Renseignements pratiques

Frais de participation : 5 500,00 Frs* par personne,

comprenant
- le voyage sur lignes régulières AIR FRANCE/SAS
- les transferts et circuit en autobus/train
- l'hébergement ainsi que les déjeuners
- l'assistance d'un guide trilingue Français/ Anglais/Suédois, ayant une formation d'ingénieur
- un compendium de documentations préparé par la Fédération des Ingénieurs

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Possibilités de voyage sur vols directs Paris/Stockholm/Paris (durée du vol 2h20)

Alt 1 : Départ de Paris, Dimanche 20/9 à 10h20
Retour de Stockholm, Samedi 26/9 à 17h

Alt 2 : Départ de Paris, Samedi 19/9 à 10h20
Retour de Stockholm, Vendredi 25/9 à 17h

Pour toute information contacter :

M. TURBIL, ANRT, tél (1) 501 72 27

M. RINDÅS, AFSR Paris, tél (1) 500 15 36

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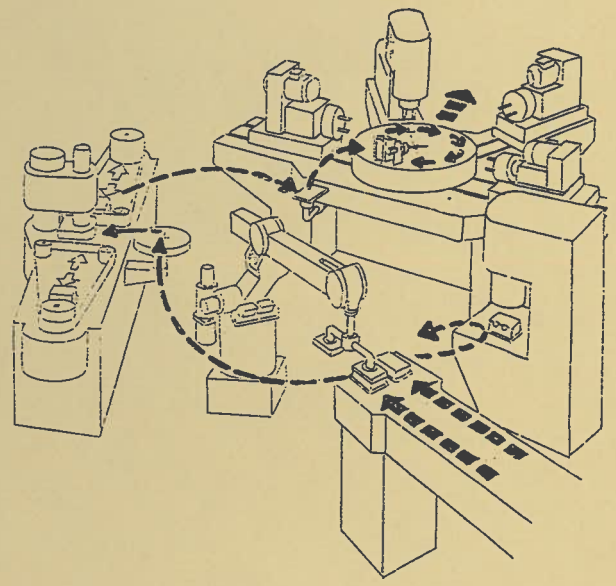
* Prix calculé sur la base de 10 participants voyageant ensemble, et susceptible d'être modifié.

Mission d'étude en Suède
sur la

ROBOTIQUE

21 - 25 septembre 1981



organisée par :

l'Association Nationale de la Recherche Technique (ANRT)
et l'Association franco-suédoise pour la Recherche (AFSR)

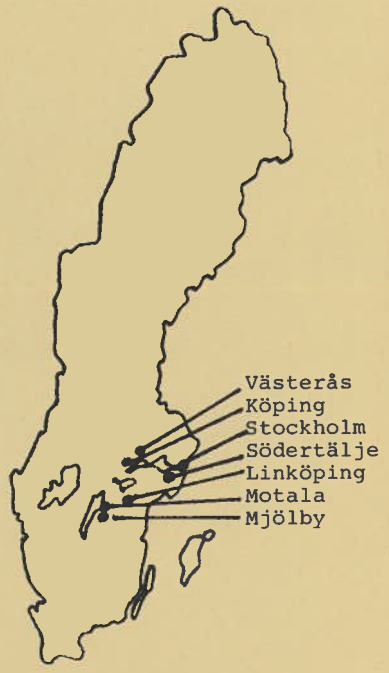
avec le concours local de :

la Fédération suédoise des ingénieurs (STF)

En matière de robotique industrielle, la Suède présente le double intérêt d'occuper la première place européenne à la fois parmi les constructeurs et pour le nombre de robots installés.

En effet, les principaux constructeurs suédois - ASEA, Electrolux et Kaufeldt - totalisent à eux trois 35 % du marché européen.

De plus, avec 10 % de l'ensemble des robots installés, la Suède arrive au troisième rang mondial après le Japon et les Etats-Unis; ce qui, rapporté à sa population active, révèle une densité d'implantation tout à fait remarquable.



A ce titre, et compte tenu des contacts que nous avons précédemment établis avec les industriels suédois, tant producteurs qu'utilisateurs de robots, il nous a semblé intéressant d'organiser cette mission d'étude. Nous nous intéresserons aux différents aspects de la robotique, sans oublier bien entendu quelques travaux de développement récents, tels ceux concernant l'assemblage automatisé.

P R O G R A M M E P R E L I M I N A I R E

Lundi 21 septembre

Matin	Séminaire de présentation générale organisé par la Fédération des Ingénieurs avec la participation d'universitaires et de représentants des constructeurs
Après-midi	Visite des usines de SAAB-SCANIA à Södertälje Moteurs et boites de vitesses de voitures - construction de camions

Mardi 22 septembre

Visite de la Société ASEA à Västerås

Matin	Division de robotique industrielle : construction et essais
Après-midi	Applications dans le cadre des diverses unités de production d'ASEA (moteurs électriques, etc)

Mercredi 23 septembre

Matin	Visite de l'usine VOLVO de Köping (forte densité de robots de manutention) Production de boites de vitesses et organes de transmission
Après-midi	Visite de l'Institut des Techniques de Production de l'Ecole Polytechnique de Linköping - Professeur Nils Mårtensson (une des équipes de recherche les plus avancées en Suède en matière de robotique et d'assemblage automatisé)

Jeudi 24 septembre

Matin	Visite de l'usine Electrolux à Motala (production de réfrigérateurs et cuisinières)
Après-midi	Visite de la Société AB Bygg & Transportekonomi à Mjölby (production de matériel de manutention dans un "atelier flexible" comportant vingt machines-outil et équipé du système de contrôle numérique MTC 10 de SAAB

Vendredi 25 septembre

Matin	Visite d'Electrolux à Stockholm (assemblage et essais de robots - exemples d'applications)
Après-midi	Visite de la filiale suédoise d'IBM à Stockholm (production d'imprimantes et de terminaux).

ASSOCIATION FRANCO-SUÉDOISE POUR LA RECHERCHE
c/o ANRT
101, AVENUE RAYMOND POINCARÉ
75116 PARIS

Bulletin d'inscription à retourner le plus rapidement possible
(limite des inscriptions le 31 juillet 1981)

Nom ..... Prénom .....

Fonction .....

Société/Institut .....

Intéressé à participer à la Mission d'Etude en Suède sur la ROBOTIQUE du 21 au 25 septembre 1981.

Préfère pour les voyages la solution [1] ou [2]

Suggestions concernant les visites .....

.....

.....

Autres personnes pouvant être intéressées .....

.....

AFSR

ASSOCIATION FRANCO-SUÉDOISE POUR LA RECHERCHE

Svensk-franska forskningsföreningen

CONDITIONS D'ADHESION

Membres individuels
La cotisation annuelle est fixée à 25 Frs et donne accès à une information de base sur les relations franco-suédoises dans les domaines scientifique et technique.

Membres industriels
Les entreprises membres sont invitées à participer aux conférences et reçoivent tous les rapports publiés par l'association.

Les contributions à la Fondation Industrielle de l'AFSR, dont le montant est fixé à 50 000 Frs, se substituent le cas échéant à la cotisation industrielle minimale de 1000 Frs par an.

ADRESSES

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Sis à l'Académie Royale des Sciences de l'Ingénieur (IVA)
Grev Turegatan 14
Box 5073
102 42 STOCKHOLM
Tél 19-468 11 42 75
Télex 17172 IVA s
Télégramme IVACADEMI

Bureau de Paris
Sis à l'Association Nationale pour la Recherche Technique (ANRT)
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75116 PARIS
Tél 1/500 15 36

Bureau de Göteborg
Sis à l'Ecole Polytechnique Chalmers
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(au 1er janvier 1981)

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*Sandvik
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*SKF
Swedish National Development Co (SU)
*Volvo

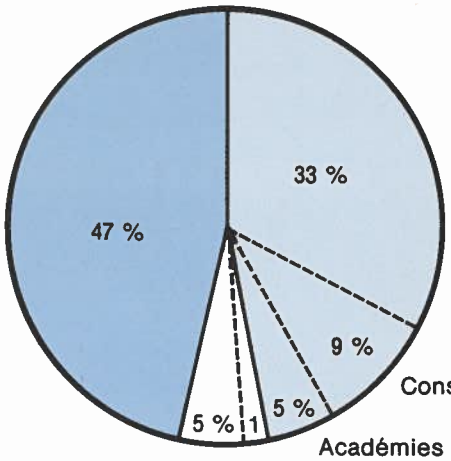
* Membres de la Fondation Industrielle de l'AFSR

VOCATION & RESSOURCES

L'AFSR a été constituée en 1967 pour promouvoir et intensifier la coopération franco-suédoise dans les domaines scientifique et technique.

Par l'organisation de conférences et de voyages d'études, l'échange de chercheurs et par sa connaissance de la recherche et de l'industrie françaises et suédoises, l'association est l'interface privilégiée entre les deux communautés.

Le budget de fonctionnement de base est de 0,6 MFF et provient des subventions publiques également réparties ainsi que des cotisations des membres industriels et individuels.



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(au 1er janvier 1981)

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FONDATION INDUSTRIELLE DE L'AFSR

Une Fondation Industrielle fut créée au sein de l'association à l'occasion de son 10ème anniversaire, pour soutenir les activités de l'AFSR et établir un réseau de contacts privilégiés entre les entreprises françaises et suédoises et étendre par la-même à l'industrie l'action menée avec succès dans les domaines scientifique et technique.

AU SERVICE DE L'INDUSTRIE

Dans le cadre de la Fondation, l'action de l'AFSR se manifeste sur deux plans. Elle constitue d'une part un creuset de réflexions et d'études sur des thèmes d'intérêt commun tels que la politique de l'innovation, l'influence de l'évolution technique sur l'avenir industriel ou l'adaptation de technologies pour les pays en voie de développement.

L'association assure en outre un service d'assistance aux entreprises, mettant en oeuvre sa connaissance approfondie des communautés scientifiques et industrielles lors d'études de développement et de débouchés ou pour la promotion des technologies avancées.

TRANSFERTS DE TECHNOLOGIES

Pour parfaire l'éventail des services, qu'elle offre en priorité à ses membres, l'association a créé avec l'aide d'organismes publics français et suédois une bourse de transferts de technologies devant bénéficier aux industries des deux pays. Bien entendu, toutes les informations confiées à l'AFSR par les entreprises membres sont traitées confidentiellement.

Le Conseil d'Administration de la Fondation Industrielle est placé sous la Présidence de M. Peter WALLENBERG, Directeur à la Skandinaviska Enskilda Banken à Stockholm.

From the Board's foreign visitors file:

June 9
Prof. **J. C. McDonald,** TUC Centenary Institute of Occupational Health, London School of Hygiene and Tropical Medicine, London, Great Britain

June 30
Dr. **Ben Holder,** Dow Chemical, USA

July 30
Mr. **Roger C. Jensen,** National Institute for Occupational Safety and Health (NIOSH), Morgantown, USA
Mr. **Raoul Grönqvist,** Institute of Occupational Health, Vantaa, Finland

August 12
Prof. **Hiroshi Nozawa,** Kanagawa University, Japan

August 17
Mr. **Pekka Maijala** and Mr. **Hannu Mäkinen,** Technical Research Centre of Finland, Tampere, Finland

August 24
Mr. **Mark Lichty,** Consolidated Rail Corporation, Philadelphia, USA

August 25
Dr. **J. R. Jacques,** Industrial Acoustics Laboratory, INRS, Centre de Recherche de Nancy, France
Dr. ir. **Louis Goossens,** Delft University of Technology, Holland

August 27
Dr. **Peter Massawe,** Moshi Arusha Health Service, Moshi, Tanzania

August 28
Mr. **Wesley G. Johnson,** Inland Steel Mining Company and National Safety Council, Minnesota, USA
Ms. **G. Kleinman,** Department of Environmental Health, University of Washington, Seattle, USA

September 9
Dr. **John Charles Stoke,** Department of Health, Wellington, New Zealand
Mr. **Attila Takáts,** Department for Environment Protection, OKTH, and Mr. **Zoltán Bonyari,** Institute of Environment Protection of the OKTH, Hungary

September 17
Mr. **Lu Changgeng,** Section of Specification of Science and Technology Bureau (SGABC),
Mr. **Lu Yaoging,** North-West Institute of Building Designs (SGABC), China and
Mr. **Lu Zuliang**

September 23
Dr. **Jonny Myers,** Department of Sociology, University of Cape Town, S.A.

September 24
Mr. **Norman Gilroy,** The Institute for the Human Environment, San Francisco, California, USA

October 5
Dr. **Dorothy J. Worth,** Tufts University, School of Medicine, Boston, Mass. USA

October 6
Ms. **Linda Jolley,** Ontario Federation of Labour, Don Mills Ont., Canada

October 5–9
Mr **Deszö Török** and Mr. **Robert Patkai,** Munkavédelmi Tudományos Kutató Intézet, Budapest, Hungary

October 9
Ms. **Marilyn Moore,** Canadian Centre for Occupational Health and Safety, Hamilton, Ont., Canada

October 13
Ms. **Dorothy Radwanski,** Health and Safety Executive London, England

October 14
Dr. **Peter Tergeist,** International Institute for Comparative Social Research, Berlin, West-Germany

October 16
Henriette Munkebye, Ministry of Health and Social Affairs, Oslo, Norway

October 21
Mr. **Richard Zajaczkiewicz,** International Labour Office, ILO, Genèva, Switzerland

October 26–27
Dr. **Vitoon Attanatho,** Siriraj Hospital, Mahidol University, Bangkok, Thailand

October 26
Dr. **A. R. N. Prasad,**the Tata Iron and Steel Co. Ltd., Jamshedpur, India

October 27
Mr. **Summer M. Rosen.** Montefiori Hospital and Medical Center, New York, USA

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 1980. In English
Work Environment Act and Work Environment Ordinance.
☐ in English ☐ in German (new)
☐ List of Ordinances, Directions and Notices
☐ Ordinance (AFS 1981:8) Limit values English translation Price: SEK 30 (excluding service charge)
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

NEWSLETTER

National Board of Occupational Safety and Health · Arbetarskyddsstyrelsen · Sweden 4/81

Gangways on tower cranes

The National Board of Occupational Safety and Health has issued a new Ordinance (AFS 1981:18) stipulating measures to ensure that pulleys, limit switches and suchlike on the jibs or counterweight jibs of tower cranes can be safely maintained and inspected. The Ordinance stipulates a gangway running the entire length of the jib or corresponding device of a tower crane with a fixed horizontal jib, semi-mobile and lorry-mounted cranes excepted. Exceptions can apply, however, to jib points.

These regulations have been framed in order to improve safety arrangements in connection with various jobs which have to be done on crane jibs or counterweight jibs. A jib gangway can greatly improve the occupational safety of erection workers engaged, for example, in extending and connecting guy ropes in the jib when a crane is being assembled or disassembled. Gangways also mean improved safety conditions for supervisory and inspecting personnel during inspection, maintenance and examination.

The Ordinance applies to all tower cranes. Tower cranes with *fixed* horizontal jibs must be provided with a gangway or some corresponding arrangement, such as an inspection platform mounted on an access vehicle.

continued on page 2.

New Ordinance

Foto: Janne Hellgren

Arbete och Hälsa

the Board's scientific series on occupational health

ARBETE OCH HÄLSA
1981:16

Gamberale, F. et al.

Criteria in the assessment of manual materials handling

The likelihood of manual lifting and carrying of materials producing long-term adverse effects, like overloading, injury or disease, can be studied by epidemiological methods. Many studies support a correlation between heavy lifting and carrying and disorders of the locomotive organs, although the results cannot be used to establish "limit values" for manual materials handling.

Present knowledge about muscle strength, biomechanical factors, aerob-

continued on page 3.

ARBETE OCH HÄLSA
1981:19 Swedish version
1981:21* English version

Scientific basis for Occupational Standards.

Critical evaluations of those scientific data which are relevant as a background for discussion of Swedish occupational standards. These are the consensus reports given by the Criteria Group at the National Swedish Board of Occupational Safety and Health between May, 1979 and June, 1980.

The following substances are discussed.
1,2-Dibrom-3-chlorpropane, Methyl iodide, Formaldehyde, Chromium, Trichlorethylene, Cadmium, p-Aminoazobenzene, 1,2-Dichlorethane, Methylene chloride, Styrene, Tetrachlorethylene, Toluene, Xylene, Inorganic lead.
55 pp, 116 refs.

Gangways or suchlike arrangements are not required for semi-mobile and lorry-mounted tower cranes, because these can usually be collapsed easily and relatively quickly for maintenance and inspection on the ground. Nor are gangways or suchlike arrangements stipulated for tower cranes with vertically adjustable jibs, because pulleys and suchlike on these cranes usually can be serviced and inspected with the jib lowered parallel to the crane tower, with the jib point resting on the ground or with the entire crane lowered to ground level.

The Ordinance contains exact stipulations concerning the design of gangways. For example, gangways are to be fitted with edging strips and one side must be fitted with a railing or hand rail. Alternatively, safety lines or safety rails may be used. Hand rails must be supported by poles not more than 5 metres apart.

The new provisions are effective from 1st October 1982, but in the case of cranes delivered before 1st October 1982 their implementation will be deferred until 1st January 1984. The Board estimates that between 400 and 500 obsolescent tower cranes in Sweden will have to be fitted with gangways under the new rules. Most new cranes with fixed horizontal jibs are equipped with gangways already.

New Ordinances

AFS 1981:17 Drivers' cabs on stationary cranes
AFS 1981:18 Gangways on tower cranes
AFS 1981:19 Steelworks

Drivers' cabs on stationary cranes

The National Board of Occupational Safety and Health has issued a new Ordinance (AFS 1980:17) concerning drivers' cabs on stationary cranes.

The new provisions do not apply, for example, to the drivers' cabs of building cranes, mobile cranes and stacking cranes. Rules concerning the drivers'

New Ordinance

cabs of building cranes and stacking cranes have previously been issued by the Board (Directions 103, 1975 and 134, 1978 respectively).

Rules have long been needed for the cabs of stationary cranes as well. Stationary cranes are used, for example, in engineering, in steel mills, in shipyards and in docks. The category includes, for example, overhead cranes, bridge cranes and portal cranes.

It is a basic fact that inappropriate cab design can cause various complaints among crane drivers, e.g. discomfort in the neck, shoulders and arms because of draughts and back trouble caused by an unsuitable seat or incorrect posture.

The Ordinance contains exact stipulations concerning such matters as ergonomics, view, heating and ventilation, noise and access paths.

Among other things the new rules provide that a cab must have an internal headroom of at least 2 metres and an internal building volume of at least 5 cu. metres. If the training of drivers at a particular work point so demands, the cab must include space and a seat for an instructor or trainee, for example.

Easily adjustable ventilation equip- →

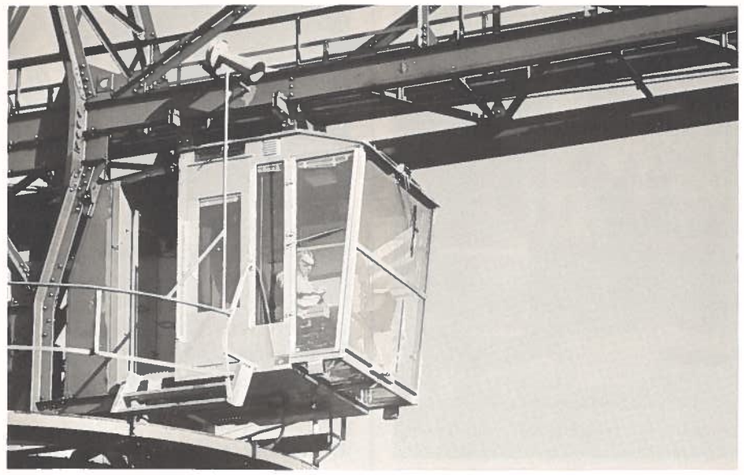
Correction

Through a regrettable printer's error five lines were omitted in Professor Ulfvarson's article on occupational hygiene measurements in Newsletter 3/81. The section in question should read:

The Methods Group is a reference group for the Interlab project, in which analytical laboratories are checked by being requested to analyse samples with known contents of various substances. A list of laboratories producing analytical results within predefined margins of error is published twice yearly. Participation in this project is voluntary and, at present, free of charge. The round which is now being prepared will be concerned with the quarts content of fine fraction, the number of asbestos fibres in filters, solvents in carbon tubes (a mixture of three or four solvents out of a larger number mentioned by name), ammonia in absorption fluid and formaldehyde in absorption fluid. The last two of these are new and are conditional on a sufficient number of laboratories enrolling.

NEWSLETTER

Newsletter is a quarterly review from the National Board of Occupational Safety and Health, S-171 84 Solna, Sweden. Telephone: + 46-8-7309000. The Board is the central authority in Sweden for matters concerning occupational safety and health.
Newsletter contains items about inter alia new regulations issued by the Board under the Work Environment Act and new research reports on occupational health from the Board.
Subscription inquiries, address changes and editorial correspondence should be addressed to Newsletter, International Secretariat, National Board of Occupational Safety and Health, S-171 84 Solna, Sweden. Subscription rate: none.
Publisher: Gunilla Warnbeck.
ISSN 0348-7598.



ment must be provided. This equipment must be constructed and proportioned in such a way that a sufficient flow of air can be supplied to the cab from outside. If the air inside the facility is potentially deleterious to the driver's health, as it can be, for example, in a steelworks, the supply air must be filtered or air ducts must be arranged from points where the air is sufficiently pure.
A driver's cab used outdoors or on premises involving low temperatures must be fitted with a heating arrangement. A cab exposed to intense heat, such as that emitted from working processes in a steelworks, must be provided with an air cooling arrangement.

All cabs must be soundproofed.

The driving seat must be of such a kind that the driver can work in a satisfactory working posture. For example, the back rest and arms must be adjustable.

The controls must be positioned so that they can easily be operated from the driving seat. The lever resistance must not be excessive. Furthermore, controls must if possible be arranged in such a way that their movement follows the movement of the load. For the sake of uniformity concerning the positioning and function of controls, the Ordinance lays down that efforts must be made for the vertical movement of the lifting device (the hoisting movement) to be controlled with the right hand and the horizontal movement of the same device with the left hand. An appendix to the Ordinance shows examples of movement charts for controls variously positioned in the cab and for various types of crane.

Emergency evacuation of the cab must be possible both rapidly and easily. Emergency exit equipment must if necessary be provided in or near the cab.

The provisions of the Ordinance apply to cabs delivered from 1st January 1983 onwards.

INVESTIGATION REPORT 1981:14

Strandberg L.

Danger, rear wheel steering.

Rear wheel steering, which is common in fork-lifts and loaders, brings about certain deceptive driving characteristics. The hazards are illustrated with authentic accident case descriptions and are elucidated through analyses of vehicle dynamics.

Vehicle stability at every speed requires that the rear wheels have a better cornering capacity than the front wheels. Therefore, rear wheel skidding with attendant overturning risk is more likely to occur:—with insufficient rear tyre pressure—if only the front wheels are studded—when a counterweight truck is unloaded.

In addition, it is **impossible to recover from a rear wheel skid with rear wheel steering.** Field tests on ice confirmed that a rear wheel skid is aggravated if the driver compensates for it in the common way by steering in the direction of the skid.

Rear wheel steering systems are usually not self-stabilizing. Thus, severe yaw motions may occur unintentionally, if the steering-wheel is held too loosely.

Conclusively, rear wheel steering should be avoided for normal driving, e.g. with a turnable driver's cab and automatic speed limitation in one direction. Such a design will also decrease the risks of load loss upon braking and improve frontward view, particularly in fork-lifts.
28 pp, 17 refs.

continued from page 1.
ic work capacity, circulatory stress and psychophysical responses as criteria for manual materials handling are summarized. In many cases a combination of different criteria is necessary for the assessment of acceptable loads. However, a large part of the available criteria materials is based on laboratory studies conducted under optimum external conditions. These conditions frequently do not exist in real work situations. The assessment of manual materials handling in a real work situation is often difficult because a combination of many different environmental factors is capable of influencing the load on the individual worker. External circumstances like dimensions of the handled object, workplace design, work organization and climate, as well as other simultaneous physical or intellectual demands on the worker are discussed. The large range in physical capacity and body size of the working population is emphasized. In conclusion this means that the practical merit of recommendations concerning manual materials handling which only pay regard to one, or a few, work environment factors is limited. Therefore, no general "limit values" for lifting and carrying can be drawn up. In many instances, however, recommendations based on available criteria can be devised for suitable, or acceptable, loading in a given work situation where the worker's physical capacity is known.

Foto: Björkdahl (DN)

Steelworks

The National Board of Occupational Safety and Health has issued a new Ordinance (AFS 1981:19) concerning work in steelworks. The Ordinance deals with furnace work and casting operations in steelworks and other metal melting plants. The purview of the Ordinance comprises steelworks, ferro-alloying plants and lead and copper melting plants.

The following environmental problems are dealt with:

- Health hazards connected with noise, air pollutants, heat, draughts and lighting.
- Risks of burns and of accidents due, for example, to tripping, slipping and pinching or crushing and to falling objects and explosions.
- Work involving ergonomic problems.

The Ordinance is divided into six main parts. The first contains general provisions applying to the whole of the melting plant. These include, for example, stipulations concerning cleaning, the use of helmets and access to emergency showers. The second part deals with the handling of raw materials and stipulates, for example, that charge material must be dry and must be handled in such a way as to avoid the formation of dust. The third part deals with work at furnaces and converters and stipulates, for example, precautions against splashing and heat radiation and fire-proof clothing and safety shoes. The fourth part deals with ingot casting and continuous casting. Stipulations here include emergency casting devices and improvements to working methods so as to avoid ergonomically troublesome jobs. The fifth part deals with the erection and demolition of furnaces, converters, ladles and tundishes, and stipulations here include mechanization and dust extraction. The final part deals with the inspection and supervision of ladles and stipulates an initial inspection of new ladles, followed by continuous annual inspections. These inspections may be carried out on an internal basis.

New Ordinance

Some of the stipulations in the Ordinance relate primarily to new facilities, and these provisions have therefore been combined with interim provisions empowering the Labour Inspectorate to grant respites or exemptions for facilities commissioned before the Ordinance comes into force, provided that safety is not prejudiced as a result.
The Ordinance enters into force on 1st January 1983.

INVESTIGATION REPORT 1981:16

Lindstedt, G et al

Determination of formaldehyde in skin cleansers etc.
The fluorimetric method of formaldehyde determination published by Wilson has been applied to hand cleansers and similar preparations. When compared to the chromotropic acid method, it gives higher formaldehyde figures. The latter method sometimes gives negative results owing to interferences from constituents of the preparations analyzed. Therefore the fluorimetric method has been adopted as the standard method in the laboratory of the Board.
Out of 183 hand cleansers and similar preparations analyzed in 1978–1980, 100 (55 %) were negative with regard to formaldehyde, 34 (19 %) contained no more than 0.005 % formaldehyde, 9 (5 %) more than 0.05 % and only one more than 0.2 %.
19 pp, 9 refs.

INVESTIGATION REPORT 1981:17

Fredén K. et al.

Vibration load with poker vibrators.
Medical studies to assess the presence of vibration effect were conducted on 64 persons working in factories manufacturing concrete elements. 48 persons had been exposed to some form of vibration at considerable levels. Symptoms of Raynaud's disease were detected in 19 persons. Nine had been scaled 2 or higher on Taylor's scale.
Technical measurements showed that intensive vibration occurred in one of the two commonly used poker vibrators. The levels exceeded the curve for 30 minutes exposure according to the ISO proposal. The second vibrator generated lower levels which fell within the 2–8 hour limit of the ISO proposal. Interview studies indicated that a man works 0.5–2.5 hours per day with these vibrators.
Both medical studies and technical measurements provide evidence of vibration injury risk from the use of poker vibrators.
24 pp, 6 refs.

Arbete och Hälsa

the Board's scientific series on occupational health

ARBETE OCH HÄLSA 1981:17*

Nicholson, W. J.

Criteria document for Swedish occupational standards: Asbestos and Inorganic Fibers.

Establishing dose-response relationships for *asbestos* exposure is associated with significant difficulties. Despite this, useful estimates can be made, to provide an approximate measure of asbestos disease potential at exposures lower than those of past years.

Methodological limitations are discussed by describing exposure estimations, health effects, time factors, dose-response relationships, and interaction with cigarette smoking, all with examples.

Based on data from studies in the United States, Canada, and Great Britain, quantitative dose-response estimates for mortality and X-ray abnormalities are given. The relative carcinogenicity of different asbestos varieties is exemplified. Exposure control to the lowest level possible is required.

Data indicate that total mortality may be increased by 10 % and risk of lung cancer may be doubled from lifetime exposures to asbestos fiber concentrations lower than or equal to 2 f/ml. Three studies indicate excess mortality from lifetime exposures as low as 0.5 f/ml.

Animal implantation and injection studies show that fine (<0.5 μm), durable *mineral fibers* are carcinogenic. Fibers longer than 8 μm are more carcinogenic in the experimental models studied.

Mortality studies of human populations exposed to low concentrations of synthetic mineral fibers (<0.5 f/ml) raise the possibility that long-term human disease, including cancer, may be associated with such exposure.
Adequate data are not now available, however, for a definite judgement.
103 pp, 106 refs.

ARBETE OCH HÄLSA 1981:18

Edling, C.

Criteria document for Swedish occupational standards: Nitrous oxide.

Nitrous oxide has been used as an anesthetic agent for more than 100 years and considered harmless. During the late 1950's, however, effects were reported on the white blood cells in nitrous oxide anesthetized patients. This started an increased activity in research on the toxicity of this agent.

It has been shown in different in vitro experiments that nitrous oxide inhibits cellular growth and division. Animal experiments have demonstrated teratogenic effects, effects on the white blood cells, and an inhibition of the vitamin B_{12} metabolism. Epidemiologic studies have indicated an increased risk for pregnancy complications such as miscarriages and birth defects, which might be related to nitrous oxide. Case-reports have described polyneuropathy in persons who misused nitrous oxide and psychological effects have been demonstrated in experimental situations. There seems to be no essentially increased cancer-risk from exposure to nitrous oxide.

Nitrous oxide can be metabolized by intestinal bacterias and form free radicals. This could explain the toxic effects on fetuses while the interaction with vitamin B_{12} could be the mechanism for blood cell effects and polyneuropathy.

In most studies exposure to nitrous oxide has been at such a level (above 70,000 ppm) that it has no relevance when dicussing health risks for personnel who are normally exposed to much lower levels (below 6000 ppm). In some experiments, however, effects have been described at low exposure levels. Teratogenic effects in rats at 1000 ppm and psychological effects in man at 50 ppm have been observed.

From the data presented it might be concluded that nitrous oxide can be an occupational hazard. When discussing an occupational standard value (Threshold Limit Value) it must be taken into consideration that coincident exposure to other anesthetic gases may strengthen the adverse effects of nitrous oxide.
36 pp, 105 refs.

ARBETE OCH HÄLSA 1981:20

Principles and recommendations as to sampling and analysis of substances in the list of limit values.

This paper describes the principles of the most important methods of analysis of air pollution in the work environment. The first part of the paper contains a description of sampling strategy and statistical analysis of observed values in connection with quantitative determinations of air pollutions. The next part is about direct reading methods of analysis of gaseous substances and methods for separate steps of sampling and analysis. Also included is a description of volume measurements of air samples, sampling through direct collection and enrichment methods, and the transport and storage of samples. Analyses of samples with the most important methods of analysis of gas samples and dust samples are also described. In the last part there is a list of substances with threshold limit values and for each substance the recommended method and references to literature.
80 pp, 72 refs.

ARBETE OCH HÄLSA 1981:22

Nordic Expert Group for Docu-

mentation of Occupational Exposure Limits
24. Inorganic arsenic except arsine.

A critical review of the occurrence, metabolism and effects of inorganic arsenic with special reference to occupational exposure is presented. Adverse health effects caused by long-term exposure to inorganic arsenic may include hyperkeratosis, skin cancer, lung cancer, liver disturbances, peripheral vascular disorders, mental disability and peripheral neurological damage. Cancer of the lugn is regarded as the critical effect of long-term exposure to airborne arsenic. Based on available dose-response relationships it can be estimated that exposure to airborne arsenic at concentrations of about 50 ug/m^3 for more than 25 years could be associated with a nearly 3-fold increase of respiratory cancer mortality in groups over 65 years of age. The uncertainty of the estimate is pointed out.

Metabolism and toxicity of arsenic are dependent on the chemical form, e.g. valence state. It is not known, however, if carcinogenic potential differs between trivalent and pentavalent inorganic arsenic. At present, health evaluations have to be confined to inorganic arsenic as such without differentiation regarding chemical form.
51 pp, 146 refs.

ARBETE OCH HÄLSA 1981:23

Sjögren B., Håkansson M., Randma E., Svensson Å.

Welding problems connected with work environment, Part 18.

Acute effects in relation to MAG-welding of painted and non-painted steel, and welding of non-painted steel with covered electrodes.
This study concerns acute effects when welding painted and non-painted steel. The steel was painted with a commonly used shop primer composed of iron -oxide and zino tetraoxychromate as pigment and polyvinyl-butyral and phenol resins. The study comprised 15 persons welding with covered electrodes in non-painted steel, 30 persons welding with MAG in non-painted steel and 23 persons welding with MAG in painted steel. The control group consisted of 60 persons working in metal industry.

Symptoms from the eyes and respiratory tract were more common among the welders than among the controls. These symptoms were more common among persons welding with MAG in non-painted steel (60 %) than among persons welding with covered electrodes in the same steel (33 %). No particular airborne substance could be blamed for this difference.

The groups welding with MAG in painted and non-painted steel had the same frequency of symptoms despite the fact that the group welding painted steel had a lower effective arc-burning time, i.e. a lower exposure.

Spirometric measurements (FVC, $FEV_{1,0}$, FEV %, MMF) were performed before and after work. There was no difference between the group welding with MAG in painted steel and the controls.

The total group of welders had a higher frequency of chronic bronchitis than the control group, but the difference was not significant (p = 0,12).
20 pp, 9 refs.

ARBETE OCH HÄLSA 1981:24*

Hagberg M.

On evaluation of local muscular load and fatigue by electromyography.

Electromyographic amplitude and spectral analysis may reveal both the contraction level and the development of muscle fatigue. An estimate of the local load variation on a muscle may be obtained by computing the amplitude probability distribution function (APDF) of the fullwave rectified and lowpass filtered or RMS detected myoelectric signals.

Local muscular fatigue measured as endurance time and as EMG amp¨ tude and spectral changes during is metric, dynamic and intermittent is metric exercise were strongly corr lated. Fatigue development was sim lar in isometric and in continuous dynamic elbow flexion exercise. In intermittent isometric exercise fatigue development was slower than in sustained isometric exercise at corresponding mean contraction levels.

In sustained abduction and forward flexion at a right angle, EMG signs of fatigue were revealed in the supraspinatus muscle and in the descending part of the trapezius muscle after five minutes, as well as short time constants of myoelectric changes. In repetitive shoulder flexions, fatigue development in the descending part of the trapezius was correlated with external load. The time constants of EMG amplitude increase were also correlated with endurance time and with local factors in perceived exertion.
53 pp, 91 refs.

ARBETE OCH HÄLSA 1981:25

Ulfvarson U., Bergström B., Hallberg B.-O., Hallne U.

Welding problems connected with work environment. Part 17. Air contaminants from flame cutting in heavy steel plate coated with various shop primers.

Laboratory experiments with heating of heavy steel plate coated with shop primers show that a great number of organic substances are formed in the decomposition of the primers. Substances known to have irritating properties have been found in realistic experiments in the laboratory. The concentrations of these substances in a place corresponding to the breathing zone of an exposed worker are low, however. Unlike this dust, carbon monoxide and nitrogen oxides are formed in concentrations which call for measures to limit the exposure. These observations are supported by field studies where the concentrations of dust, carbon monoxide and nitrogen oxides are sometimes high, especially in confined spaces.
37 pp, 13 refs.

ARBETE OCH HÄLSA 1981:26

Nordic Expert Group for

Documentation of Occupational Exposure Limits.
25. Mineral fibres.

A critical review and evaluation of the literature relevant to standard setting for occupational exposure to synthetic mineral fibres (MMMF) and a recommendation of the effects which should form the basis of such a setting.

The following aspects have been regarded as important:

Thick MMMFs (diameter larger than 5 μm) can cause itching and exanthema in the skin. The effect is mechanically conditioned and it is caused by small traumas in the skin.

Among long-term exposed there has been found increased mortality from "other nonmalignant pulmonary diseases" such as chronic bronchitis and emphysema. In animal experiments an increased interstitial fibrosis has been found after intratracheal application. This effect is far less pronounced than the effect from exposure to asbestos fibres and is not caused by pulverized mineral fibers.

Intrapleural and intraperitoneal applications in animal experiments have shown that MMMF have a carcinogenic effect which is related to the configuration of the fibres. Fibres having a diameter smaller than 1 μm and being longer than 10 μm are the most potent ones. This effect has not been seen after inhalation or intratracheal application.
40 pp, 79 refs.

Investigation Reports

INVESTIGATION REPORT 1981:4

Landström U. et al.

Physiological effects produced during exposure to infrasonic noise

The present paper is a description of some physiological reactions following whole body exposition to infrasonic noise (16 Hz, 125 dB(lin), one hour). The experiments were carried out on 20 healthy male subjects, 20–35 years old. Production of infrasound was achieved with a pressure chamber, in which the subject was sitting during exposition.

The infrasound was found to cause an increase in diastolic blood pressure and a marked reduction in systolic pressure. In most cases it was possible to registrate a reduction in rate of breathing. In some individual cases it was also possible to notice an increase in production of HC1 from the stomach and a reduction in secretion of cortisol from the adrenal cortex. The result in general confirms that the effect of infrasound, 16 Hz, 125 dB(lin), is individually related. On the whole the effect on the tested physiological reactions was small, only the effect on blood pressure was found to be statistically significant.
45 pp, 22 refs.

INVESTIGATION REPORT 1981:6

Nise, G. Widholm, B.

Comparison of passive dosimeters, carbon tubes and motorized sprays for determining atmospheric toluene content.

12 pp, 4 refs.

INVESTIGATION REPORT 1981:10

Leyman H.

Twenty-four safety engineers. Interviews concerning the working conditions and aspirations of safety engineers.

49 pp, 0 refs.

INVESTIGATION REPORT 1981:11

Blomquist G. et al

A comparison between different methods for collecting mould spores.

Sampling of air borne mould spores with filter, midget impinger, cascade impactor (Andersen sampler), slitsampler (Casella bacterial sampler MK2 and BIAP) and cyclon sampler was investigated. The mould spore concentration during the period when the experiments were performed varied between 5×0^3 and 2×10^7. The methods were tested for one year at a warehouse.

The results showed that both filter and impinger were incapable of giving a correct measurement of the mould spore concentration. In the case of filter the spores probably dried during the sampling and were regarded as dead since no viable colonies were found. With the impinger the low recovery was probably caused by bad retraining of the spores, due to their hydrofobic surface characteristics. At low spore levels in the air, up to 10^4 spores per m^3, the other methods were comparable. At higher spore levels only the two slitsamplers gave comparable results although the BIAP slitsampler showed lower values than the Casella bacterial sampler.

The methodology was improved when high spore amounts were measured due to overloading of the agar plates. To facilitate measurement of high spore amounts, the agar gel after sampling was homogenised in sterile sodium-chloride solution and spread on growth media after stepwise dilution. This treatment of the sample did not influence the actual number of colonies.

34 pp, 11 refs.

INVESTIGATION REPORT 1981:12*

Current experimental studies on organic solvents. Symposium April 27, 1981

The report contains abstracts of 17 papers presented at a Swedish symposium on organic solvents.

17 pp, 0 refs.

NEWSLETTER

National Board of Occupational Safety and Health · Arbetarskyddsstyrelsen · Sweden
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No 1. June 1980

Statistics on occupational injuries

The Swedish Occupational Injury Information System (ISA) – reported on in Newsletter No. 3 October 1978 – was inaugurated on January 1, 1979, its purpose being to establish input documentation for the preventive aspect of occupational safety and health. Official occupational injury statistics are to be published and it will also be possible for other information to be compiled for the purposes of a particular recipient. Responsibility for the ISA system is vested in the National Board of Occupational Safety and Health.

Statistical reports containing statistics under the ISA system for the first and second quarter 1979 have now been published. The statistics comprise seven tables. A general survey will be found in one table. The other tables show accident patterns in different sectors and occupations by events, types of machinery, implements, materials etc.

Condensed general survey tables from the statistical reports are given below.

The reports are published by the National Central Bureau of Statistics and may be obtained from the Board's Publishing Service: See order form.

NUMBER OF OCCUPATIONAL INJURIES BY TYPE OF INJURY AND EMPLOYMENT STATUS, 1979 1st QUARTER

Type of injury	Employees contractors and students		Self-employed persons		Conscripted personnel		All	
	Total	of which fatal cases	Total	of which fatal cases	Total	of which fatal cases	Total	of which fatal cases
All types of occupational injuries	39 134	46	1 913	5	616	–	41 663	51
Occupational accidents	29 429	31	1 680	3	495	–	31 604	34
Occupational diseases	4 373	2	120	–	85	–	4 578	2
Accidents on way to or from work	5 332	13	113	2	36	–	5 481	15

NUMBER OF OCCUPATIONAL INJURIES BY TYPE OF INJURY AND EMPLOYMENT STATUS, 1979 2nd QUARTER

Type of injury	Employees contractors and students		Self-employed persons		Conscripted personnel		All	
	Total	of which fatal cases	Total	of which fatal cases	Total	of which fatal cases	Total	of which fatal cases
All types of occupational injuries	31 563	52	1 745	2	473	2	33 781	56
Occupational accidents	25 981	35	1 604	2	390	2	27 975	39
Occupational diseases	3 334	4	114	–	65	–	3 513	4
Accidents on way to or from work	2 248	13	27	–	18	–	2 293	13

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Recombinant DNA advisory committee

The Swedish Government has set up a Recombinant DNA Advisory Committee of the National Swedish Board of Occupational Safety and Health. Excerpts from the ordinance (SFS 1979: 1173) containing standing instructions for the Committee are found below. The ordinance entered into force on 1st January 1980.

Duties

The task of the Recombinant DNA Advisory Committee of the National Swedish Board of Occupational Safety and Health is to conduct advisory activities in order to promote safety in connection with the use of recombinant DNA and to disseminate knowledge concerning developments in the field of recombinant DNA.

In this connection it shall be the duty of the Advisory Committee

to observe developments in the field of recombinant DNA and to devote particular attention to new circumstances of actual or potential relevance to public supervision of the use of these techniques,

to take initiatives in matters concerning the classification of hazards and in other matters concerning safety and protection,

to make statements to the supervisory authorities concerned and to other authorities, as well as to public and private institutions and enterprises, in matters concerning the classification of hazards and other matters of safety and protection, and to inform the said authorities, institutions and enterprises of conditions in the field of recombinant DNA which may be of use in connection with their activities, always provided that the information supplied to private institutions and enterprises may be limited to questions of general importance,

to inform the general public of developments in the field of recombinant DNA in such a way as to maintain interest in safety questions and stimulate public debate,

to observe the need for training for personnel who are working or will be working with recombinant DNA techniques,

to notify the Government if any field of application or any intended use of recombinant DNA techniques can be queried on ethical or humanitarian grounds or if the scope of public control needs to be enlarged to include questions other than those already subject to the award of permits or public control.

Organization

The Advisory Committee shall comprise a Chairman, a Vice Chairman and seventeen other members.

Members and their deputies are to be appointed by the Government for three years at a time.

The Chairman shall be the Director-General of the National Board of Occupational Safety and Health. The Vice Chairman shall be specially appointed by the Government.

Four members shall have special knowledge and experience of basic and applied research within a science affected by recombinant DNA technology. Four members shall be members of the Parliament.

The remaining members are to be appointed as follows:

- one after nomination by the National Board of Occupational Safety and Health
- one after nomination by the National Board of Health and Welfare
- one after nomination by the National Environment Protection Board
- one after nomination by the Swedish Medical Research Council
- one after nomination by the Natural Science Research Council
- one after nomination by the Swedish Confederation of Trade Unions (LO)
- one after nomination by the Central Swedish Organization of Salaried Employees (TCO)
- one after nomination by the Swedish Confederation of Professional Associations (SACO/SR)
- one after nomination by the Swedish Employers' Confederation and the Federation of Swedish Industries jointly.

The Advisory Committee shall include a study group for the risk classification of various projects. The Advisory Committee may also include study groups dealing with other particular matters.

The Secretary and other staff of the Advisory Committee are to be provided by the National Board of Occupational Safety and Health.

■

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.

Ordinances issued by the Board

ANTIFOULING PAINT

The Board has issued **Ordinance No 1980:1** concerning **Amendment to the Board's Directions No 19:8,** Antifouling Paint.

TRACTOR EXCAVATORS

The Board hass issued **Ordinance No 1980:2** concerning **Tractor excavators with dredging unit manufactured by Svenska Hymas AB.**

CAR LIFTS

The Board has issued **Ordinance No 1980:3** concerning **Amendments to the Board's Directions No 133,** Car lifts.

■

New issues of "Arbete och Hälsa"

As a rule the issues of "Arbete och Hälsa" *appear in Swedish with a summary in English.*
Summaries contained in the latest issues follow below.

ARBETE OCH HÄLSA 1980:1

Gösta Lindstedt and Jan Sollenberg: Polycylic aromatic hydrocarbons in occupational environment.

The chemistry, formation, occurence and analytical chemistry of polycyclic aromatic hydrocarbons (PAH) has been reviewed as well as their biochemistry, metabolism, and toxicity with special regard to carcinogenicity. In Sweden, analyses in the occupational environment have been mainly confined to benzo(a)pyrene (BaP), the most frequent of the strongly carcinogenic PAH:s. The analyses carried out in Sweden since the early 1960's have been reviewed, discussed and compared to similar analyses from investigations in other countries. In some countries, more complete PAH analyses, including dozens of pure components, have been made in different work atmospheres.

Independent of which PAH components have been analysed, the most heavily exposed workers are at coke ovens (topside), aliminium works (near the ovens), graphite factories (making electrodes), roofing (handling hot pitch or tar) etc. All these categories have an average exposure in excess of 10 µg BaP/m^3. More moderate exposure (1-10 µg BaP/m^3) has been observed for nontopside work at gas and coke works, iron and steel works, graphite works (in general), and alumi-

nium works (in general). The main source of PAH in all these works is coal tar or pitch, which is heated and evaporated.

In other work places, PAH:s are generated on the spot, mainly in combustion engines. The BaP level in the air in these places is always rather low, less than 0.1 $\mu g/m^3$. Investigations have been carried out in garages, car workshops, iron mines, and tunnels under construction. The BaP level differs little from that in crowded city streets.

The epidemiological investigations of PAH-exposed personnel which have been carried out in foreign countries are reviewed. The most strongly exposed workers (coke oven workers, roofers etc) have a statistically significant increase of lung cancer and some other types of cancer.

Threshold limit values for PAH in general and for BaP in different countries are discussed. In Sweden, a limit value of 10 µg BaP/m^3 has been established in 1978. This is rather high when compared to the USA values 0.2 mg/m^3 (ACGIH) or 0.15 mg/m^3 (OSHA) for the benzene-soluble fraction of the particulates. It is therefore proposed that the limit be lowered in the future. Additional limit values, e.g. for the whole PAH fraction, would also facilitate the supervision of work atmosphere. In practice, different TLV values (for BaP only or for the whole PAH fraction) are equally useful, since the precautions taken to minimize heavy exposure will be the same in all cases. At the present state of knowledge, it is impossible to estimate cancer risk, even if a complete analysis of all PAH components in the air is available. Therefore, all that can be done is to eliminate the PAH exposure as much as possible.

ARBETE OCH HÄLSA 1980:2

Ödkvist, L.M., Åstrand, I, Larsby, B & Käll, C:
Does styrene disturb the balance apparatus in man?

Animal experiments have earlier shown that solvents like xylene, styrene, trichloroethylene and methyl chloroform interfere with the balance apparatus giving positional nystagmus. Some solvents also change the nystagmus response to rotation and to movable visual stimulation in an optokinetic test. To find out how these results can be extrapolated to man five male volunteers were examined. After one hour of styrene exposure the mean concentration of styrene in blood was 8.7 mg/kg equivalent to an uptake of 1020 mg styrene. The optokinetic test showed a disturbance of their eye movement capability. No positional nystagmus, fixation nystagmus or balance disturbance was observed.

The optokinetic test seems to be sensitive to the styrene effects on the central nervous system in man as well as in rabbit. Further studies should be done to show if the slow or the rapid nystagmus phase is the most sensitive and if there is any correlation between acute and chronic solvent effects on the central nervous system.

ARBETE OCH HÄLSA 1980:3

Per Höjerdahl and Sven Alenius:
The efficiency of oil mist collectors – II Test results for sixteen oil mist collectors.

With the method published in "Arbete och Hälsa 1978:7" (see Newsletter No. 2 August 1978), sixteen different oil mist collectors have been tested. Included were five filter oil mist collectors (one with HEPA-filter), two rotating drum oil mist collectors, and nine electrostatic precipitators. These have been tested with the one and same oil mist. In the tests, the collection efficiencies dependence on time, up to four hours, and on particle size have been measured. The oil mist collector's influence on the vapour phase in the oil mist have been measured, too. The concentrations of ozone have been measured before and after the electrostatic precipitators.

Measurements of oil mist concentrations and particle size distributions have been done with two direct reading instruments. A hydrocarbonmeter based on a flame ionisation detector has been used for measurement of the total mass concentration and the mass concentration of the vapour phase before and after the oil mist collectors. A particle counter has been used to count oil drops in different size intervals before and after the collectors.

The particle number concentration before and after the collectors has been measured in six intervals with the particle diameter limits 0.3; 0.5; 0.7; 1.4; 5 and 7 um. Except for the HEPA-filter collector, the collection efficiencies for respective interval, in percent, have been: -45 to 99.51; 13 to 99.39; 35 to 99.50; 84 to 99.75; 95,2 to 99.96 and at least 95.4.

In the case of the HEPA-filter collector, the corresponding collection efficiencies in percent could not be more precisely determined than the following: 99.97 to 99.99 for 0.3-0.5 um; more than 99.99 for 0.5-3 um; more than 99.95 for 3-5 um and more than 97.3 for 5-7 um.

The collection efficiencies, in percent, of the vapour phase in the oil mist have varied between -275 and 28 for the different collectors.

For the fabric filter- and rotating drum oil mist collectors the collection efficiency decreases with time after start with a new filter. For the electrostatic precipitators such a decrease of the collection efficiency with time could not be shown.

Of the electrostatic precipitators, two (working on the single-stage principle) have shown considerably higher concentrations of ozone in the exhaust air than the supply air.

ARBETE OCH HÄLSA 1980:4

Karl- Gunnar Lövstrand and Sven Bergström:
Exposure to electric fields.

Electrophysical factors in high voltage substations such as corona, ELF electric and magnetic fields, have been surveyed. The electric fields there reach very high values which do not occur in other working environments.

Three measuring instruments were developed for surveying the substations and for determination of the exposure of workers to electric fields: 1) A field meter which measures the unpertubed field strength. With this instrument the electric field was surveyed in high voltage substations at a height of 1.8 m. 2) A dose-meter which was used for measurement of the exposure at different working operations. 3) An instrumented full size dummy which was used for determination of the distribution and strength of induced currents in a man exposed to ELF electric fields.

Measurements were made in 20 substations throughout Sweden mainly 400 kV substations but also in stations for lower voltages. The results show that the exposure of the workers is below 5 kV/m during more than half of the working day. The working time in field strengths higher than 10 kV/m is normally less than a few percent of the working day.

ARBETE OCH HÄLSA 1980:5

Rolf Alexandersson, Birgitta Kolmodin-Hedman, Göran Hedenstierna and Moje Magnusson:
Diisocyanates-HDI. Lung physiology studies on car-painters.

The study was initiated by the fact that car-painters in increasing extension wanted to see a doctor about troubles in airways. Car-painters are exposed to isocyanates, especially hexamethylendiisocyanate, HDI. The purpose of the study was to investigate the effect of HDI on lung function in order to differentiate between potential effects of isocyanates, especially HDI, and other agents we also examined two control groups, a) car-platers exposed to the same solvents and grinding dust as car-painters, but not to HDI, and b) car-mechanics, not really exposed to any of the mentioned agents. Car-painters and car-platers were compared to

matched controls on Monday before work. Acute effects of car-painting were tested by comparing the lung function values on Monday morning with those on Friday afternoon. For the interwiew a standardized questionnaire was used. Pulmonary function was evaluated by means of spirometry and a single breath nitrogen wash out. Closing volume in relation to vital capacity (CV%) was increased in car-painters, indicating a "small airways disease" on Monday before work and tended to increase during a working week. Car-platers did not differ from their controls.

Thus, by using a nitrogen wash out method it is possible to indicate HDI-reactions in small airways before they are visible in conventional spirometric methods.

ARBETE OCH HÄLSA 1980:6

Nordic expert group:
Chlorine and chlorine dioxide

Survey of literature on chlorine and chlorine dioxide to serve as background for discussion of occupational exposure limits.

Acute irritative symptoms, as long as documented chronic effects caused by long-term low-grade exposure are lacking are recommended to be used in this discussion.

ARBETE OCH HÄLSA 1980:7

Samuel W. Glass and Sten Sundin:
Factors effecting vibration levels in impact drills.

The aim of this study was to identify those factors which contribute most to vibrations among acceleration levels in vibration spectra for impact drills operated under similar working conditions. 24 different drilling situations in cinderblock including different feed force, grip force and drilling position for 2 drills (large - Bosch 1174 and small - AEG SB 2E-350) and 2 bit sizes (13 mm and 6 mm diameter) were measured and 13 subjects were studies. Acceleration was measured using 3 orthogonally mouted miniature piezoelectric accelerometers. The signals were recorded on an FM recorder and lated analyzed using a 1/3 octave band spectral analyzer with a 64 second averaging time.

An analysis of variance was performed on the acceleration level of each frequency band and at the critical frequency (as related to ISO/DIS 5349 curves). No statistical significance ($p < 5$ %) as a function of grip force or drill position was found. Feed force generally did have a significant effect. Even within the constraints of controlled feed force, variations were rather large (maximum range = 12 dB, S = from 2 dB to 6 dB). Variation among critical frequency vibration levels ($S < 2.4$) was less than peak vibrations among spectra.

A conceptual model inculding the machine wear, work piece characteristics, operator's hand-arm dynamic characterisics and operator technique was developed to evaluate the source of the variation among similar spectra within the constraints of controlled feed force. Teh influence of machine wear was evaluated by comparing early and late spectra in the test series. Work piece variation was evaluated by measuring teh drill feed velocity over short time intervals under controlled feed force conditions. Operator dynamic characteristics were evaluated using both dynamic mass mideling of the drill system (including hand-arm dynamic mass values from Reynolds 1977) and experimental comparison of variation form one operator with variation from 13 operators. Variation in work piece material characteristics and operator technique variation were considered most responsible for spectral variation. Since the effect of parameters appeared to follow normal statastical distribution laws, substantial reductions in special variation may be expected from longer averaging times and a large population of drill cycles.

The nature of the feed force effect was further investigated using two idealized conceptual models, one considering the effect of feed force on drill vibration independent of motor speed variation and the second considering only the effect if motor speed varation. The idealized model conditions were simulated using the small drill and a single operator. With increased feed force the first model condition demonstrated increased acceleration levels while the second demonstrated decreased acceleration levels. Which effect is dominant depends on the drill and work situation.

Investigation reports — in Swedish — issued by the Board

INVESTIGATION REPORT 1980:1

Carina Käll, Claes Frisk, Mats Wennhager, Göran Hägg, Åsa Kilbom, Bengt Jonsson and Irma Åstrand:
Physiological strain during city mail delivery.

INVESTIGATION REPORT 1980:2

Anita Isaksson and Lena Karlqvist:
Description of the working environment of the Stockholm Home-Help Office with respect to strenuous worksteps involved in moving people.

An English summary of the report is reproduced below.

The number of pensioners has increased in recent years. A large proportion of them are care recipients in their homes through the agency of the Home-Help Office. In 1977 there were 3 000 pensioners (out of a total of 24 000) in Stockholm described as "heavy" care cases, i.e. care recipients requiring considerable lifting assistance in order to transfer themselves. High demands are claimed for care staff, since few homes are adapted to individual functional status of care recipients, and technical aids are largely absent. This makes work physically very heavy, why only a few home-care aids are able to work full-time. Many home-care aids are reported to show disorders from the muscular-skeletial system and staff turnover is high.

The present report describes the working environment of some home-care staff of the Stockholm Home-Help Office with respect to the strenuous worksteps involved in moving people. Home-care aids, i.e. day and night staff as well as evening and night patrols, working with 31 care recipients were studied. Requisite data were recorded on care recipients, their living standard and existing technical aids. On the basis of these studies, proposals have been drawn up for measures to improve working conditions for staff providing these "heavy" cases with care in the home. Requisite data were collected on staff and duties tabulated. Work demands were rated on a 3-point scale for each home-care aid for the work phases studied. The study concentrated on the work positions of the home-care aids and on the care recipients' need for assistance in order to transfer themselves.

The study disclosed that:

- 17 of 20 care recipients cared for by day and night staff used wheelchairs, two were bed-ridden and only one could walk without assistance.
- Seven care recipients lived in flats modified for use by disabled persons but only one flat was individually tailored to suit the occupant's specific functional status.
- Non of the care recipients were able to utilise the modified kitchen. The low counter height (80 cm) was a major shortcoming for staff who were forced to work in an uncomfortable, forward-bent position.
- Sanitary facilities were too small and were difficult to enter owing to high thresholds and doors which

were too narrow. They seldom satisfied the housing regulations drawn up by the National Planning Office.

- Bedrooms were often furnished so that it was difficult for staff to find ergonomically suitable work positions when assisting care recipients.
- Stairs plus the absence of a lift or ramps made access to the flat difficult.
- Most care recipients lacked any technical aids which could facilitate work for staff when moving care recipients. Lifting had to be performed manually.
- Home-care staff were almost always women, despite the physically strenuous nature of the work.
- Day staff often worked alone for two hours at a time. Night staff worked alone for a whole night at a time.
- 58 % of the home-care aids have reported some disorders from the muscular-skeletial system.
- Examples of awkward work positions were found in the care of people in bed, moving care recipients from bed-to-wheelchair-to-shower-to WC- seat and in manual lifting of care recipients into and out of cramped bathrooms and lavatories.
- Ratings of work demands disclosed that the load was particularly great on the back, arms and hands. The risk of accidents was also rated high. For evening and night patrols work demands were consistently rated somewhat lower.

Here are several proposals for measures whose aim are to improve the working conditions of home-care staff:

- The design and furnishing of the homes of care recipients must be tailored to the prevailing level of their functional status and carried out at the earliest possible stage. At the same time, great consideration must be paid to the duties of staff so their work can be performed in an ergonomically correct manner. There should be special regulations specifying the duties of home-care aids as well as the demands staff have a right to make regarding their work environment.

Examples of these demands are:

- Accessibility in the house/flat
- Standard, equipment and furnishing
- Requisite and functional technical aids for performing the work
- Better tranining should be provided in work methods and work techniques.
- More home-care aids should work in pairs.
- The recruitment of more men to the ranks of home-care staff would be desirable.

INVESTIGATION REPORT 1980:3

Göran Blomqvist, C Nilsson and O Nygren:
Analysis and sampling of chromium (VI).
III Determination of the relation of the percentage of chromium (VI) and the total percentage of chromium in welding fume during metallic arc welding in stainless steel.

INVESTIGATION REPORT 1980:4

Erik Lindberg:
Exposure to carbon monoxide in foundries.

An English summary from the report is reproduced below.

One hundred and three foundry workers in seven foundries have been interviewed about complaints and symptomes at work. The exposure to carbon monoxide has been measured in the different foundries. Blood samples from the interviewed persons, taken before and after a working shift, have been analysed for carbon monoxide hemoglobine (COHb).

In working-places where the concentration of COHb in blood from non-smokers didn't exceed 5 % there were no complaints, neither by non-smokers, nor by smokers. In working-places where the concentration of COHb in blood from non-smokers in some cases exceeded 5 %, there were complaints – mostly of headache – in work. The frequency of workers complaining of headache increases with increasing COHb-concentrations. The higest concentration of COHb in non-smokers was 16,7 %. Thus, headache will arise at much lower COHb-values than by exposure to pure carbon monoxide. This we believe, depends on many other poisonous substances in the smoke than carbon monoxide.

INVESTIGATION REPORT 1980:5

Gunnar Ek:
Cleaning of castings in cleaning cabins.

List of reports in English or with English summaries from the Board's occupational health department 1979-01-01 — 12-31

Alexandersson, R:
Studies on the effects of exposure to cobalt.
II. Reactions in the respiratory organs to cobalt in relation to exposure in hard metal industry.
Arbete och Hälsa 1979:2, 34 pp, 40 refs.
Swedish with English summary.

Alexandersson, R & Hedenstierna, G:
Studies on effects of exposure to cobalt.
III. Studies on gas distribution and airway closure before and after four weeks of vacation.
Arbete och Hälsa 1979:7, 25 pp, 30 refs.
Swedish with English summary.

Alexandersson, R & Lidums, V:
Studies on effects of exposure to cobalt.
IV. Concentration of cobalt in blood and urine as indicators of exposure.
Arbete och Hälsa 1979:8, 23 pp, 33 refs.
Swedish with English summary.

Alexandersson, R:
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VI. Uptake and respiratory effects of cobalt in tungsten carbide workers.
Arbete och Hälsa 1979:10, 24 pp, 19 refs.
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Anshelm-Olsson, B Gamberale, F, Grönqvist, B & Andersson, K:
Reaction time changes among steel workers exposed to solvent vapor. A longitudinal study.
Arbete och Hälsa 1979:16, 16 pp, 7 refs.
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Journal of Chromatography, 173 (1979), pp 19-32.

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Journal of Analytical and Applied Pyrolysis, 1 (1979), pp 53-65.

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Sensitizing potential of beryllium, copper and molybdenum compounds studied by the guinea pig maximization method.
Contact Dermatitis 5 1979, pp 332-333, 5 refs.

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Pollution of delivery ward air by nitrous oxide – methoxyflurane.
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Scand. J. Work Environ. & Health, 5 (1979), pp 195-204, 11 refs.

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Acta Neurol.Scand.Suppl. 73, Vol 60 (1979), p 163.

Friberg, M:
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Arbete och Hälsa 1979:19, 12 pp, 4 refs.
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Vibration analysis of high cycle 5 400 hand grinders used on flat steel plates.
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The whole issue is in English.

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Amplitude distribution in vocational electromyography.
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Danish with English summary.

Nordic expert group. **Trichloroenthylene.**
Arbete och Hälsa 1979:13, 38 pp, 59 refs.
Danish with English summary.

Nordic expert group. **Styrene.**
Arbete och Hälsa 1979:14, 37 pp, 100 refs.
Swedish with English summary.

Nordic expert group. **Methylene chloride.**
Arbete och Hälsa 1979:15, 37 pp, 80 refs.
Swedish with English summary.

Nordic expert group. **Inorganic lead.**
Arbete och Hälsa 1979:24, 55 pp, 147 refs.
Swedish with English summary.

Nordic expert group. **Tetrachloroethylene.**
Arbete och Hälsa 1979:25, 39 pp, 78 refs.
Swedish with English summary.

Nordic expert group. **Chromium.**
Arbete och Hälsa 1979:33, 52 pp, 114 refs.
Norwegian with English summary.

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Reprints of the reports are only obtainable from the author(s), the publishing company or the scientific journal in question.

The Board's scientific series "Arbete och Hälsa" (Work and Health), traning reports and investigation reports can - as long as stocks are available - be obtained from the Board (see order form).

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January 9
Mr Odd Højdahl, Director, Mr Svein Ragnar Kristensen, Deputy Director General, Dr Hans Tjønn, Mr S Banerji, Head of Planning, Ms Åse Hjørnevik, Consultant, Norwegian Board of Occupational Safety and Health, Oslo

January 8-9
Dr Anthony Robbins and Dr Kenneth Bridbord, NIOSH, Maryland, USA

January 15
Mr Leif Dahl, Inspector, Mr Kjell Haugland, Inspector, Mr Richard Wangsmo, District Superintendent, Norway

January 30
Dr Alexandre Berlin, Health and Safety Directorate, CEC, Luxembourg

February 2
Mr Kazuyoshi Yamamota, Government Expert Officer of Industrial Safety, Ministry of Labour, Tokyo, Japan

February 8
Alberta Select Legislative Committee on Worker's Compensation, Canada Participants: Honorable Bill Diachuk, Minister of Worker's Health, Safety and Compensation
Dr Walter Buch, Mr Rolland Cook, Mr Leroy Fjordbotten, Mrs Myrna Fyfe, Mr Grant Norley, Dr Ian Raid, Mr George Hickson, Mr Leonard Smith and Ms Carol Seguin

February 25 - March 6
Dr Kuniomi Nakamura, National Institute of Industrial Health, Kawasaki, Japan

April 1
Mr Ladislav Louda, Ing, Institute of Hygiene and Epidemiology, Prague

April 8-9
Prof. J. Indulski, Dr Szeszenia-Dabrowska, Institute of Occupational Medicine, Lodz, Poland

April 23
Dr Eula Bingham, Asst. Secretary of Labor for OSHA, Ms Jeannie Werner, Asst. to Dr Bingham, Ms Marilyn Powers, OSHA, Coordinator for Training, Mr Bob Jennings, OSHA Policy Office, Mr Glen Pearcy, Public Information Director for OSHA, Mr John Werner, NIOSH Labor Liaison, USA

May 19
Prof Y. I. Kundiev, Director of the Kiev Scientific Research Institute of Labour Hygiene and Occupational Diseases, USSR

May 21
Mr Ataman Altan, Lawyer, Association of Social Security, Ankara, Turkey

May 23
Mr Bernhard Petitguyot, Lawyer, Ministry of Labour, Paris, France

Change of address:
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Arbetarskyddsstyrelsen,
National Board of
Occupational Safety
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S- 171 84 Solna
Sweden

No 1. June 1980

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☐ Investigation Report No .....

☐ Training Report No .....

☐ Catalogue of research projects 1978. In English .....

☐ Work Environment Act and Work Environment Ordinance. In English .....

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Mailing address: S-171 84 Solna · Telephone: 46-8-730 90 00 Publisher: Gunilla Warnbeck

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No.3-4 December 1980

Atmospheric pollution at the workplace

Measures to combat atmospheric pollution at the workplace

The Work Environment Act, which came into force on 1st July 1978, is a frame enactment and, accordingly, its provisions are mainly of a general character. This Act is accompanied by a Work Environment Ordinance empowering the National Board of Occupational Safety and Health to issue regulations for the implementation of the Act. These regulations take the form of Ordinances collected in the Board's Statute-book, abbreviated AFS.

A general Ordinance, AFS 1980:11, entitled "Measures to combat Atmospheric Pollution at the workplace with a view to the Prevention of Ill Health", was issued recently by the Board. This Ordinance comprises eight sections of regulations and a commentary.

The first two sections define the purview of the Ordinance and the meaning of "atmospheric pollution" for its purposes.

Section 3 indicates alternative means of reducing the amount of atmospheric pollution at the workplace:

(a) The replacement or alteration of a substance, job, process or technical device.
(b) The confinement of the work or the process to a closed system or space.
(c) Process ventilation to deal with contaminated air.
(d) The conduct of work from a control room or cabin.
(e) The restriction to special hours of work involving a high degree of atmospheric pollution.

Section 4 lays down that personal safety equipment, e.g. a respirator, is to be used when the measures provided for in Section 3 are not feasible or sufficient. The commentary on this section refers, by way of examples, to various situations of this kind: stoppages, overhauls, cleaning, repairs and other temporary operations.

Section 5 deals with the ventilation of working premises where the air is polluted.

Sections 6 and 7 lay down that technical devices and facilities must be planned and arranged in such a way that they can be easily cleaned.

Section 8 stipulates that the quality of the air at a workplace must be checked if atmospheric pollution can occur to such an extent as to be harmful or constitute a nuisance.

The Ordinance takes effect on 1st January 1981.

Slipping accidents

INVESTIGATION REPORT 1980:29E
(English text!)
Strandberg, Lennart

The mechanics of slipping accidents
A project outline. Presented at a conference, arranged by International Ergonomics Association and Nordic Ergonomics Society, Oslo, Norway, August 1980.

Official statistics indicate that slipping is one of the most common causes of accidents. Falls contribute to about 40 per cent of the 4 000 fatal accidents that occur annually in Sweden. In fact, falls are more common than motor vehicles as a registered cause of accidental deaths. During 1975 occupational

(continued on page 4)

New publication about the Board

A new 20-page colour brochure presenting the National Swedish Board of Occupational Safety and Health has been issued in English, Finnish, French, German, Spanish and Swedish.

A copy of the brochure (English version) is attached to this issue of NEWSLETTER.

The publication contains headlines such as

A late awakening by the affluent society
– Gunnar Danielson, Director General
Research and education for a better work environment

How the Labour Inspectorate works

Further copies can be ordered free of charge. (See order form, page 6.)

New Ordinances – an overview

1980:11 Measures to combat atmospheric pollution at the workplace

1980:15 Pre-school (nursery school) and after-school centres (Amendment (reprint) to Notice No. 1978:17)

1980:16 Chemical pesticides (Amendment to Directions No. 126)

1980:18 Electrical equipment for cranes

Electrical equipment for cranes

The National Board of Occupational Safety and Health has issued Ordinance AFS 1980:18 concerning electrical equipment for cranes and other lifting gear.

The regulations, which have been issued following consultations with the National Board of Industry, lay down that electrical equipment for cranes must comply with the Crane and Lift Commission Standards IKH 6.30.07 or offer corresponding safety.

The regulations apply to all cranes and lifting gear except for lifting gear on board ships or in the reactor buildings of nuclear power stations.

The regulations enter into force on 1st July 1981 with respect to cranes and other lifting gear delivered from that date onwards.

The issue of these special regulations concerning electrical equipment for cranes has been prompted by the fact that the general provisions issued by the National Board of Industry concerning high voltage electrical installations refer mainly to the harmful effects of electric current. The high voltage regulations make no provision concerning emergency stops for cranes, the positioning for disconnecting switches, the selection of terminals and circuit cards, crane machinery control systems etc. Certain specific requirements concerning electrical materials and design have to be met in order to prevent or avert "mechanical" accidents while a crane is in operation.

The Crane and Lift Commission Standards IKH 6.30.07 deal more closely with the requirements which have to be met by certain parts of the electrical equipment of a crane. The Standards also contain rules aimed at preventing or averting mechanical accidents. The aspects which are dealt with include the following:
Mains connection and auxiliary voltages
Operating devices, relays etc.
Lighting
Current transfer material
Marking of cables, cable cores, disconnecting switches, operating controls etc.
Installation of apparatus etc.
Voltage monitoring, emergency stop and control systems
Protective earthing and earthing of control circuit etc.

The Standards include explanatory charts for large and small cranes.

The IKH 6.30.07 Standards have recently been revised and a second edition published. The first edition appeared in 1976. The revision has above all been occasioned by elucidations and alterations having been found necessary in certain respects.

Arbete och Hälsa

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ARBETE OCH HÄLSA 1980:11

Wigaeus, Ewa, Holm, Stina & Åstrand Irma

Exposure to acetone. Uptake and elimination in man.

Eight male subjects were exposed to acetone vapour on two occasions for two hours in the laboratory. The first time they were exposed to about 1300 mg/m^3 during rest for 120 min (Series 1) and the second time to about 700 mg/m^3 during rest for 30 min and during light exercise (50 watt) on a bicycle ergometer (Series 2a) or during increased intensity (50, 100, 150 watt) for 90 min (Series 2b). The concentration of acetone in the inspiratory and expiratory air was measured and the uptake in the organism was measured continuously using the Douglas bag technique. The concentrations in alveolar air, arterial and venous blood were followed during and after exposure until the next morning. All portions of urine were collected until the next morning and analysed for acetone concentration.

In Series 1 the mean uptake in the organism was 0.58 g. In Series 2a and 2b the uptake was 0.72 and 1.15 respectively. The relative uptake was about 45% in all series during the entire exposure time. The concentration of acetone in alveolar air was 35-40% of the inspiratory air and was not affected by increased work load. The concentration of acetone in arterial and venous blood did increase continuously during exposure in all series and there was no tendency for equilibrium between the concentration in blood and inspiratory air. At the end of exposure the mean arterial concentration was 15 mg/kg in Series 1 and 17 respectively 25 mg/kg in Series 2a and 2b. Although there was a relatively slow decrease of acetone from alveolar air and blood after exposure endogenous levels were reached the next morning (1.7 mg/m^3 and 1.3 mg/kg, respectively). The half-life of acetone in alveolar air was about 4.3 hours (5 min - 9 hours after exposure). In venous blood the half-life was calculated at 6.1 hours (0 - 4 hours after exposure) and in arterial blood at 3.9 hours (0 - 2 hours after exposure).

The highest concentrations of acetone in urine were measured 3 - 3.5 hours after exposure and the levels were about the same as in venous blood at the end of exposure. Total elimination of acetone via lungs and kidneys, corrected for endogenous elimination, corresponds to about 16% of the total uptake in Series 1 and 20% respectively 27% in Series 2a and 2b. The total elimination via the urine corresponds only to about 1% of the total uptake.

31 pp, 13 refs.

ARBETE OCH HÄLSA 1980:12

Blomquist, Göran et al.

Characterization and identification of fungi using pyrolysis-gas chromatography and pattern recognition.

The present study is part of a project to develop a method for the characterization and identification of fungi occurring in the work environment.

We have found that a method combining pyrolysis-gas chromatography and pattern recognition provides a good identification of the fungi chosen as test sample. The principles of the method are summarized in the following steps.

1. Samples are cultivated to pure fungi colonies.
2. The fungi colonies are isolated, further cultivated, harvested and then freeze dried.
3. A fraction of the freeze dried fun-

gus is decomposed into molecular fragments by means of pyrolysis.
4. The mixture of molecular fragments is separated by gas chromatography.
5. Each chromatogram is translated into a datavector which is analysed statistically in relation to other data.

The principal problem of other authors using pyrolysis-gas chromatography has been bad reproducibility. However, we have found that the reproducibility can be improved by analyzing the gas chromatograms with pattern recognition, specificly with the reproducibility model described in reference 2. This model did not eliminate the influence of different cultivation media on the pyrolysis-gas chromatograms. Hence to obtain reproducible chromatograms, the fungus must be cultivated in a standardized way before the pyrolysis.

Small differences in watercontent between the different samples can be taken into account by the data analytic model. The computer program is rather simple written in BASIC and can be run on a microcomputer, ABC-80, Intel-80 or the equivalent.

24 pp, 12 refs.

ARBETE OCH HÄLSA 1980:13

Nordic Expert Group for Documentation of Occupational Exposure Limits:

Boric acid and borax.

A critical survey and evaluation of the relevant literature shows that a basis for estimating occupational exposure limits for boric acid and borax is lacking. In animal experiments, male fertility disturbances and embryotoxicity seem to be the most sensitive effect indicators, although even these effects seem to appear only at relatively high dosages.

37 pp, 84 refs.

ARBETE OCH HÄLSA 1980:14

Nordic Expert Group for Documentation of Occupational Exposure Limits:

Ethylene glycol.

Survey of literature on ethylene glycol to be used as background for discussion of occupational exposure limits. The discussion should be based on prevention of irritation symptoms in mucous membranes, as these symptoms will occur earlier than symptoms or effects on the central nervous system and kidneys.

36 pp, 123 refs.

ARBETE OCH HÄLSA 1980:15

Carlsöö, Sven

Effects of vibrations on the human skeleton; joints and muscles.
A review of the literature.

Owing to the elasticity and plasticity of the skeleton, joints and muscles, the musculoskeletal system is capable of absorbing and damping mechanical vibration without damage as long as the vibration level is within tolerable limits. However, technical developments have led to the exposure of many people to intolerable vibration levels with destructive changes as a result.

These injuries to the musculoskeletal system have been , and continue to be, the subject of research interest. Initially, the joints and joint complaints attracted the greatest attention. It is mainly in the joints that vibration damping takes place. The incidence of destructive joint changes has been examined in comprehensive clinical, epidemiological and radiological studies, mainly concentrating on the joints of the hand and arm. The response of muscles to vibration is often expressed with a tonic vibration reflex (TVR) which arises as a result of stimulation of the muscle spindles so it therefore resembles the classic tonic stretch reflex There is increased muscular involvement for stabilisation of the joint positions, especially in whole-body vibration. Studies have also disclosed how vibration affects body balance and equilibrium control and how vibration can induce muscle pain, cramps and reduce muscular strength.

29 pp, 27 refs.

ARBETE OCH HÄLSA 1980:16

Höjerdal, Per & Alenius, Sven

Dust collector with a self-cleaning HEPA filter. Test with silica dust, welding fume and oil mist.

A dust collector, including a HEPA filter with a mechanical system for cleaning it, has been tested with silica dust, welding fume, and oil mist. These different aerosols were chosen because they represent typical and frequently occurring industrial air-borne pollutants. The silica dust can be characterized as solid, relatively large particles with a rough surface, welding fume as relatively small and solid spherical particles with a smooth surface, and oil mist as relatively large spherical drops.

The dust collector's efficiency and its dependence on time and particle size have been studied.

Measurements of particle concentrations and particle size distributions have been performed with two direct reading instruments before and after the dust collector. The instruments measure number concentrations in two different size ranges, 0.01-1 microns in eight intervals and 0.3- approx. 15 microns in five intervals.

Measurements with sampling filters and with a hydrocarbonmeter, based on a flame ionisation detector, have also been carried out.

The efficiency for silica dust decreased with time and increased with increasing particle size. For silica dust particles from 0.3 microns and upwards, efficiencies between 99.4 and 99.994 % were found. No consistent dependence of efficiency on time or particle size was indicated during the welding fume test. For welding fume particles efficiencies between 98 and 99.98 %, have been found. The welding fume test came after the test with silica dust and employed the same filter. The efficiency for oil mist drops increased with increasing drop size. No time dependence for efficiency was indicated during the test period. Efficiencies between 99.6 and 99.997 % have been found for the oil mist drops and between -100 and 0 % for the vapour phase.

The pressure loss over the HEPA filter was measured during the test with the different aerosols. The efficiency of the filter-cleaning is described by the pressure loss over the filter from the beginning to the end of the cleaning procedure.

47 pp, 9 refs.

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Investigation Reports

INVESTIGATION REPORT 1980:20

Christensson, Bengt, Kjellström, Anja & Krantz, Staffan

Measurement using the filter method 2. Dialyzer separation efficiency.

28 pp. 22 refs.

INVESTIGATION REPORT 1980:22

Kuusisto, Pertti, Lindh, Tomas & Olsson, Göran

Measurement using the filter method 3. Investigation of portable pumps used for aerosol sampling.

43 pp. 0 refs.

INVESTIGATION REPORT 1980:23

Hallgren, Christer et al.

Sampling and analysis of power saw fumes.
1. Pilot study.

32 pp. 47 refs.

INVESTIGATION REPORT 1980:26

Bodlund, Kaj

Measurement using a portable noise-meter.

37 pp. 25 refs.

INVESTIGATION REPORT 1980:27

Prick, Håkan & Tillman, Cherilyn

Investigation of preparation methods for fiber counting in the phase contrast microscope.

40 pp. 0 refs.

INVESTIGATION REPORT 1980:29E
(continued from page 1)

injuries caused approximately 3 million sickness-days. 26 per cent of them were due to falling accidents. The actual involvement of skidding cannot be evaluated, because slip-ups have been registrered only as a subgroup of "falls on same level". However, skidding may initiate other types of accidents as well. This is supported by preliminary data from a new occupational injury information system. The EDP-system allows selective retrievals. In one of the first outputs slip-ups are involved in at least 25 accidents out of 102 including "fall to lower level" during house construction work.

Thus it is urgently necessary to improve the slipping resistance of shoes, floors and walking surfaces. Development is guided by friction measurement with different kinds of apparatus. Unfortunately, many of these are based on an oversimplified theory of static friction, which seems to be quite irrelevant due to the viscoelastic properties of shoe soles and heels. However, even if the apparatus measures dynamic friction, tests must be performed with forces and motions closely resembling a real human skid. Otherwise, friction measurements and real slipping resistance will be poorly correlated.

Recently, a gait analysis system was developed which now has been used to evaluate force and motion data from walking and skidding subjects in the laboratory. The system includes piezoelectric and optoelectronic sensors connected on-line to a computer with substantial software for gait analysis. This paper presents a method and results such as: The average critical slip motion started 0.05 s after heel strike; Then the vertical load was about 60 per cent of body weight and acting at the heel rear edge; The experiments usually resulted in a fall if the sliding exceeded 0.5 m/s in velocity or 0.1 m in distance.

12 pp, 11 refs. In English

INVESTIGATION REPORT 1980:30

Lanshammar, Håkan & Strandberg, Lennart

Slipping accident mechanics - stage 1

The research project, Mechanics of Slipping Accidents, will elucidate the physical variables and measurement methods, where real slipping resistance is best reflected. The first stage of the project, presented here, aimed at a biomechanical outline of human slip-ups during normal walking.

The experiments were performed on flat and level foot-path with a few different shoe designs. Occasionally, the centre of the measurement zone was lubricated, without notice to the subjects. A moving harness restrained falls, if any. Shoe forces, body and shoe motions were gauged by electronic sensors connected on-line to a computer, and evaluated by special software for gait analysis.

In most of the 130 recorded experiments, the heel was sliding upon heel strike. The sliding motions were often unnoticed by the subject and occurred even without lubricant. Thus, the dynamic friction properties seem to be more important than the static ones for avoiding slips and falls. This report outlines the dynamics of slipping by statistics from experimental data, and by time histories of different variables. These include foot angle, sliding velocity, friction use, and the shoe force vector.

100 pp, 26 refs.

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EFFECTS OF PHYSICAL CONDITIONING ON THE PREFERRED WORK LOAD LEVEL ON A BICYCLE ERGOMETER

No. 79, 1979

EFFECTS OF PHYSICAL CONDITIONING ON THE PREFERRED WORK LOAD LEVEL ON A BICYCLE ERGOMETER*

BENGT EDGREN ANITA HEDLUND

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The effects of physical conditioning during two and a half months on preferred work load level on a bicycle ergometer was studied in a group of female football players (n = 10). Assessments were made by a work test based on preferred settings (PST) and a submaximal standard test. After training was obtained an increase of 10 % in $\dot{V}_{O_2}$-max. The preferred work load level increased with 18 %. The heart rate level was the same in PST both before and after the physical conditioning programme. This means that the subjects did not prefer a higher physiological stress level, but made a better performance for the same physiological cost after training.

Introduction

A work test based on preferred settings was presented by Edgren (1977), and an application of the test was made by Myrsten, Elgerot and Edgren (1977). It was shown that the preferred setting work test had a very high reliability and could be considered as valid as a submaximal standard test of physical working capacity according to Sjöstrand (1947) and Wahlund (1948). In addition to an assessment of physical fitness according to a standard test, the preferred setting test gives information about the individual's "normal and just right" work level.

The aim of the present study was to throw light upon the physiological responses to and the preferred work load levels before and after a programme of physical conditioning. General knowledge in the

*) This study was supported by a research grant to Prof G. Borg from the Tercentenary Fund of the Bank of Sweden (project number 103).

field gives a base for two main hypotheses. Either the preferred work load level could be the same before and after the training but in the latter case performed to a less physiological cost, or the cost could be the same for a higher preferred work load level after training. A third outcome is also possible, a mixed result could be obtained so that a minor increase in preferred work load is followed by a minor decrease in physiological cost. No specific hypothesis was adopted concerning the one or the other outcome. The reason for this was that as far as the authors know no results from studies on preferred work load levels are available in the literature.

M e t h o d

Subjects

Members of a young female football (soccer) team took part in the study. The team consisted of 12 members, but one of them moved to another part of the country and another did not take part in the conditioning programme. For the 10 girls taking part, the mean and standard deviation for age, weight, and height were 19.7 (2.9) years, 57.4 (5.7) kilos, and 166.4 (5.3) cm. The changes in body weight between the test occasions before and after the period of physical conditioning were very small. The group could be considered having a good physical fit.

Apparatus

All tests were performed on an electrically braked bicycle ergometer (Holmgren and Mattsson, 1954) with a fly-wheel having a mass of 9.1 kg x x m^2. The work intensity could be varied continuously by a resistor shaped as a "throttle handle" on the ergometer. Ten full turns covered the range 20 - 600 W. The resistor was logarithmic so that the first 8 full turns covered the range 20 - 340 W. The bicycle has been described by Borg and Dahlström (1960).

HR was measured by stethoscope and stopwatch.

Procedure

The first test in the study was made at the end of the winter-season, before the start of the outdoor conditioning programme and the match

play in the football league. The physical conditioning programme was: twice a week two hours of training for endurance fitness, muscular force and technics in football playing. The match play in the league was: Once or twice (mean 1.5) a week games of two periods of 30 min. each. All together the physical activity during the spring-season was very high. The duration of the season was about two and a half months. The second test was carried out immediately after the end of the spring-season. Even at the first test occasion the group could be considered rather well-trained as they participated in an indoor conditioning programme during the winter-season. However, during the spring the programme was considerably more intense.

At each test occasion two physical work tests were carried out on the bicycle ergometer, the preferred setting test (PST) and a submaximal standard test, denoted ST. The standard test was included for comparison. The PST was at each session performed before the ST in order to avoid any influence of the ST on the PST levels. The time of rest between the two tests were at least 30 min. The tests were carried out with a pedalling rate of 60 r x min^{-1}.

For PST the subjects were instructed to set a work load perceived as "normal and just right" by using the "throttle handle". During work the subjects were permitted to adjust the work load any time so that their perception of exertion remained unchanged during the test which lasted for 6 min. Each minute the set work load was registered and HR was measured after 2, 4, 5, and 6 min.

Two randomized trials of PST were performed at each session, one trial in descending and one in ascending order. The presets were 166 and 33 W, respectively. It was assumed that the subjects had to adjust downward in the former and upward in the latter case. The mean of the registered work load after 4, 5, and 6 minutes' work in both trials, altogether 6 observations, was chosen as the indicator of preferred work load level (W_{pref}). The mean of the HR-values registered at the end of each trial was an indicator of the physiological cost (HR_{pref}) for work on the preferred level.

In the standard test - submaximal and according to Åstrand, I. (1960) and Åstrand, P.-O. (1961) - the subjects worked for 6 min. at a work intensity of 100 W. The work load was chosen in order to give a HR within the range 130-170 beats x min^{-1} under steady-state for all subjects. [1] From HR at the end of the test (HR_{100}), the maximal oxygen uptake ($\hat{V}_{O_2}$-max) was estimated according to nomograms. In the results $\hat{V}_{O_2}$-max is expressed in both l x min^{-1} and ml x kg^{-1} x min^{-1}.

Results and discussion

The Reliability of the PST and ST Assessments

The intra-trial reliability of the preferred settings of PST expressed in product-moment correlations showed coefficients ranging from .78 to .99 when all registrations were included. If only the three last minutes were included the range was considerably reduced and coefficients between .92 and .99 were obtained. These figures are almost identical with those obtained in the first study.

The inter-trial reliability was lower and varied between .63 and .83. The lower reliability is due to the different presets. Working upward from a low preset tends to give a lower preferred work load than working downward. Also this outcome confirmed the earlier results and motivated that the mean of both trials in one session was used for the indicators W_{pref} and HR_{pref}. The correlation between session 1 and 2 was .88 for W_{pref} and .87 for HR_{pref}.

For ST the correlation between session 1 and 2 for HR_{100} was .88, i.e. the same as those for W_{pref} and HR_{pref}. The variable $\hat{V}_{O_2}$-max showed somewhat lower correlation, namely .77 for 1 x min^{-1} and .65 for ml x kg x min^{-1}. The level of these coefficients were increased to .85 and .79, respectively, if the estimated HR-max was considered in the calculation of $\hat{V}_{O_2}$-max.

---

1) In fact the standard test was extended and the work load increased by 33 W each 6 min and ratings of perceived exertion (according to RPE by Borg, 1971) were given at the end of each 6 min period. The aim was to get a possibility to estimate the maximal HR-level for each subject (HR-max). The regression between HR and RPE was computed. The maximum of RPE was assumed to be 20 (RPE-max) and was the reference. The intersection between the regression line and RPE-max gave an estimation of HR-max, which value was used for correction of $\hat{V}_{O_2}$-max.

The Effect of Training

In Table 1 are shown the indicators from the tests obtained before (session 1) and after (session 2) the spring-season. In the table are included the t-values (dependent test) for differences between test occasions.

Table 1. Means (M) and standard deviations (SD) for indicators from each session. Differences between session 1 and 2 are expressed in t-values. n = 10.

Test	Variable	Session	M	SD	t for diff 1-2
PST	W_{pref}	1 2	60.9 71.8	25.2 24.2	- 2.81 x)
	HR_{pref}	1 2	123.1 122.5	20.2 19.6	0.18
ST	HR_{100}	1 2	144.9 137.8	16.3 14.0	2.89 x)
	$\hat{V}_{O_2}$-max 1 x min^{-1}	1 2	2.8 3.1	0.5 0.6	- 2.42 x)
	$\hat{V}_{O_2}$-max ml x kg^{-1} x min^{-1}	1 2	48.9 54.0	6.9 8.4	- 2.47 x)

x) $p \leq .05$

As may be seen from the table there were significant differences in the expected direction for all variables except for HR_{pref}. The change in W_{pref} was an increase of 18 %. HR_{100} decreased 7 beats x min^{-1} which corresponds to an increase in $\hat{V}_{O_2}$-max of 10-11 %. There were no differences in the levels of $\hat{V}_{O_2}$-max if the variables were computed according to the estimated HR-max, but as mentioned before the intercorrelations increased. This means that even in this small group HR-max is randomized over the subjects. The increase of about 10 % in $\hat{V}_{O_2}$-max is in concordance with expectation as the initial level of physical fit was assumed to be rather high in the group.

For PST the absence of change in HR_{pref} in combination with an increase of W_{pref} supports the hypothesis that only the preferred work load level is affected by the physical conditioning programme. The subjects worked at a constant physiological level independent of the state of training, but preferred a higher work load when the state of training was higher.

The increase of 18 % for W_{pref} is rather high - higher than the change in $\hat{V}_{O_2}$-max. As shown by Borg, Edgren, and Noble (1975) the effects of training seem to be rather complex. In their study was found a change of 17 % in both RPE and $\hat{V}_{O_2}$-max after training in a military group. However, these two indicators were uncorrelated. Therefore, in the present study there is no base for interpretation of changes in W_{pref} in relation to $\hat{V}_{O_2}$-max.

The changes of the indicators may not be an effect of the physical conditioning programme. They can as well be the result of a general trend that one is better fit at the end than at the beginning of spring. A prerequisite for separation of these effects is to include a control group. However, the aim of the study was to enlighten the effects of a difference in preferred work load level due to an increase in physical fitness independent of how the latter had come through. Finally, in spite of the rather long time period between the first and the second test occasion minor test-retest effects may have been in play. If so, according to the earlier study (Edgren, 1977) these effects should decrease the change in $\hat{V}_{O_2}$-max and increase the change in W_{pref}.

For interpretation of the outcome it has to be pointed out that the group was small and homogeneous. Further studies of other groups have to be carried out before it can be concluded that in general physical conditioning increases preferred work load level in such a way that the physiological cost remains unchanged.

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Abstract card

Edgren. B. and Hedlund. A Effects of physical conditioning on the preferred work load level on a bicycle ergometer. Reports from the Institute of Applied Psychology, the University of Stockholm, 1980 No 79. - The effects of physical conditioning during two and a half months on preferred work load level on a bicycle ergometer was studied in a group of female football players (n = =10). Assessments were made by a work test based on preferred settings (PST) and a submaximal standard test. After training was obtained an increase of 10% in V_{O_2}-max. The preferred work load level increased with 18%. The heart rate level was the same in PST both before and after the physical conditioning programme. This means that the subjects did not prefer a higher physiological stress level, but made a better performance for the same physiological cost after training.

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A late awakening by the affluent society

Director General Gunnar Danielson visiting a mine.

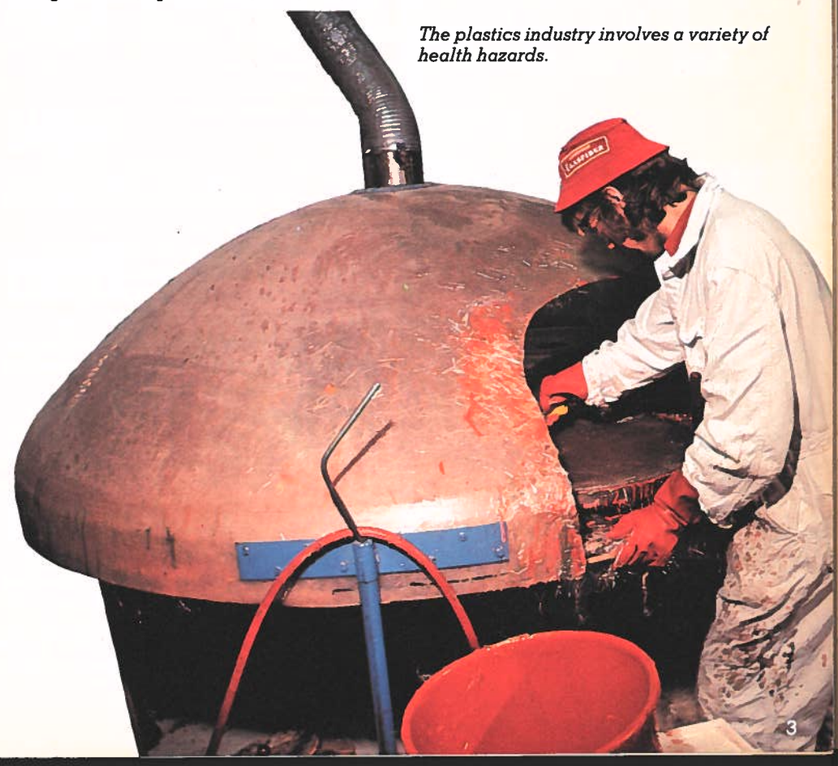
Work is as old as human culture, and doubtless even primitive man was aware that work for his daily bread could also mean danger to his life and health. But it was not until the coming of the Industrial Revolution, during the late nineteenth century, that regular occupational safety arrangements began to be made in Sweden, with the passing of legislation and the appointment of special authorities to supervise the safety of working life.

The past few years have seen the emergence of an unprecedented interest in the occupational environment. The position which working conditions have now come to occupy in the public awareness was unheard of and unforeseeable in earlier times. Our working conditions today are to a great extent superior to those which earlier generations had to put up with. And yet the hazards and discomforts of working life today seem more imminent and substantial than ever before. The awakening has come late, and in many cases it has been a painful process. In the midst of our prosperity we found that the people sustaining our society through their labours were risking their lives and safety in a manner which could not be accepted in a community purporting to be socially progressive.

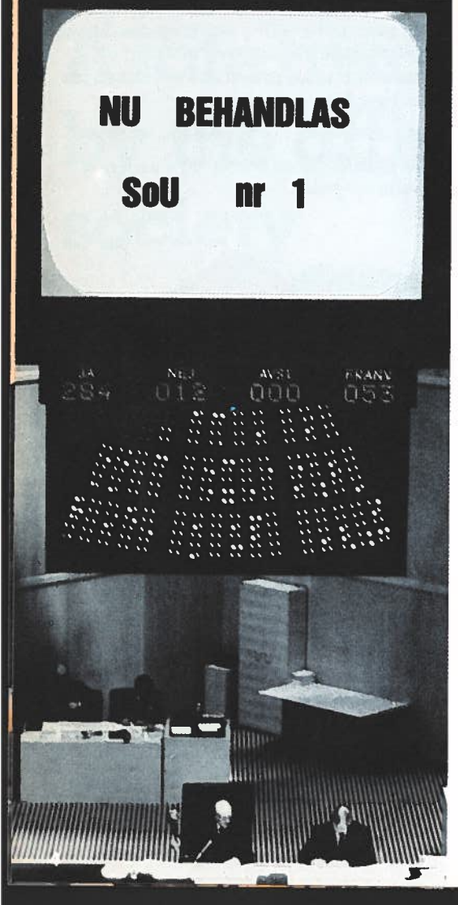
The vigorous debate on the working environment and growing understanding of the subject have laid promising foundation for the renewal of thinking habits and legislation. The unanimity of politicians, employers, unions and social reformers of various kinds has been a great asset, and work on the new legislation has been able to proceed in an atmosphere of close partnership between them and the people for whom the rules are intended. The new Work Environment Act entered into force on 1st July 1978.

Occupational safety legislation is an important weapon in the fight for safer work places. The National Board of Occupational Safety and Health is the central enforcement authority for this legislation. Its tasks also include a great deal of advisory activity coupled with the compilation of practicable standards for the implementation of statutory rules.

Most of the direct contacts occurring with different work places are managed by the Labour Inspectorate which is organized on a regional basis. The overriding aim is for public efforts to establish safe and healthy working conditions and a generally positive working environment to be practically realized in working life.



The plastics industry involves a variety of health hazards.



The improvement of safety work is to a great extent dependent on improved knowledge concerning occupational hazards and their prevention. Research into the working environment is an important component of this work. At the Board researchers work side by side with those whose task it is to observe conditions in working life and to make sure that the knowledge generated by research is put into practice through the publication of standards or by other means. The advantages thus accruing in the form of close contact and mutual co-operation are obvious. Similarly it is a great advantage that the training of occupational health personnel can be conducted within the framework of the Board's activities.

This brochure is a brief presentation of the Board's activities. It is hoped that this information will be of use to those who are interested in the working environment and in the methods whereby society endeavours to solve the problems arising in this context. At the same time the reader should bear in mind that, in the course of their duties, the occupational safety authorities co-operate with a large number of other authorities and institutions, and not least with the unions of employers and employees. To this co-operation must be added an increasingly necessary and steadily widening international co-operation.

The Work Environment Act, passed by the Swedish Parliament in 1977 with an overwhelming majority of 284 to 12, came into force on 1st July 1978.

From the Occupational Hazards Act to the Work Environment Act

1889

can be taken as a starting point in tracing the development of work environment questions in Sweden. That year the Parliament passed the Occupational Hazards Act. Three labour inspectors were appointed the same year.

1912

In 1912 new legislation was passed: the Workers' Protection Act.

1949

saw the foundation of the National Board of Occupational Safety and Health, at the same time as a new Workers' Protection Act came into force. This Act remained operative until 1978, though several amendments were passed in the meantime.

1966

In 1966 The National Institute of Occupational Health was established.

1970

The closing years of the 1960s saw an awakening of the great interest in matters concerning the occupational environment that led to the appointment, in 1970, of the Work Environment Commission.

1972

In 1972 the National Institute of Occupational Health merged with the National Board of Occupational Safety and Health.

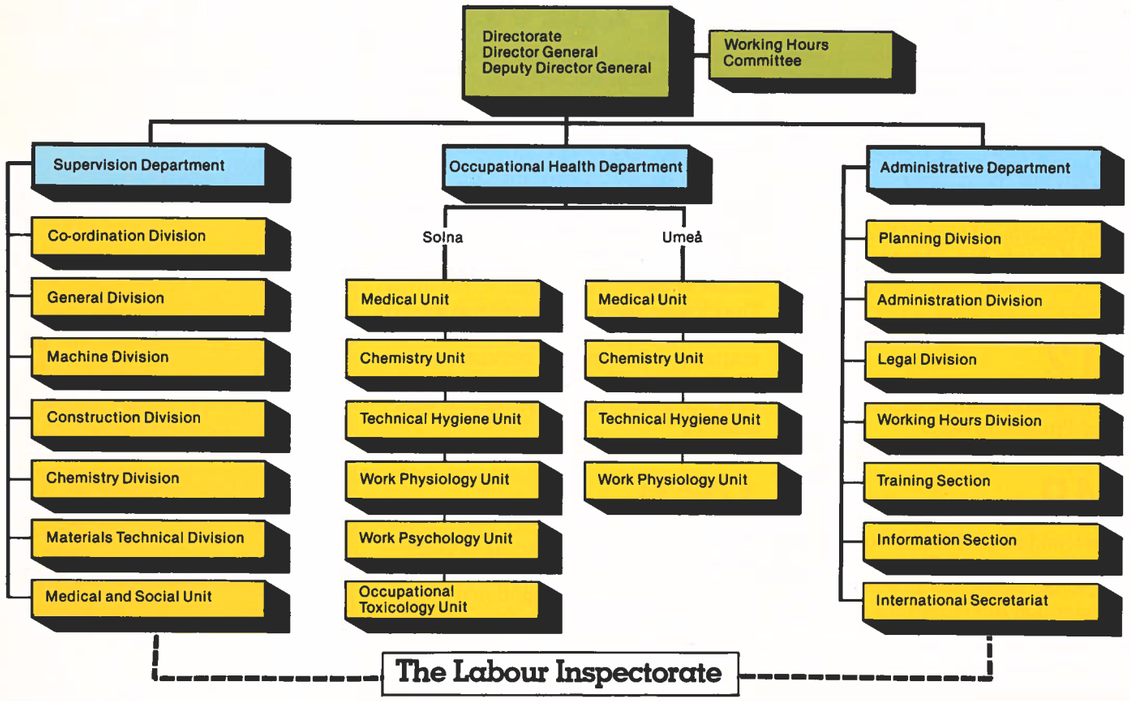
1974

In 1974 following proposals by the Work Environment Commission, amendment were made to the Workers' Protection Act. Among other things, safety delegates were given increased power and the National Board of Occupational Safety and Health and the Labour Inspectorate were reorganized.

1978

In 1978 the Work Environment Act entered into force. The final report submitted to the Government by the Work Environment Commission in 1976 included the draft text of a completely new enactment—outline legislation to be supplemented by regulations issued by the National Board of Occupational Safety and Health.

The Ministry of Labour
The National Board of Occupational Safety and Health



The National Swedish Board of Occupational Safety and Health

is a central administrative authority for matters concerning occupational safety and health and the authority in charge of the Labour Inspectorate.

The duties of the Board include the following.

- ☐ The direction, co-ordination and supervision of activities in the field of occupational safety and health.
- ☐ Central enforcement of legislation concerning the working environment and working hours.
- ☐ The publication of regulations and recommendations concerning the implementation of legislation on the working environment and working hours.
- ☐ The conduct of research in occupational health.
- ☐ Central enforcement, in the context of occupational safety and health, of the Act on Products Hazardous to Health and to the Environment.
- ☐ Surveys of occupational hygiene.
- ☐ The maintenance of national documentation, information and consultation facilities on matters relating to occupational hygiene.
- ☐ The training of occupational health service personnel.

The National Board of Occupational Safety and Health is headed by a board of laymen comprising the Director General (Chairman), his deputy, three representatives of employers' associations, four trade union representatives, two M.P.s and two representatives of the Board's own personnel. This directorate, which usually meets once a month, deals mainly with important questions of principle, budgeting and regulations.

The Board is divided into three departments: the Supervision Department, the Occupational Health Department and the Administrative Department.

Attached to the Board is an advisory committee on recombinant DNA questions. This committee is also chaired by the Director General.

The Board is Sweden's national CIS centre.

The Labour Inspectorate

is responsible, under the authority of the National Board of Occupational Safety and Health, for supervising the observance of rules concerning occupational safety and health and working hours, and it offers advisory services in matters relating to the occupational environment. Sweden is divided into nineteen labour inspection districts, each of which is headed by a joint committee including employers' and workers' representatives. Municipal inspectors are responsible for the supervision of certain small-scale workplaces.

The activities of the Labour Inspectorate are directed and co-ordinated by the National Board of Occupational Safety and Health.

The new headquarters of the National Board of Occupational Safety and Health at Ekelundsvägen 16, Solna, outside Stockholm.

The legal background

The basic provisions concerning the working environment in Sweden are to be found in the Work Environment Act which, like all other legislation, was passed by the Parliament.

The Work Environment Act applies to all sectors of working life. Thus it is equally relevant to industry, trade, farming, forestry, administration and medicine—in a word, all sectors where people are employed. The one exception is service on board ship, which comes under separate regulations. The Work Environment Act applies equally to public and private enterprise. In addition to what are normally termed working conditions, the Act also applies to compulsory military service. It applies to pupils at schools of all kinds from the age of 14 onwards, and in certain respects it even applies to self-employed persons, e.g. farmers, and to employers actively working in their own businesses.

Work environment requirements and the organizational arrangements to be made in order to guarantee compliance with those requirements are both governed by the same legislation. The rules of organization relate to the organization of safety work within the enterprise and also to the organization of public supervision and enforcement.

The Work Environment Act contains only a generalized description of work environment standards. More detailed provisions are issued by the National Board of Occupational Safety and Health. In the ultimate analysis therefore, the Board's task is to draw up the rules indicating more exactly the characteristics of a satisfactory work environment and the steps to be taken in pursuit of this end.

It should be noted that central national administrative authorities in Sweden occupy an independent position in relation to the Government and its Ministers. Thus the Government is not entitled to interfere with the content of the directions issued by the Board; this is purely the Board's responsibility. Nor, as in many other countries, does the Board constitute a part of the Ministry of Labour. Instead its direction is entirely vested in the Director General and the Directorate.

The regulations issued by the Board take effect immediately. Their validity cannot be challenged by appeal to the Government or a court of law. These regulations can be made to include penal sanctions for breaches of their provisions. Sanctions of this kind are imposed by the common courts.

Regulations may deal with the way in which a job is to be done, the equipment with which a particular machine is to be fitted, the uses to which a chemical substance may be applied and the way in which it is to be handled. They can apply to a sector or to a particular problem, e.g. noise.

The content of air samples from work places can be analysed with the aid of scanning electron microscopes.

Research and education for a better work environment

The Occupational Health Department of the National Board of Occupational Safety and Health is Sweden's central institution of occupational health research. This research is done by about twenty-five professors and associate professors together with more than 250 assistants. The professors and associate professors also hold university appointments, in which capacity they are above all concerned with training researchers.

Research

Research covers a wide spectrum, although its main emphasis is on chemical hazards in the occupational environment.

The effects of organic solvents are being studied in a number of animal-experimental, human experimental and epidemiological projects. These include, for example, extensive studies of the absorption, metabolism, degradation and elimination of such substances in the organism. Neurophysiological and experimental-psychological studies of effects on the nervous system are another main line of investigation, and the findings thus obtained in the field of behavioural toxicology, for example, are used in the definition of threshold limit values. Studies are also being made of the effects on the nervous system of exposure to heavy metals.

With reference to mineral dust (e.g. silicon dioxide), asbestos and man-made mineral fibres, problems of measurement and analysis are being explored and animal-experimental studies are in progress concerning properties conducive to fibrosis of the lungs. Work is also in progress on studies in lung physiology relating to exposure to dust and other atmospheric impurities.

Skin problems form the subject of a variety of investigations concerning chemically induced skin cancer and allergic contact dermatites. The prior assessment, through animal experiments, of skin allergy hazards is an important field of inquiry in this context. Studies are also being made of the percutaneous absorption of solvents and other substances and of the toxic effects which this involves.

Investigations of the carcinogenic, mutagenic and teratogenic effects of various substances constitute an expanding field of research. Apart from epidemiological studies, animal-experimental cancer tests are conducted and experimental-biological studies are made of genotoxicity.

Certain inquiries are aimed at a broad inventory of problems affecting entire sectors or extensive work processes such as welding. As regards industrial ventilation, investigations are in progress aimed among other things at establishing hygienic guidelines for the use of recycled air. Research concerning suitable methods of sampling and analysing air contaminants also occupies a great deal of scope, as do studies of biological monitoring methods.

Concerning physical factors in the working environment, studies are being made of noise; research topics here include the effects of infra-sound. Studies are also being made of lighting problems and of the risks of eye injury due to optic radiation.

Radiofrequent radiation and the effects of electric and magnetic fields are

coming in for an increasing amount of attention. Wide-ranging studies are also being made of workplace temperature conditions and of related problems concerning TLVs and occupational safety and health. Finally, a great deal of attention is being paid to the effects of vibrations, both whole body vibrations in machine operator cabs and vibrations in hand-held automatic tools.

Problems connected with heavy jobs and with strenuous work postures and movements form the subject of a comprehensive programme of research in occupational physiology and biomechanics, at the same time as epidemiological studies are being made of load diseases, e.g. lumbar and arm complaints. Among other things these studies are intended to improve our ability to assess different people's tolerance limits for lifting and carrying work and for repetitive work using the hands and arms. Certain projects refer to specific work situations, e.g. the driving cabs of forestry machines and railway locomotives.

Work in the field of work psychology includes studies in social psychology, as well as the behavioural-toxicological research already referred to. These studies in social psychology refer among other things to problems concerning accidents, with special regard to attitude and information problems and the significance of forms of remuneration.

Studies of various kinds of personal safety equipment are also conducted in the accident sector. In addition, a certain amount of accident research is done in the technical and mechanical field. Special interest has been taken in slip-up accidents.

Education

The professors and associate professors on the staff of the Board serve as tutors in the training of researchers at universities and institutes of technology.

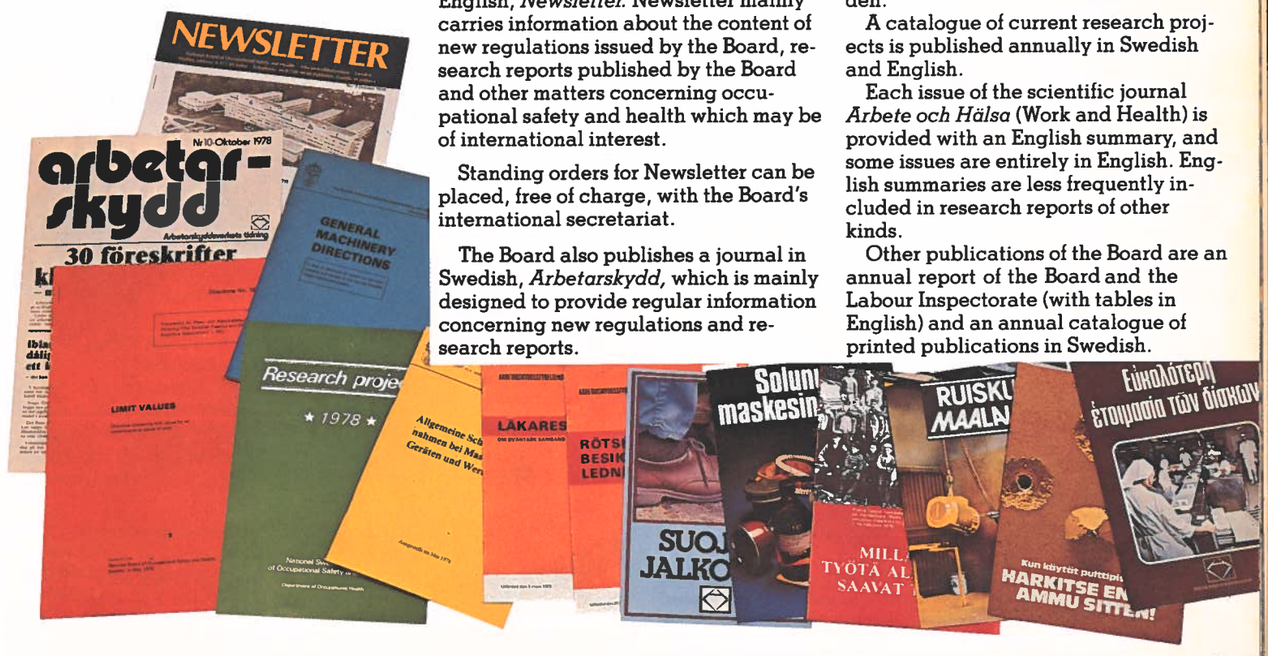
The most comprehensive sector of training activities sponsored by the Board concerns specialist training for occupational health service personnel. This training involves occupational health physicians, occupational health nurses, safety engineers and personnel physiotherapists. It comprises both theoretical instruction at the Board and practical service with companies or with occupational health service units.

The total number of persons trained for Swedish occupational health services can be seen from the following table.

Sponsoring authority/organization	Occupational health physicians	Occupational health nurses	Safety and hygiene engineers
National Institute of Occupational Health (1967—1972)	176	249	105
National Board of Occupational Safety and Health (1972—1979)	575	994	647
Total	751	1 243	752

Number of occupational health physicians, occupational health nurses and safety and hygiene engineers undergoing basic specialist training in occupational safety and health up to and including the calender year 1979.

Publications



The National Board of Occupational Safety and Health publishes a journal in English, *Newsletter.* Newsletter mainly carries information about the content of new regulations issued by the Board, research reports published by the Board and other matters concerning occupational safety and health which may be of international interest.

Standing orders for Newsletter can be placed, free of charge, with the Board's international secretariat.

The Board also publishes a journal in Swedish, *Arbetarskydd,* which is mainly designed to provide regular information concerning new regulations and research reports.

Some of the Board's regulations and directions have been translated into other languages, mostly English.

A number of the numerous information brochures about the Board's regulations are translated, mostly into languages that benefit immigrant workers in Sweden.

A catalogue of current research projects is published annually in Swedish and English.

Each issue of the scientific journal *Arbete och Hälsa* (Work and Health) is provided with an English summary, and some issues are entirely in English. English summaries are less frequently included in research reports of other kinds.

Other publications of the Board are an annual report of the Board and the Labour Inspectorate (with tables in English) and an annual catalogue of printed publications in Swedish.

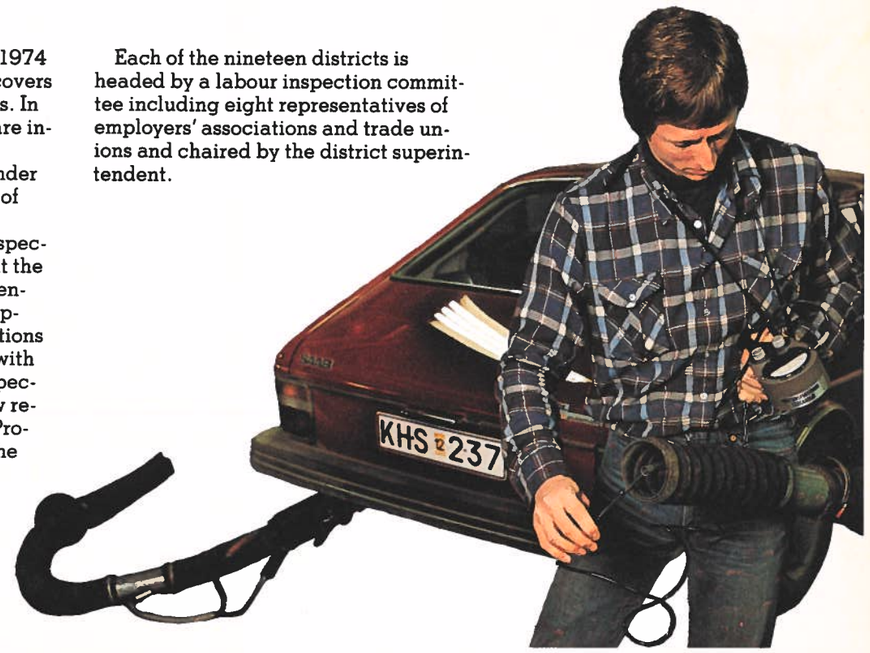
The National Board of Occupational Safety and Health is headed by a board of laymen comprising the Director General (Chairman), his deputy, three representatives of employers' associations, four trade union representatives, two M.P.s and two representatives of the Board's own personnel. This directorate, which usually meets once a month, deals mainly with important questions of principle, budgeting and regulations.

How the Labour Inspectorate works

The Labour Inspectorate has since 1974 been divided into 19 districts and covers about 90 000 registered workplaces. In addition, the smallest workplaces are inspected by municipal officers. The Labour Inspection districts come under the authority of the National Board of Occupational Safety and Health.

It is the business of the Labour Inspectorate to ensure in various ways that the rules concerning the occupational environment and working hours, as represented for example by the regulations issued by the Board, are complied with at workplace level. The Labour Inspectorate is similarly within its purview responsible for enforcing the Act on Products Hazardous to Health and to the Environment.

Each of the nineteen districts is headed by a labour inspection committee including eight representatives of employers' associations and trade unions and chaired by the district superintendent.



Local exhaust units are one way of overcoming air pollution problems. This labour inspector is checking to see that the exhaust unit has sufficient capacity for the job.

Visits to workplaces are perhaps the best known feature of the work of the Labour Inspectorate. Each labour inspector is responsible for a number of workplaces. He makes sure that legislation is complied with there, and he advises the employer and employees and discusses questions of occupational safety and health together with them.

One of the important tasks of the Labour Inspectorate with regard to the working environments of tomorrow is to inspect drawings for new workplaces or for the enlargement or alteration of existing ones.

The labour inspectors also do a great deal of lecturing to safety committees, for example, and in connection with training courses.

Accident investigation is an important field, and the knowledge thus gained helps to prevent recurrences. The Labour Inspectorate also plays an important part in the compilation of occupational injury statistics. Data are stored centrally in a data register kept by the National Board of Occupational Safety and Health.

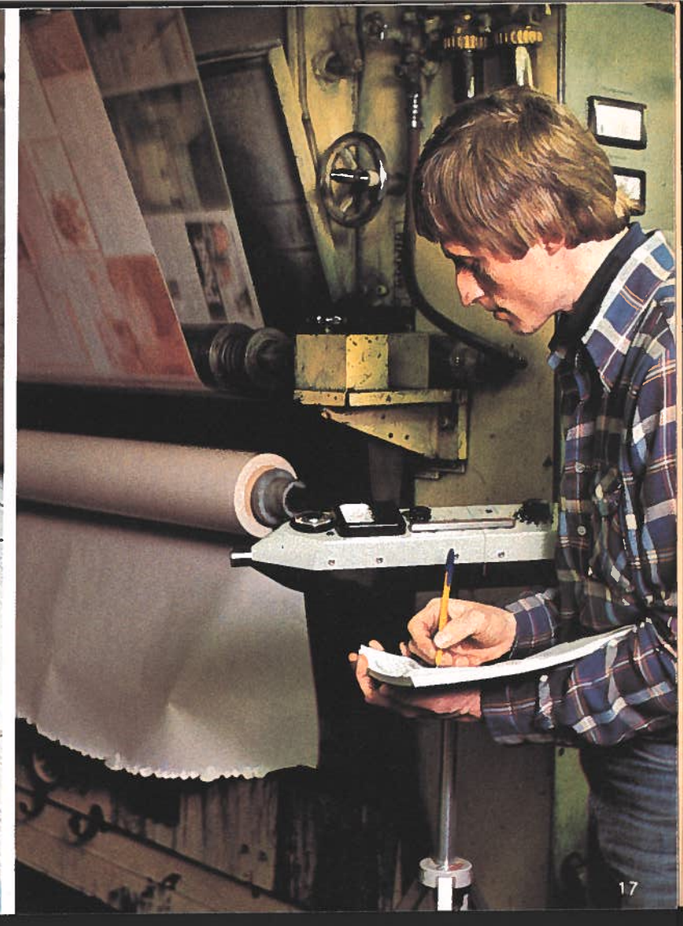
Questions concerning the working environment are normally settled on a joint basis by employers, employees and the Labour Inspectorate, but sometimes the labour inspectors have to resort to coercive measures in order to bring about improvements to the working environment.

About one-third of the 60000 or so visits paid each year result in the labour inspector sending an inspection report to the company and the safety delegate concerned, descibing the measures which in his view will have to be taken in order to improve the working environment.

The Labour Inspectorate can also issue injunctions or prohibitions. An injunction can be backed up by a contingent fine which can be exacted judicially in the event of non-compliance. Penal sanctions can be imposed on employers in breach of injunctions or prohibitions.

It is impossible for a single person to command expert knowledge of all aspects of the working environment, and the staff of each Labour Inspection district therefore includes specialists. For example, there are chemists who investigate chemical health hazards, there are specialists in the measurement and appraisal of various problems connected with the working environment, such as noise, atmospheric pollution, ventilation and lighting. There are inspectors for particular sectors, e.g. building inspectors, agricultural and forestry inspectors, and mining inspectors. The Inspectorate also has legal advisers and can draw on medical expertise.

The Labour Inspectorate is extensively concerned with the prior inspection of drawings for work premises. Visits to workplaces may involve measuring different qualities of the working environment. The picture far right shows noise measurement in progress.



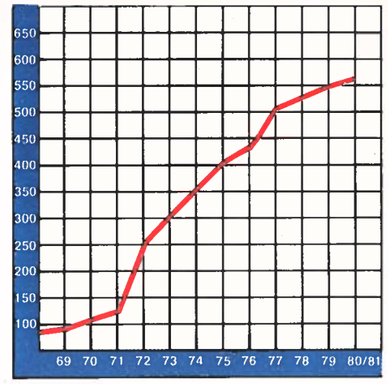
The National Board of Occupational Safety and Health is engaged in extensive research concerning solvents. The subject pictured here is inhaling acetone. The aim of the experiment is to clarify the absorption and secretion of solvents by the bloodstream.

Sweden is divided into 19 Labour Inspection districts.

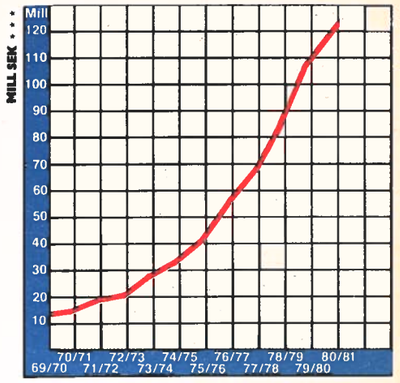
* *Excluding extra personnel.*

** *To the budget of the Board should be added sek 10—20 mill a year in contributions from the Work Environment Fund.*

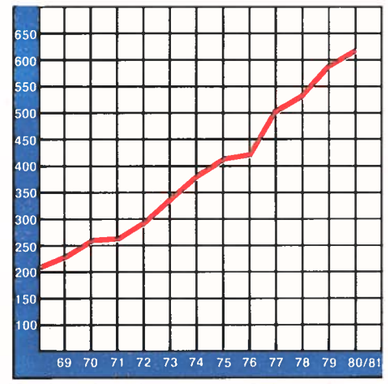
*** SEK *(Swedish Crowns)*



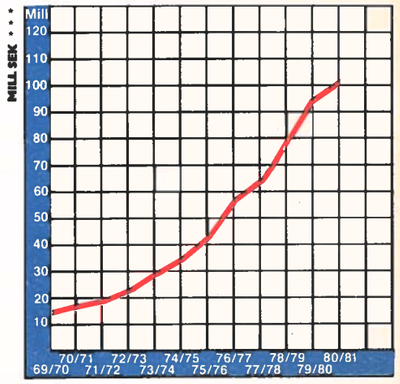
Number of employees at the Board. *



The budget of the Board. **



Number of employees at the Labour Inspectorate. *



The Labour Inspectorate budget.

Elmia Arbetsmiljö 80
Elmia AB
Box 6066
S-550 06 JÖNKÖPING, Sweden.
Tel 036-11 90 60. Telex S-70164.
Telegrams Elmia.

THE WORKING ENVIRONMENT, PART OF OUR STANDARD OF LIVING

Many forces are at work to make present day and future working environments as safe as possible, and these efforts will be shown at the third international trade fair on the working environment, Elmia Arbetsmiljö 80.

ARBETSMILJÖ

ARBETSMILJÖ 80.

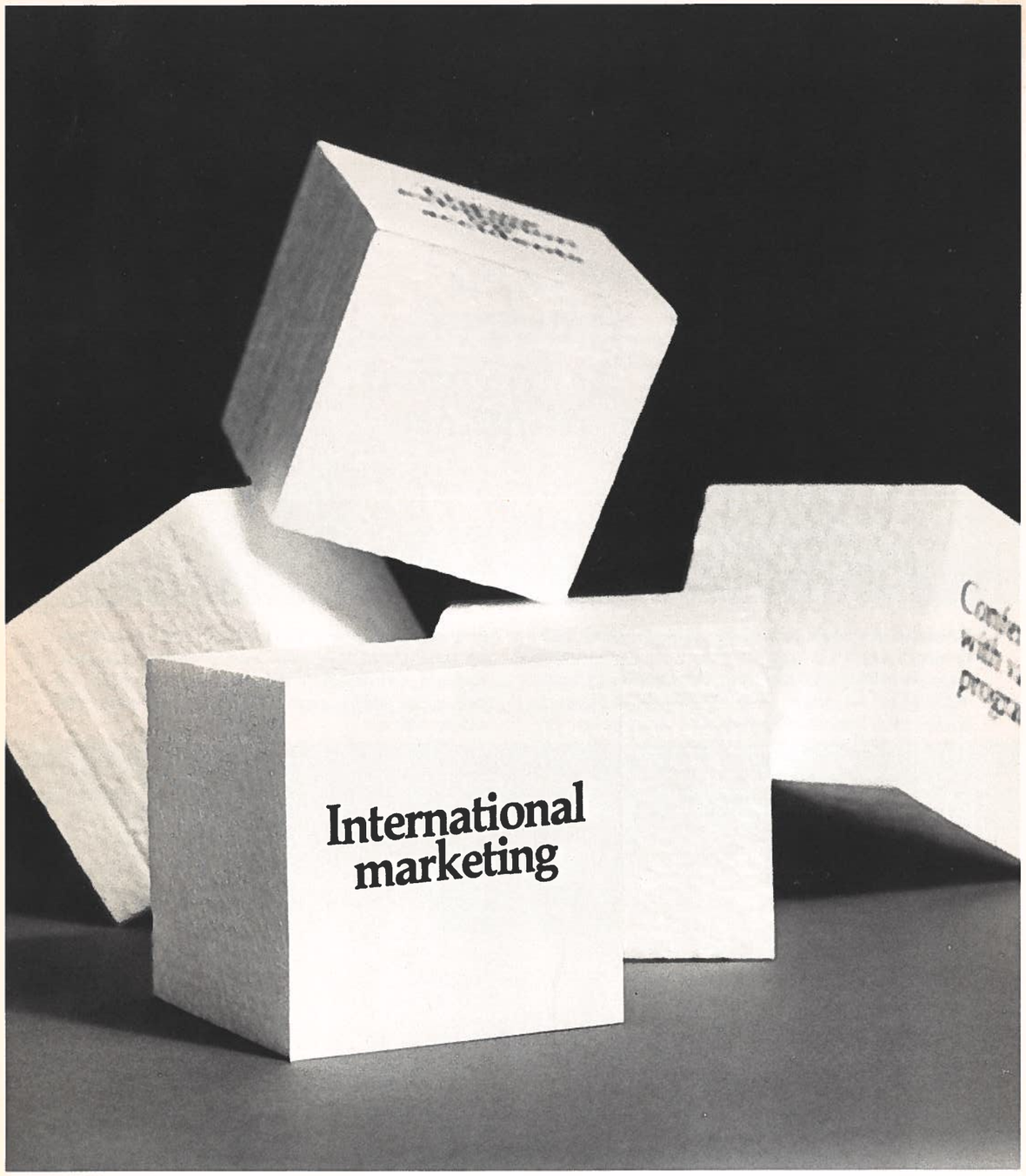
September 15-19, 1980. Elmia AB, Box 6066, S-550 06 JÖNKÖPING, SWEDEN. Tel. 036-11 90 60. Telex S 70164.

Elmia Arbetsmiljö 80 addresses itself to trade people in Sweden and abroad within the fields covered by the theme of the fair. The fair is being organized for the third time in 1980.

The trade exhibition covers plant and equipment within the fields covered by the theme, and will contain a number of interesting new developments. Items on display will include the following: noise abatement and anti-air-pollution equipment, industrial robots, equipment for the workplace, fittings, equipment for individual and collective protection, as well as measurement and automatic control technology.

Conferences held during the fair will deal with subjects such as: psycho-social factors in the future working environment, appraisal of efforts within the working environment field from a social and business economics standpoint, ergonomic problems, the problems of the computer workplace, and risk and security analyses. Special information will also be provided for industrial safety committees, supervisors and safety officers.

Under the collective heading "Accidents" the theme exhibition will deal with various aspects of this subject.



1979 1980

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Advertising

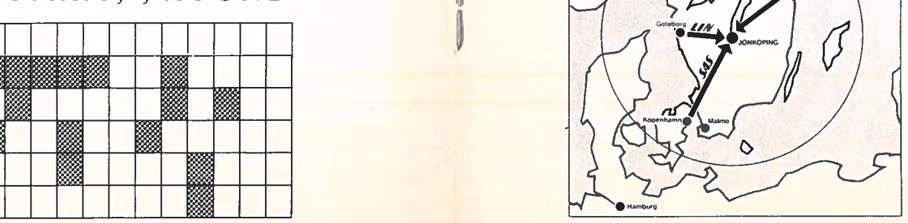
Trade press

News on "Arbetsmiljö 80"

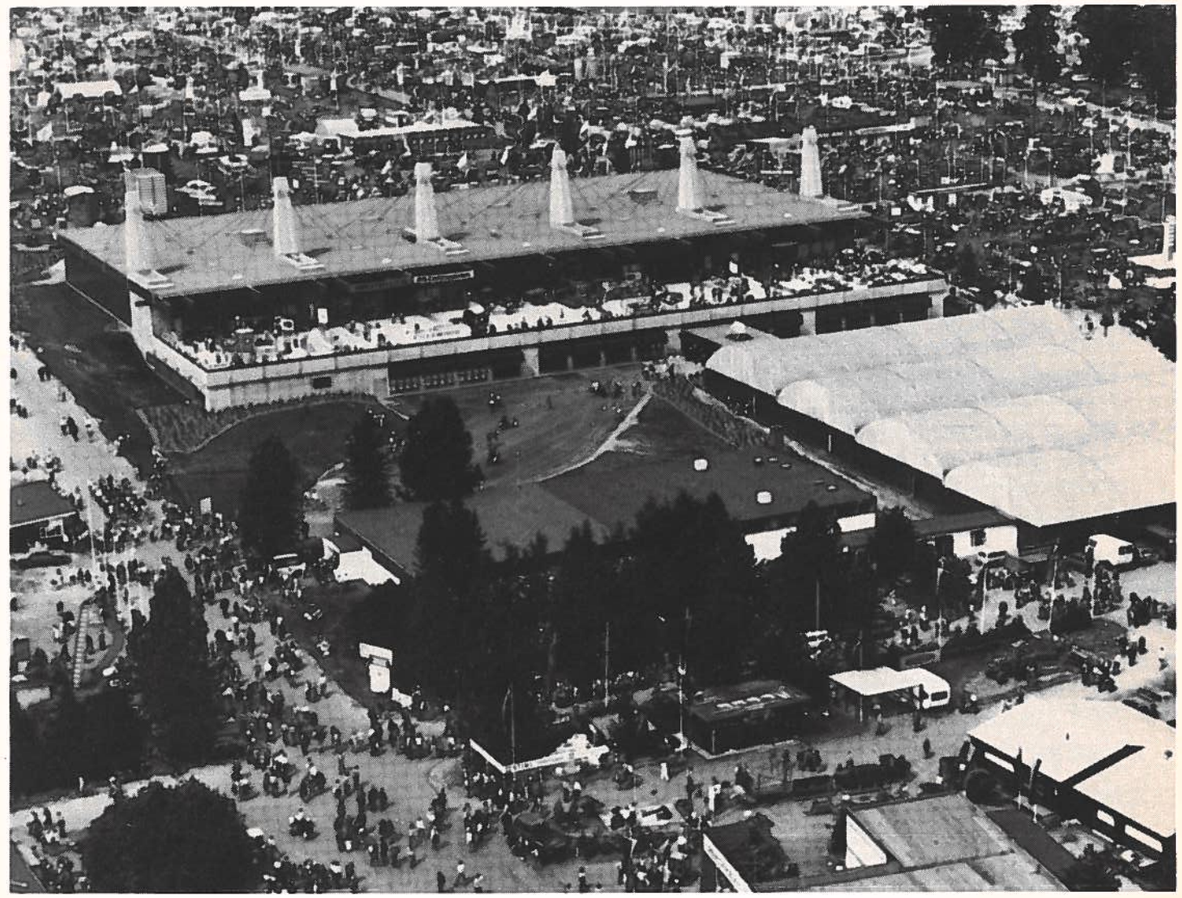
Press releases

Press information

Press showing



Modern exhibition halls, in the heart of Sweden´s most concentrated industrial area



Elmia´s exhibition halls, among the most modern in Sweden, have a total area of 8,200 sq.m. Additional features include a restaurant and several fully-equipped conference rooms.

Elmia is well-situated – no less than 2 1/2 million people live within a 200 km radius of the fair site.

How to get to Jönköping and Elmia

Jönköping is 45 minutes from Copenhagen and 40 minutes from Stockholm by air. There are daily flights to the Jönköping airport which is only 15 minutes by car from the Elmia exhibition grounds. The E4 motorway through Jönköping passes close by and has a link road leading to Elmia. Good rail service, trains run hourly to Stockholm and to the Continent.

Elmia exhibition grounds – exhibition area outdoors and halls

Hall 1:

Foyer: Information desk. Press, banking and postal facilities.

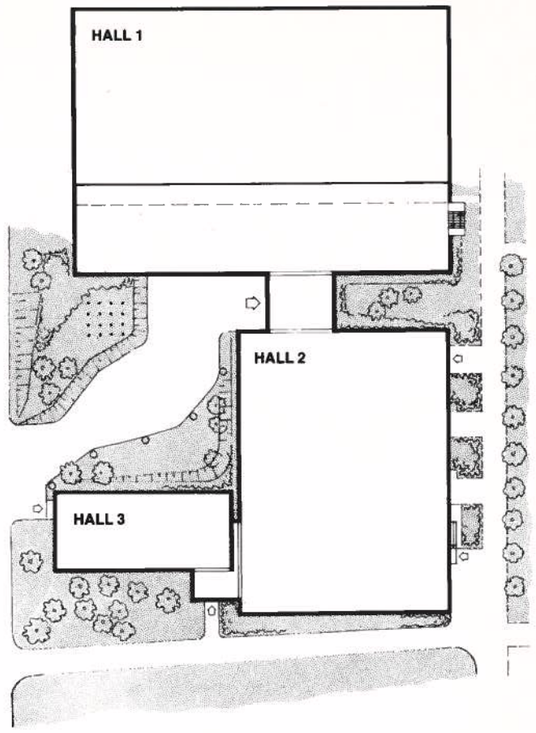
Exhibition Hall: 4200 sq.m. exhibition area. This hall is free from supporting columns. Maximum height of ceiling 6 metres, entrance doors 4 x 4 metres. Electricity, water drainage, compressed air and telephone can be connected. Large admission of daylight gives very good lighting conditions.

Terrace: 2000 sq. m. floor area directly adjoining the Exhibition Hall.

Conference Room 1: 496 comfortable seats fitted with writing table. Large stage (10 x 3 metres). Simultaneous interpretation system. Modern audiovisual equipment. The room has been specially planned for the handicapped.

Group Rooms: Directly adjoining the Conference Room there are five group rooms, accommodating 10-50 persons.

Restaurant: Seats 500.



Hall 2:

3800 sq.m. exhibition area. Height of ceiling 5 metres, entrance doors 4 x 4 metres. Electricity, water, drainage, compressed air and telephone can be connected. Good lighting conditions.

Hall 3:

Conference Room 2 seats 250.

Facts about ELMIA ARBETSMILJÖ 80

Exhibition period:	September 15-19, 1980
Build-up	September 8-14, 1980
Breakdown	September 19-23, 1980
Mailing address:	Elmia AB, Box 6066, S-550 06 Jönköping, Sweden
Goods address:	Elmia AB, Rosenlundsfältet, Jönköping
Showing for press, TV, radio and other specially invited guests	Monday, September 15th, 1980
Inauguration:	11.30 a.m. on Monday September 15th, 1980
The Fair is open:	September 15-18 from 9 a.m. to 5 p.m. September 19 from 9 a.m. to 3 p.m.
Stand fees:	Indoors: Skr 375:–/sq.m. partition walls included Outdoors: 50 sq.m. Skr. 2500:– 100 sq.m. Skr. 3500:– For additional space Skr. 30:–/sq.m.

For further information please send in the coupon to Arbetsmiljö 80, Elmia AB, Box 6066, S-550 06 Jönköping, Sweden or telephone 036/11 90 60.

Arbetsmiljö 80, September 15-19, 1980

We are interested in participating in the Fair
Line of products .....
Size of stand .... x .... = ... sq.m.

We are interested in participating in the conferences and wish to receive further information

Name of the company .....

Person to contact .....

Address .....

.....

Country .....

Telephone .....

ELMIA AB
Box 6066
S-550 06 Jönköping
Sweden