more) and the total body concentration will of course be high. For those solvents that were investigated by human exposure experiments at the Department of Occupational Health, these predictions were confirmed.

Arbete och hälsa 1976:8

Third Swedish - Yugoslavian symposium on occupational health Stockholm May 6th - 11th, 1975.
The whole issue is in English.

Within the framework of Swedish-Yugoslavian co-operation in the field of occupational health symposia have been arranged covering different parts of this field.

Most of the papers from the third symposium are published in this issue.

List of contents

Arbete och hälsa 1976:9

Ulf Ulfvarson, Henrik Janbell and Gunnar Rosén:
Physical and chemical working environment factors in hotels and restaurants.

An investigation into the working environment in the catering industry has been made. The eleven establishments studied were chosen so as to be representative of the whole industry; they were situated in both town and country areas, some having many employees and some only a few. Some places were old whereas others were new or recently renovated. Establishments with additional facilities apart from a restaurant, such as a hotel or a retail outlet, have been included in the study. The climate, the ventilation, air contamination, illumination and noise, especially in the kitchen, the dish-washing room and the public area were investigated. In addition, radiation levels close to microwave

ovens were measured. It was concluded that these were no direct hazards to health in any of the visited establishments but that they all had in common conditions which could be regarded as causing discomfort leading to stress, namely, the heat close to hot surfaces in kitchens, noise and bad illumination. The noise level from dance music in the dancing area could sometimes be high enough to cause hearing damage. The illumination in the dining area was sometimes so low that it had been thought it could contribute indirectly to the occurrence of accidents. However, this has not been substantiated by the present investigation. The age of the establishment or the time since renovation did not appear to have any direct connection to the amount of discomfort produced. Rather, this is thought to be related to rapid wearing and to rapid changes in the use of the establishments.

Arbete och hälsa 1976:10

Carl-Johan Göthe, Per Övrum and Börje Hallén:.

Exposure to anaesthetic gases an ethanol during work in operating theatres.

The concentration of halothane and ethanol in operating theatres was studied in 37 routine operations performed in 9 different departments of surgery at 6 different hospitals. The time-weighted halothane concentrations in the respiratory zones of anaesthetic and surgical nurses varied in the different operating departments from 0,3-34,0 ppm (time-weighted average 7,2 ppm) and 0,1-9,2 ppm (time-weighted average 2,5 ppm) respectively. The corresponding ethanol concentrations varied for anaesthetic nurses from 0,3-36,5 ppm (time-weighted average 12,5 ppm) and for surgical nurses from 1,5-46,6 ppm (time-weighted average 15,3 ppm). The anaesthetic technique influences upon the exposure of operating-theatre staff to anaesthetic gases but not to ethanol. In controlled experiments volunteers were exposed to low concentrations of halothane or ethanol. Both substances were retained to about 60%. The content of ethanol in end-expired air approached zero within a few minutes after end of exposure, while low residual concentrations of halothane were demonstrable for more than an hour. The exposure of ethanol is insignificant in relation to the metabolic capacity of the body. However, ethanol is an indicator of the presence of volatile disinfectant components, and its spread in the room atmosphere should be kept in mind when the ventilation of operating theatres is designed. Effective elimination of airborne pollutants in operating theatres calls for good general ventilation in conjunction with local exhaust close to the sources of anaesthetic gas leakage. General ventilation mainly affects the concentration of substances well-mixed with room atmosphere, such as volatile disinfectant components and anaestethic vapours which have spread beyond the actual work zones of the medical staff. For significant reduction in the concentration of anaesthetic gases in the respiratory zones of the medical staff, it is necessary to vent them right at the source of leakage. Since airborne anaesthetics occur not only in operating theatres, general ventilation has to meet certain minimum requirements also in anaesthetic and recovery rooms. Operating theatres and anaesthetic rooms also have to be supplied with equipment for local exhaust of anaesthetic gases.

Arbete och hälsa 1976:11

Anders Carlsson and Thomas Lindquist:
Exposure of animals and man to toluene.

Twenty rats were exposed for 60 minutes to ^{14}C-labeled toluene (1950 mg/m^3) in the inspired air. The largest amounts of toluene and metabolits were found in the white adipose tissue. In a second series of experiments seven healthy male subjects were exposed to 375 mg/m^3 of toluene in the air during rest and light, moderately and heavy physical exercise on a bicycle ergometer. The duration of each exposure period was 30 min. Of the seven male subjects three were thin, one had slight and three had excess overweight. The concentration of toluene in the alveolar air and the total uptake of toluene were determined during exposure. A certain difference in the concentration of toluene in the alveolar air during exposure was noticed between the subjects. The thin subjects had a higher concentration of toluene in alveolar air than the other subjects both during rest and exercise. The total uptake of toluene in the body during exposure showed that subjects with the least amounts of adipose tissue had the smallest uptake and the subjects with the largest amounts of adipose tissue had the largest uptake.

Arbete och hälsa 1976:12

Irma Åstrand, Per Övrum, Thomas Lindqvist and May Hultengren:
Exposure to butanol. Uptake and distribution in man.

Twelve subjects were exposed to 300 or 600 mg/m^3 of butanol in the inspired air during rest and exercise on a bicycle ergometer. The time of exposure was 2 hours. With regard to the high blood/air partition coefficient of butanol the results were puzzling. The arterial blood concentration was low. The concentration of the last part of the expired air - the "alveolar" concentration - was low.

The quotient "alveolar" conc x 100/ insp conc was low in relation to the low percentage uptake. However, the easy solubility in water of butanol may explain the results. Butanol was probably partly taken up in the water of the mucous membranes of the dead-space during the inspiration. Thereafter it was partly given away from the membranes. Therefore, the concentration of butanol in the last part of the expiration was probably not the same as the concentration in the alveolar air.

OTHER NEW REPORTS PUBLISHED BY THE BOARD

Investigation report AMTG 103/76, 14 pages.

Ingvar Skare:
Evaluation of indicator tubes. Part II. Oxygen - 2. *In Swedish.*

The summary in English from the report is reproduced below.

The new indicator tube for oxygen analysis from the Dräger-werk (5%/B) has here been tested and found to be an attractive tool in controlling oxygen deficiency at working places.

The oxygen tube has a suitable range and a good scale division. The coloured front was sharp and the endpoint was easy to read (low deviation between readers).

A systematic pluserror of 0.6 vol% oxygen at the 21 vol%-level was discovered. The systematic error was reduced to 0.2 vol% at lower oxygen levels.

The relative standard deviation was low - less than 3 per cent over the most interesting part of the scale. This means that a 95% confidence interval of ±1 vol% oxygen from the expected value can be maintained by a single tube analysis.

No influence from barometer pressure-, temperature- or humidity variations was established as far as corrections were made for the actual air density deviations referring to calibration conditions. These corrections must be performed as the indicator tube "works" in a mass per volume manner but is graduated in vol%. The physiological response on man of different oxygen values is touched.

No influence from interfering substances is expected in real working situations.

Investigation report AMMF 105/76, 19 pages.

Mats Levin:
Measurement and occupational health assessment of optical radiation. 1. Welding work places at Gränges-Nyby Ltd, Nyby bruk. *In Swedish.*

Investigation report AMMF 106/76, 70 pages.

Olov Östberg, Dag Holmgren, Claire Wittington, Colin Mackay:
Ergonomic aspects of the identification and watching of fingerprints.
In Swedish.

A summary in English is found below.

The employees of the Fingerprint Bureau of the National Swedish Police Board have to spend a substantial part of their working day in severely constrained and forward-bent working postures, and they are constantly concentrating and must not be disturbed. The posture is the result of the use of hand-hold magnifying glasses, in combination with an unsuitable working desk height, and the concentration is essential in order for intricate patterns in the fingerprints to be located and discernible. Based on system analysis, activity analysis, observations, interviews, and measurements, the form and content of the present job routines were analysed and compared to those of newer techniques and equipments marketed. It was decided that the introduction of such optical and electronic systems would not significantly improve the working conditions of the fingerprint staff. Instead it was suggested that the work places and working environments should be modified according to current ergonomic know-how. A reference list is given, and solutions from similar types of occupations (e.g. engraving) are illustrated by means of drawings. To give an example, a prototype workstation was constructed and tried out at the Fingerprint Bureau. It included suggestions for table mechanisms, chair, lighting, magnifying glass arrangement, work place layout, holders for fingerprint documents, etc. Finally, in collaboration with the fingerprint staff a list of priorities was set up for the furthering of better working conditions, including the necessary steps in modifying the prototype workstation.

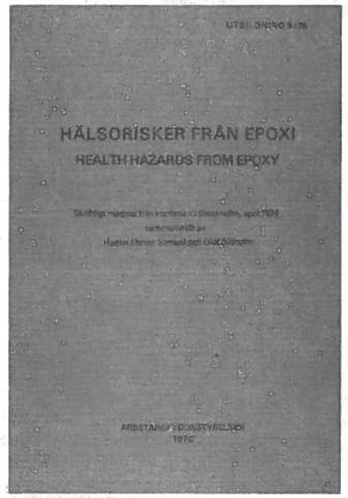
Investigation report 001/76, 64 pages.

Margareta Winell:
Summary and evaluation of literature on carcinogenic effects.
1. Some aromatic amines. *In Swedish.*

Training report 4/76, 96 pages.

Health hazards from epoxy.

Lecturers' manuscripts from a conference on the health hazards with epoxy materials held in Stockholm, April 24, 1974 with foreign and Swedish participants. *In English and Swedish.*



NEW RESEARCH PROJECTS OF THE BOARD

The latest annual list in English of research projects in progress at the Occupational Health Department of the Board can be obtained from the Board. See order form.

FROM THE BOARD'S FOREIGN VISITOR'S FILE

22 April 1976
US Work Environment Study Group Participants:
Mr and Mrs Marc Stepp, UAW (United Automobile Workers), Mr and Mrs Ray Majerus, UAW, Mr Hodge Majerus, UAW, Mr Frank Wallick, UAW, Professor Eula Bingham, University of Cincinnati, Dr William Lloyd, NIOSH, Dr Benjamin Bruckner, NIOSH, Mr Bert Carp, political adviser, Mr Scott Lilly, political adviser, Ms Victoria Bor, SOEH, (Society of Occupational and Environmental Health), Ms Letitia Davis, Urban Environment Conference Mr and Mrs Leonard Zubrensky, Labour Lawyer.

6 May
Dr Vladimir Solokov, Dr Boris Somov, Institute of Hygiene and Occupational Diseases of the Academy of Sciences of the USSR, Moskow.

9 June
Mr René Beaudry, Judge, Mr Gilles Lagace, M.D, Mr Laurier Juteau, Engineer. Study Committe on Health in the Asbestos Industry, Quebec, Canada.

11 June
Dr Carolyn Mather, Public Works Department, West Perth, W Austalia.

31 August
Mr I Lanshin with colleague. Mr Lanshin is the President of the Federation of Building Trade Workers of the USSR.

7 Sept
Visit in connection with French-Swedish colloquium on occupational accidents.

French participants:
S.N.A.M. Laboratoire de Physiologie du Travail et Ergonomie:
Mr Francis Jankovsky, Mr Norbert See and Professor Alain Wisner.

Laboratoire de Psychologie du travail de l'EPHE:
Mr Xavier Cuny and Professor Jaques Leplat.

I.N.R.S. - Institut National de Recherche et de Sécurité:
Dr Jean-Jaques Jarry and Mr E Quinot.

Mr Jaunet, Usines Renault, Mr Dominique Jerome and Mrs Cristina Miquel DGRST, Mrs Jeanette Nilsson and Mr Gerard Riviere Franco-Swedish Research Society, Mr Philippe Royere, French Embassy.

15 Sept
Professor and Mrs Toshio Yamaki, Medical University of Industrial Health, Tokyo.

15 Sept
Ms Lisbeth Hjort, Norsk Produktivitesinstitutt, Norway and Ms Ayse Akkøk, Turkey.

CANCER ON MICE AND MEN. IARC PROVES AND PRO– VOKES WITH FIGURES

Dr Ruggero Montesano, International Agency for Research on Cancer, Lyon, in September held a lecture at the Board on the value of carcinogenicity testing in the prevention of human cancer. Dr. Montesano, among other things, presented the following IARC statistics.

Carcinogenicity test on 828 chemicals are in progress in 89 institutes in 19 countries (March, 1976).

A test on a single chemical for carcinogenic action requires approximately 600 - 700 laboratory animals, $ 100 000 and 3 years.

Of the 828 chemicals being tested 317 (38 %) have already been tested and 511 (62 %) are tested for the first time.

73 of the 317 chemicals already tested were considered by an IARC working group. Of these 57 chemicals were found carcinogenic in animals and/or in ,man. Further testing was found justified for 12 of the remaining chemicals.

Among the 511 chemicals tested for the first time

- 320 (63 %) are manufactured used or occur naturally
- 191 (37 %) apparently are of no environmental importance.

Carcinogenicity test on propylene oxide, trichloroethylene, bensylchloride and ethyleneoxide - with a production of more than four million tons annually - have been carried out on a total of 48 rats and 118 mice.

Change of address:

Write to

International Secretariat,

Arbetarskyddsstyrelsen,

National Board of

Occupational Safety

and Health,

Fack,

S-100 26 Stockholm,

Sweden.

NEWSLETTER

National Board of Occupational Safety and Health · Arbetarskyddsstyrelsen · Sweden
Mailing address: Fack, S–100 26 Stockholm · Telephone: 46-8-54 02 60 Publisher: Gunilla Warnbeck

No. 2 April 1976

FINAL REPORT OF THE WORK ENVIRONMENT COMMISSION OUTLINES A COMPLETELY NEW CODE OF OCCUPATIONAL SAFETY LEGISLATION

The Work Environment Commission was appointed in 1970. Its chairman was the director general of the National Board of Occupational Safety and Health (Arbetarskyddsstyrelsen), and the Commission included representatives of the trade unions and employers' associations together with a number of advisers.

The Commission in January this year presented its final report to the Government. After it has been circulated to the relevant organizations and authorities for comment, the report is intended to form the basis of a Bill to Parliament.

In the final report the Commission outlines a completely new code of occupational safety legislation. The new Work Environment Act thus proposed defines the fundamental requirements applying to working conditions and covers measures for the prevention of every variety of health and safety hazard relating to the working environment. The Work Environment Act will override all other legislation in these respects.

The essential aim of the new Act is to afford protection against health hazards and accident risks. But the Act also sets out to do more than protect workers against certain negative phenomena endangering health and security. In keeping with the broader view which is now taken of the working environment, the proposal is also founded on the aim of establishing working conditions in which the individual can experience his work as a meaningful and rewarding part of his life.

The Work Environment Act gives a rough outline of the means whereby these ends are to be achieved, and it defines the liabilities, obligations and rights involved.

One important section of the Act concerns co-operation between employer and employee. This section contains regulations concerning the organization of safety arrangements within the firm. Considerable emphasis is placed here on the participation of employees in the shaping of their work environment, but attention is also drawn to the role of public

authorities in furnishing guidance and intervening when necessary to ensure that the legislation serves its purpose. The National Board of Occupational Safety and Health and the Labour Inspectorate (Yrkesinspektionen) are invested with far greater powers to issue regulations, supervise the implementation of the Act and intervene at particular work places.

In an interim report published in 1972 the Commission proposed among other things that new regulations should be introduced with a view to strengthening the influence exerted by employees on the design of their work places. A special call was made for an increase of the powers of safety delegates and safety committees. The appointment of regional safety delegates was one of the important new ideas put forward with smaller work places in mind.

The provisions added to the existing Worker's Protection Act in response to the proposals in the interim report with effect from January 1, 1974 have to all intents and purposes been incorporated in the proposed new legislation, through certain alterations and additions have been made in the light of subsequent experience.

Otherwise most of the Act represents a completely new order of things as compared to the Worker's Protection Act. The general validity of the legislation is further underlined by an expansion of its applicability, e.g. in the armed forces, in education, in family agricultural enterprises and with regard to self-employed persons.

The proposed Work Environment Act is essentially of an outline character, which means that the material content of its rules concerning the state of the working environment and the enforcement measures to be taken will very much depend on the regulations which the National Board of Occupational Safety and Health will be empowered to issue concerning the implementation of the Act. The proposed Act and the accompanying Work Environment Ordinance contain a number of provisions empowering the Board, in close co-operation with trade unions and employers' associations, to issue detailed regulations in various points.

Within the framework of the new Act, it will be possible for requirements concerning the working environment to be stepped up in keeping with social and technological developments in the community generally. The successive publication of regulations by the Board will lead to a closer definition of requirements and the establishment of a more reliable basis for safety work. Many of the penal sanctions proposed refer to infringements of these regulations. Otherwise the system of sanctions is based on the existing rules concerning the issue or orders and prohibitions to negligent employers.

The new legislation will demand a considerable increase in the resources at the disposal of the occupational safety authorities. The Commission therefore advocates a continuation of the present rapid expansion of personnel and facilities. This recommendation is made in the full realization that the demands and expectations attaching to the new legislation cannot be fulfilled otherwise.

It is proposed that the new legislation be made effective as from January 1, 1978.

-Excerpt from the English summary of the final report.-
The whole summary (18 pages) which also gives a more systematic description of the Commission's proposals, can be ordered from the Board. See order form.

NEW DIRECTIONS OF THE BOARD

Noise

The Board's general directions for the prevention of injury or disease due to exposure to noise in work places - **Directions No. 110 Noise at work** - will come into force on 1st July,1976.

In these directions it is emphasized, by way of introduction, that noise can cause illness at far lower sound levels than are required for permanent hearing damage. The directions state by way of a general rule that noise on work premises must be kept to a level which is acceptable in relation to the type of activities concerned. Employers must systematically test the use or introduction of working methods for low noise emission. Even in adverse conditions, the acoustic planning of activities in connection, for example, with the building, alteration or enlargement of work premises must be aimed at keeping the noise to which workers are exposed during a typical working day below an equivalent sound level of 85 dB (A). If the noise level at a work place exceeds this figure, a systematic noise abatement campaign is to be mounted by the employer in consultation with the workers. It is recommended that workers be given the opportunity of hearing tests including tone audiometry in connection with their engagement or transfer to new duties. Periodic hearing tests are also recommended in connection with work involving a risk of hearing damage.

Microwave ovens

The Board's directions concerning the approval and inspection of microwave ovens with respect to microwave leakage - **Notice No. 1976:10 Microwave ovens** - will come into force on 1st July, 1976, (In the case of designs previously approved under a special testing procedure, the design and approval requirement will not come into force until 1st July, 1977).

The Notice provides that newly manufactured microwave ovens must be of a design approved by the Board with respect to the prevention of microwave leakage. Testing requirements are based on work done within the International Electrochemical Commission (IEC). In order for a design to be approved, microwave leakages measured at a distance of 5 cm or more from a charged oven must not exceed 5 mW/cm^2. Employers must ensure that microwave ovens in use are regulary checked for microwave leakage. Ovens of nonapproved design must be checked in this respect once annually. Ovens of approved design are to be checked at least once every three years. The microwave leakage thus measured must not exceed 5 mW/cm^2 at a distance of 5 cm or more from the oven.

Asbestos

The following directions concerning asbestos have been published by the Board since the previous issue of Newsletter.

Notice No. 1975:23 Crocidolite (blue asbestos), according to which crocidolite, material containing crocidolite or equipment of which crocidolite or material containing crocidolite is a part may not be used in working life.

Notice No. 1975:24 Notification of work with asbestos

Notice No. 1975:28 Respiratory apparatus during work with asbestos

Notice No. 1975:29 Spraying with asbestos, interpreting paragraph 18 of the **Directions no. 52 Asbestos** as meaning that spraying with asbestos or material containing asbestos may not occur for insulating purposes, underbody coating, in construction work etc. and limiting in time the right of the Labour Inspectorate to make exemptions from the **Directions No 52** when it comes to spraying.

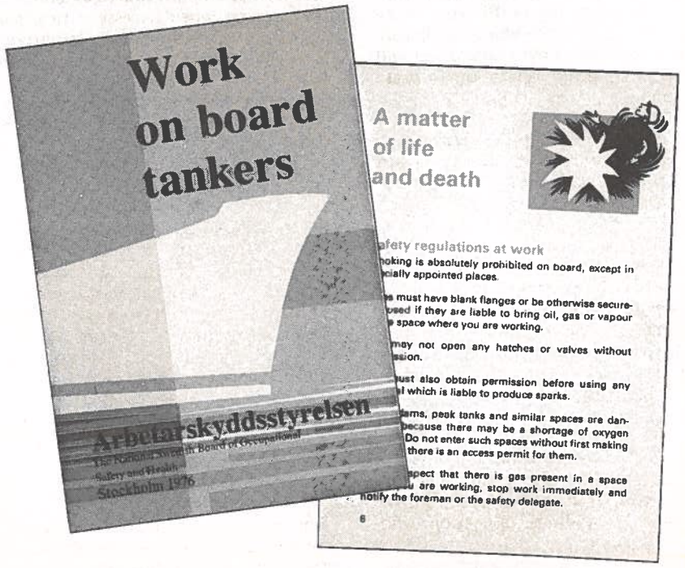
Notice No. 1976:5 The use of mats with asbestos backing,according to which employees may not install such mats. Effective Jan. 1977.

Notice No. 1976:7 Asbestos in paint, glue, putty, jointing materials etc, according to which such products may not be used in working life after 1976.

Notice No. 1976:8 The use of asbestos cement products, according to which employees may not execute work involving new installations of asbestos cement products. Effective June 1976 with certain exceptions during a transitional period.

Notice No. 1976:9 Revision of the limit value for asbestos, lowering the value from 2 fibres/ml to 1 fibre/ml. Effective July 1976.

Single copies of the publications of the Board mentioned in this Newsletter are submitted free of charge to foreign addresses on request. See order form.



Summaries of the Board's directions

In 1975 the Board started issuing summaries of certain of its directions. The summaries are in the first place intended for the workers. Some of these versions have been or will be translated into the main immigration languages. In addition an English summary has been made of four of the Board's shipyard directions i.e. directions No. 19:1 Oil tankers, No 19:2 Gas tankers, No 19:3 Chemical tankers and 19:6 Inert gas - **Summary directions No. ADI 42 Work on board tankers.**

Other directions published by the Board since the previous issue of Newsletter.

Directions No. 53:1 Central tray laying and central dish washing. Directions concerning safety conditions in connection with central tray laying and central dish washing in hospitals.

Directions No. 106 Plastic receptacles for dangerous liquids. Directions concerning safety precautions for the carriage and storage of dangerous liquids in certain plastic receptacles.

Directions No. 107 The automotive industry. Directions for the prevention of accidents and injury during work in garages and other service facilities in the automotive industry.

Directions No. 108 Reinforced ester plastic. Directions and regulations for the prevention of accidents and injury during work involving the use of reinforced ester plastic.

Directions No. 109 Nailing machines. Directions concerning safety precautions to be observed by suppliers and users of pneumatic fastening tools.

Notice No. 1976:1 Blaster's licenses from the National Board of Occupational Safety and Health.

Notice No. 1976:2 Carbonless paper

Notice No. 1976:3 Supervision of eccentric press control valves

Notice No. 1976:6 The inspection and repair of tractor cabs.

Notice No. 1976:11 Inspection and testing of pressure vessels, lifting devices, conveyors and hoisting gear

Notice No. 1976:12 Noise measurement for combine harvesters

Notice No. 1976:13 Safety precautions during sand blasting

Please note that all the directions mentioned in this issue are published in Swedish only.

NEW ISSUES OF "ARBETE OCH HÄLSA"

The Board's scientific series "Arbete och hälsa" contain results of the research carried out within the Board's Occupational Health Department. As a rule the issues appear in Swedish with a summary in English

Summaries of the latest issues follow below.

Arbete och hälsa 1975:12

Ingvar Skare:
Evaluation of the reliability of certain indicator tubes. I. Working plan. Oxygen. Ammonia.

This report is the first one in a series concerning evaluation of indicator tubes as analytical tools for measuring gas concentrations at occupational hygiene investigations.

In the present report the working plan is presented. It involves controlled laboratory tests of tubes for about 15 common gaseous pollutants with wet chemical methods as references. For each pollutant different types of indicator tubes available on the Swedish market are to be tested. The final results of the tests on the oxygen and ammonia tubes are published.

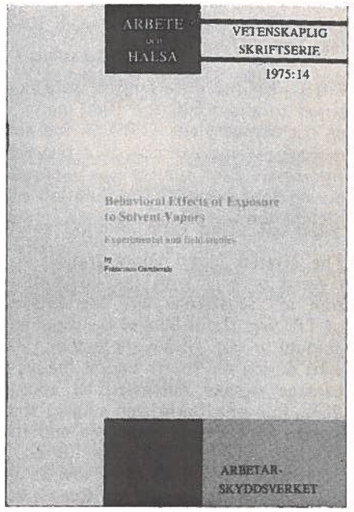
Arbete och hälsa 1975:13

Ann-Sofie Kindblom and Ingvar Holmér:
Breathing resistance during work with filter respirators.

Twelve men performed exercise on a bicycle ergometer for 45 minutes at work intensities of both 50 W and 100 W. During the exercise they breathed alternately through a valve (15 min), through a mask plus filter with low breathing resistance (filter 1, 15 min) and through a mask plus filter with high breathing resistance (filter 2, 15 min). Inhalation time was significantly shorter than exhalation time under all test conditions. Inhalation time was furthermore slightly longer for the filter with the highest breathing resistance. Frequency of breathing was significantly higher, and tidal volume and mean carbon dioxide level lower, when breathing through the valve as compared to through filter 1 and filter 2. Heart rate, oxygen uptake and ventilation were not affected by increased breathing resistance.

The degree of perceived breathing resistance increased with increasing breathing resistance, and the effect was reinforced by the increment in work intensity. The maximum pressure and mean pressure during both inhalation and exhalation were greater with filter 1 than with the valve, and were greatest with filter 2 under all test conditions.

For moderately heavy work with a pulmonary ventilation of approx. 40 l/min, using a respirator with a breathing resistance of 250-300 Pa per l/s (corresponding to filter 2), a maximum duration of 1 hour's worktime without a break should be acceptable. When breathing masks are to be used, attention should also be paid to the considerable individual variation in inhalation resistance, approx. 20% at a ventilation of 40 l/min, which is caused primarily by differences in breathing pattern.



Arbete och hälsa 1975:14

Francesco Gamberale:
Behavioral effects of exposure to solvent vapors. Experimental and field studies. In English.

The studies were aimed at a systematic investigation and a quantitative evaluation of the acute effects on the central nervous system of exposure to organic solvents.

The experimental studies were performed in controlled and systematically varied conditions involving the exposure of the subjects to various concentrations of the organic solvents toluene, methyl chloroform, styrene, white spirit and methylene chloride. During exposure and under reference conditions, measurements were taken of, among other things, the subjects' performance in a number of psychomotor, perceptual and cognitive tests. Changes in the level of performance during exposure compared with performance under reference conditions were used as an indicator of effects on central nervous functions. Field studies mainly comprised tests of the psychomotor reactions of occupationally exposed subjects and matching unexposed reference groups. All groups were tested before and after a working day and in the immediate vicinity of their places of work.

The experimental studies revealed unequivocal relations between reduced performance and the solvent content of respiratory air. Some of the solvents investigated had a negative influence on performance after only short periods of exposure and at concentrations corresponding to the Swedish threshold limit values of the various substances in effect at that time. The field studies established connections between performance in psychomotor tests and occupational exposure.

Arbete och hälsa 1975:15

Irma Åstrand and Per Övrum:
Exposure to trichloroethylene. I. Uptake and distribution in man.

Fifteen healthy male subjects were exposed to about 540 and 1080 mg/m^3 of trichloroethylene (TRI) in the air during rest and exercise on a bicycle ergometer. Each subject was exposed during four periods. The duration of each period was 30 minutes.

The arterial blood concentration increased linearly with the concentration in the alveolar air. The uptake of TRI was about 55% of the supplied amount at rest. At a work load of 150 watt during the fourth period the percentage uptake decreased to about 25%. For one fairly thin subject the uptake was near zero at the end of exposure. This development is probably due to the relatively low solubility of TRI in blood and tissues. The uptake of TRI might be estimated from pulmonary ventilation and concentration in alveolar and inspiratory air.

Olov Vesterberg, Jadwiga Gorczak and Mudite Krasts:
Exposure to trichloroethylene. II. Metabolites in blood and urine.

Fifteen men were exposed to trichloroethylene (TRI) in three different ways with regard to the concentration of TRI in air as well as exercise on a bicycle ergometer. The total amount of TRI supplied and taken up by each person was measured. The concentrations of trichloroethanol (TCE) and trichloroacetic acid (TCA) were determined in blood and urine. In spite of large differences in uptake, there were small differences in the concentration of TCA in blood during the day of exposure. There was a large scatter for the values of TCA in urine within each group.

The concentration of TCE in arterial blood increased during exposure. Thereafter the concentrations were almost constant during two hours and differed among the groups. This can be interpreted as being due to balancing rates of formation and elimination of TCE. The levels mentioned were related to the uptake of TRI. This was also true for the rate of excretion of TCE in urine if calculations were made on the morning sample obtained the day after exposure. TCE is the most potent substance when the effects on the central nervous system are considered. If the concentration of TCE in blood exceeds a certain level, the risk for accidents can be expected to increase.

Francesco Gamberale, Görel Annwall and Birgitta Anshelm-Olsson:
Exposure to trichloroethylene. III. Psychological function.

The effect of exposure to the solvent trichloroethylene (TRI) on performance of tests of numerical ability, reaction time (simple and choice) and short-term memory were studied in fifteen healthy male subjects. The subjects were tested individually on three different occasions during exposure to 540 and 1080 mg/m^3 TRI in inspiratory air and under control conditions, respectively. At predetermined times during the three 70 min exposure periods, samples were taken of the subjects' alveolar air.

Neither the reaction time tests nor the short-term memory test showed any signs of performance decrement during exposure to TRI as compared to under control conditions. However, a statistically significant decrement in performance was obtained on the test of numerical ability during exposure to TRI. The results as a whole indicate that there should not be any risk of an acute effect on central nervous functions at concentrations which do not considerably exceed the Swedish threshold limit value for the solvent (160 mg/m^3).

Arbete och hälsa 1976:1

Staffan Krantz and Jan Scullman:
Infrared analysis of quartz.

The investigation includes a theoretical part and an experimental part, concerning infrared analysis of quartz dust. In the experimental work, nine groups of pure quartz dust samples have been studied with reference to particle size distribution. The results show that due to extreme differences in particle size distribution (< 1 µm compared with 4-5 µm), the result of the quartz analysis can vary with 50%. Differences in the particle size distribution in the fraction<5 um can give rise to deviations up to 20%. However, in industry differences in particle size distribution within the respirable fraction are negligible, which means that deviations from 100 % due to particle size distribution don't effect the evaluation of the occupational risk. The investigation also shows that a suitable standard quartz ought to have a high absorbance at a non-extreme particle size distribution. Moreover 45 industrial dust samples from different industries have been analysed with IR-technique and the results have been compared with x-ray diffraction analyses. This shows that there is a good correlation between results from IR-spectroscopy and x-ray diffraction although for some industrial dust differences have been observed.

Arbete och hälsa 1976:2

Lars Olander and Staffan Krantz:
A method for testing the capture degree of local exhaust systems.

A method for testing the efficiency of local exhaust systems has been developed. For testing the method 4 different manual grinding machines with local exhaust hoods have been used on three different materials, iron, plastic and concrete. The conditions which ordinarily cause variation during concentration measurements at particle generating processes have been controlled during these tests.

A particle counter (Royco 225) was used for the dust measurements. For the evaluation a mathematical expression, which describes the capture degree of the local exhaust system has been used.

Arbete och hälsa 1976:3

Irma Åstrand and Francesco Gamberale:
Effects on human beings of solvents in the inspiratory air.
A new method for estimation of uptake.

A new method is introduced for estimation of uptake in the body through the respiration of gaseous materials in the ambient air. The usefulness of the method when producing the basis for the threshold limit values is discussed. Proposals for biological limit values of a number of solvents are given. The values are calculated with the aid of the method.

Arbete och hälsa 1976:4

Birgitta Kolmodin-Hedman, Marianne Håkansson, Ester Randma, Bengt Sjögren and Åke Swensson:
Aspects of occupational medicine for the control of workers treating and planting pine and fir trees with lindane.

Six persons treated pine and fir plants with an emulsion containing 1 per cent of lindane. Ten persons packed these plants for two days in-doors. The plasma levels of lindane after treatment were 1.9-5.6 ng/ml and after packing for two days 1.2-25.7 ng/ml. Plasma levels of lindane, followed after exposure decreased to half the initial values in 3-5 days. Planting resulted in plasma levels of lindane $<$ 0.2-22.3 ng/ml at the end of the first week. Despite further planting the lindane levels decreased to $<$ 0.2-3.5 ng/ml at the end of the second week.

Symptoms were not registered in higher frequency in a group of planters exposed to lindane compared to a group of planters who worked with unprepared plants. Symptoms were not correlated to high plasma levels of lindane.

OTHER NEW REPORTS PUBLISHED BY THE BOARD

The Board also publishes reports on methods, investigations, commissioned research work and training. The reports presented below exist in Swedish only. Two of them contain summaries in English which are reproduced in extenso.

Methods report 009/75, 16 pages

Jan-Erik Hansson, Mats Bjurvald, Martin Friberg, Lars Klusell and Hans Nilsson.
Description of certain work demands.

In recent years, the Work Physiology Unit, at the National Board of Occupational Safety and Health, in collaboration with the Labour Market Board, has been involved in projects dealing with the adaptation of work and the assignment of people with reduced work capacity to suitable jobs.

A system for describing certain work demands without specialist knowledge is described. Views are also provided on training in conjunction with the use of the work description. The "adjustment teams" [1] already in existence in many companies are recommended as the most suitable units for dealing with adaptation work.

The system is recommended for main use when efforts are being made to find new jobs or improve existing jobs. The proposed system can also be used to perform a broad survey of the environment in a company.

The system for the description of certain work requirements and the proposed method for training have been successfully tested at work sites in retail trade, wholesale trade, industry and state and borough administrations.

1)
The adjustment team is a co-operation body between the employer, the trade unions and the employment office.

The adjustment team shall

- work for a more positive attitude in working life towards older and handicapped workers
- propose measures facilitating the employment of older and handicapped workers and
- propose measures to help older and handicapped workers to remain in employment.

Methods report AMTG 108/75, 22 pages.

Ingvar Skare:
G2 - II. Nitrogen dioxide - manual methods.

Investigation report AMA 010/75, 30 pages

Martin Friberg and Hans Nilsson:
Personal protective equipment in forestry work: An ergonomic study.

A field study of the ergonomic design of personal protective equipment in forestry work was carried out among 40 cutters. Furthermore, some aspects of eye protective nets, and of pads for protection against saw cuts to the legs were studied in the laboratory.

It was found that the air temperature in the safety helmet was on average 30-33° C, at outside air temperatures of 22-26° C during work in the shade. In winter, at an outside air temperature of -2,0° C±3,1, the air temperature in the helmet was 5,2°C±1,9. A white helmet with better ventilation would probably reduce the heat load in the summer. The distance between the helmet shell and the head tended to covary with the cutters' opinions on the helmet's fixation and fit. The distance was shorter among satisfied cutters. A new interior fitting reaching further down the neck would probably steady the helmet better onto head during cutting operations.

Skin temperature under the ear seals of the ear muffs showed daily averages from 32°C to 36°C for different cutters at outside air temperatures of 16°C to 26°C. The highest observed skin temperature was 36,9°C. The mean pressure of the studied ear muffs onto the head was 22,1±6,2 N, with the pressure of some ear muffs exceeding 30 N. Optimum pressure against the head should be determined.

The eye protective nets worn by the cutters reduced the amount of light transmitted by 32-45%. The most commonly used net types had a mesh dimension of approximately 1,7 mm. It was found that an increase in mesh dimension which gives a real improvement in light transmission cannot be recommended due to the impaired protective effect.

The bending resistance was studied of leg protective pads made of charmeuse nylon, nylon cord, fibre weave and fibre fur. It was found that the bending resistance of pads made of nylon cord was 5 times as great as that of either fibre fur or 18-20 layers of charmeuse nylon. Maximally tolerated bending resistance should be determined.

In interviews, forestry safety engineers especially stressed the need for lighter protective equipment as well as lighter working tools. They also critisized the power saw on many points.

Investigation report AMMF 101/76, 50 pages.

Olov Östberg, Dag Holmgren and Ewa Gunnarsson:
Work stations for CRT visual display units - a survey

Investigation report AMMF 102/76, 52 pages.

Olov Östberg, Mats Levin and Bengt Knave:
Assessments of optical radiation hazards - plasma arc jet and UV-lamp

Investigation report AMMF 103/76, 44 pages

Mats Levin, Olov Östberg, Bengt Knave and Allan Ottosson:
Assessments of optical radiation hazards - plasma arc cutting machines

Investigation report AMMT 103/75, 71 pages

Jan-Olof Säfwenberg and Bo Holmberg:
Qualitative and quantitative aspects on chemical carcinogenesis

Investigation report TK 1/76, 12 pages

Ulf Bruder and Arne Stråby:
Vinyle chloride exposure in the PVC-processing industry.

A report from an investigation made in cooperation between The Swedish Plastics Federation and The National Board of Occupational Safety and Health.

Training report 004/75, 122 pages.

Carcinogenic substances in working life.

Reviewing papers from the VI Nordic Occupational Health Congress, May 1974, Stockholm.

NEW RESEARCH PROJECTS OF THE BOARD

The latest annual list of research projects in progress at the Occupational Health Department of the Board has just appeared and can be obtained from the Board. See order form.

THE NORDIC COMMITTEE OF OFFICIALS FOR QUESTIONS CONCERNING THE WORKING ENVIRONMENT

The Nordic Committee of Ministers is a joint body of the five Nordic Governments. This Committee should not be confused with the Nordic Council, which is responsible for co-operation between the Nordic countries at parliamentary level.

Co-operation through the medium of the Committee of Ministers covers practically all sectors of society. The most important sectors are covered by committees of officials, whose task is to draft business for the meetings of the Committee of Ministers and to direct the investigatory work on which the Committee's decisions are based. The various committees are aided by a Secretariat, established in 1973 and situated in Oslo, which at present employs some 35 persons. There is also a Secretariat for Cultural Co-operation in Copenhagen.

One of the fourteen committees of officials is **the Nordic Committee of Officials for Questions concerning the Working Environment.** This Committee started work in June 1973 The members of the Committee comprise one representative of each of the relevant authorities - ministry, occupational safety authority and institute of occupational health - in the Nordic countries. In Sweden's case this means that the National Board of Occupational Safety and Health has two representatives on the Committee, because the Institute of Occupational Health was incorporated by the Board in 1972 and now constitutes the Board's Occupational Health Department.

The latest meetings of the Committee were held on 12th-13th March 1975 in Copenhagen and on 2nd-3rd September 1975 in Gothenburg. The next meeting is expected to take places on 20th-21st May 1976 in Iceland.

The Committee's business includes the following:

an exchange of information concerning developments in the working environment sector in the various countries

co-ordination of the standpoints of the Nordic countries at extra-Nordic levels in matters concerning the working environment

streamlining of Nordic co-operation concerning occupational safety regulations

co-operation in the field of occupational health.

In May 1975 the Committee arranged in a conference of Nordic Ministers responsible for questions concerning the working environment.

Two working groups, the Steering Group for Occupational Safety Regulations and the Working Group for Occupational Health, have been set up under the auspices of the Committee of Officials for Questions concerning the Working Environment.

The main task of the Steering Group is to co-ordinate and effectivize the drafting of occupational safety regulations. This work covers all occupational safety regulations and implies the allocation between the Nordic countries of the drafting of different regulations. The documents thus produced are placed at the disposal of all the Nordic countries. The Steering Group is responsible for the implementation of the project entitled Joint Nordic Documentation concerning Occupational Safety Regulations which has been resolved on by the Nordic Committee of Ministers. In September 1975 a Documentation Centre was set up adjacent to and as an extension of the documentation service of the Danish Occupational Safety Authority. This Centre accepts orders from the Occupational Safety authorities of the Nordic countries for documentation concerning occupational safety regulations.

A seminar on the potentialities of future Nordic co-operation on matters concerning hygienic limit values was held during 1975 at the initiative of the Working Group for Occupational Health. A new seminar concerning these matters will be held during 1976. Also during 1975, a working session was arranged on response recording during exposure to solvents, and a conference was held on co-operation concerning the working environment in sawmills and the timber industry. Finally, a symposium held in 1975 dealt with the prospects for Nordic experimental activities concerning the psychosocial problems which come under the heading "stress in the working environment". Further consideration will be given to these matters during 1976.

The Scandinavian Journal of Work Environment and Health, which is an English-speaking Nordic journal, has received grants from the budget of the Nordic Committee of Ministers since 1974.

Change of address:

Write to

International Secretariat,

Arbetarskyddsstyrelsen,

National Board of

Occupational Safety

and Health,

Fack,

S-100 26 Stockholm,

Sweden.