Occupational Safety and Health (Display Screen Equipment) Regulation

Administration's response to Issues raised by members of the Subcommittee meeting on 17 January 2001

I. OSH Strategy under the Regulation

Before giving specific response to issues raised by Members at the Subcommittee meeting on 17 January 2001 in regard to the Occupational Safety and Health (Display Screen Equipment) Regulation (the proposed Regulation), the Administration would like to outline its strategy in protecting the occupational safety and health of employees using display screen equipment (DSE) in the following paragraphs.

The Occupational Safety and Health Ordinance

2. Following the 1995 Review on Industrial Safety in Hong Kong, the self-regulatory approach has been adopted to improve on the conventional enforcement-driven strategy in promoting occupational safety and health, which has a number of drawbacks, for example -

(a) the enforcement approach does not foster a safety culture among the employers and employees;

(b) prescriptive law, in which minimum standards for compliance are stipulated, can become out-dated very quickly as a result of rapid changes in technology and production methods; and

(c) enforcement actions are extremely labour intensive, but may not effectively bring down the number of occupational accidents.

3. Under the new approach, the Government would provide a framework with legislative and administrative components within which self-regulation is to be achieved through a corporate system of safety management. For this purpose, "self-regulation" was purposely built into the Occupational Safety and Health Ordinance (OSHO) as its central feature, which was enacted in 1997 to extend the scope of statutory protection of occupational safety and health to employees in the non-industrial sector. Labour Department (LD) and the Occupational Safety and Health Council (OSHC) have since assisted employers and employees to better manage workplace safety through a wide range of promotional and training programmes. Nevertheless, LD would take out enforcement actions against establishments where self-regulation fails to be applied and occupational safety and health of employees are adversely affected.

General duties

4. Section 6(1) of the OSHO, i.e. the "general duties" provision, provides that -

> "Every employer must, so far as reasonably practicable, ensure the safety and health at work of all the employer's employees."

An employer who fails to comply with the provision commits an offence and is liable on conviction to a fine of $200,000 and, if the offence is committed intentionally, knowingly or recklessly, a fine of $200,000 and imprisonment for 6 months.

5. To help employers understand their liabilities under the "general duties" provision, a list of non-compliance cases is given in section 6(2) -

(a) a failure to provide or maintain plant and systems of work that are, so far as reasonably practicable, safe and without risks to health;

(b) a failure to make arrangements for ensuring, so far as reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage or transport of plant or substances;

(c) a failure to provide such information, instruction, training and supervision as may be necessary to ensure, so far as reasonably practicable, the safety and health at work of the employer's employees;

(d) as regards any workplace under the employer's control -

  (i) a failure to maintain the workplace in a condition that is, so far as reasonably practicable, safe and without risks to health; or

  (ii) a failure to provide or maintain means of access to and egress from the workplace that are, so far as reasonably practicable, safe and without any such risks;

(e) a failure to provide or maintain a working environment for the employer's employees that is, so far as reasonably practicable, safe and without risks to health.

6. For the better carrying into effect of the provisions and purposes of the Ordinance, section 42 of the OSHO empowers the Commissioner for Labour to make regulations, in particular,

(a) providing for activities undertaken at workplaces to be assessed in order to determine the extent of risk of those activities to the safety or health of employees employed at those workplaces; [Section

42(2)(j)] and

(b) requiring persons who are responsible for workplaces to keep records of specified activities carried on at those workplaces. [Section 42(2)(k)]

The Occupational Safety and Health Regulation, for example, was enacted in 1997 to provide for, among other things, performance of risk assessments for manual handling operations.

The proposed Regulation and its enforcement

7. The proposed Regulation seeks to provide for specific safety and health requirements in respect of DSE work, on top of the general requirements under the OSHO. With provisions contained in the proposed Regulation, together with the Health Guide, employers will have a clearer understanding on how to discharge their liabilities under the OSHO in regard to DSE users.

8. The principal provisions of the proposed Regulation and their respective purposes are as follows -

(a) performance of risk assessments: to identify the health hazards associated with the use of DSE at work so that remedial measures can be instituted at an early stage before symptoms develop in any of the users;

(b) keeping risk assessment records: to prove the performance of risk assessments and to provide the results of previous risk assessments for reference in future reviews;

(c) taking steps to reduce the identified risks: to improve the safety and health standard of DSE work at the workplace;

(d) provision of information and training: to help the users conform to the established work practice and raise their awareness of health hazards associated with DSE work; and

(e) provision of suitable workstations: to ensure that workstations provided to users are suitable with regard to their safety and health at work.

9. In respect of enforcement of the proposed Regulation, during an inspection to a DSE workstation, the occupational safety officer (OSO) of LD will inspect the risk assessment records to see if potential health hazards have been identified and their risks evaluated and reduced. The OSO will also check the workstation to ensure that it is suitable for use by users, having regard to the latter's safety and health. Where appropriate, improvement notice would be served under section 9 of the OSHO. If the responsible

person fails to comply with the improvement notice without reasonable excuse, he is liable on conviction to a fine of $200,000 and imprisonment for 12 months.

The Health Guide

10. The OSHO and its subsidiary legislation apply to all employment sectors. The extensive coverage means that it is difficult to prescribe minimum standards which are applicable to all trades. A non-prescriptive approach is therefore adopted and flexibility is intentionally built into the proposed Regulation.

11. To help employers and employees better understand the legal requirements under the Regulation, the Health Guide on Working with Display Screen Equipment (the Health Guide) will be published in conjunction with the coming into effect of the Regulation. The Health Guide explains the meaning of DSE, workstation and user in the context of the Regulation. It discusses various health issues related to prolonged work with DSE and the importance of risk assessment of workstations and provides easy-to-follow steps for conducting such an assessment. The Health Guide also gives practical guidance on the ergonomic requirements of workstations and measures for preventing common health problems, including safety and health training.

12. To preserve the general application of the Health Guide to all sectors of employment, a descriptive approach is taken to elaborate the requirements under the Regulation. Compliance with the proposed Regulation does not require professional knowledge in safety and health. With the assistance of the Health Guide, coupled with common sense for day-to-day computer operations and workplace hygiene, employers would be able to apply the general rules flexibly to their specific workplace.

II. Specific Response

1. To provide information on whether a fine is imposed on non-compliance with the guidelines on use of display screen equipment (DSE) in those countries where a self-regulatory approach has been adopted for the proper use of DSE at work.

Penalties for non-compliance with regulations/standards are provided for in the UK, the USA and Taiwan, where legislation covering the use of DSE at work is regulated in law -

(a) UK: the maximum penalty for contravention of the Health and Safety (Display Screen Equipment) Regulation is a fine of £5,000 (about HK$57,000) for offences prosecuted in the magistrates' courts. If the offences are tried in the Crown Court, there is no limit on the fine which may be imposed.

(b) USA: the penalty for contravention of the Ergonomics Program Standard under the Code of Federal Regulations is a fine of up to US$7,000(about HK$55,000), and up to US$70,000 (about HK$550,000) for wilful or repeated violations.

(c) Taiwan: the penalty for contravention of the 《精密作業勞工視機能保護設施標準》 is NT$30,000 to $150,000 (about HK$7,200 to HK$36,000).

In Canada, Australia and New Zealand where only guidelines or codes of practice are issued for safety and health related to DSE work, "general duties" of employers and employees are stipulated in the occupational health and safety laws. Employers and employees are subject to a penalty for failure to discharge the respective general duties -

(a) Ontario, Canada: the penalty for contravention of the Occupational Health and Safety Act is a fine of not more than CAN$25,000 (about HK$130,000) or imprisonment of a term of not more than 12 months, or both.

(b) New South Wales, Australia: the maximum penalty for contravention of the Occupational Health and Safety Act is a fine of A$825,000 (about HK$3,450,000) for corporations, a fine of A$82,5000 (about HK$345,000) or imprisonment for 2 years or both for individual employers, and a fine of A$4,950 (about HK$21,000) for employees.

(c) New Zealand: the maximum penalty for contravention of the provisions on duties of employers and employees under the Health and Safety in Employment Act is a fine of NZ$50,000 (about HK$170,000).

In Singapore, there is neither specific legislation on the use of DSE at work nor general duty provision in the Factories Act. The guidelines that have been published on work with DSE are merely advisory in nature, and do not carry any penalty for non-compliance.

2. To provide samples of educational pamphlets and publications on promoting the proper use of DSE at work.

LD has published a variety of educational materials to promote the proper use of DSE at work, covering general occupational health issues associated with DSE work, workstation design, lighting and ventilation. Samples of these educational materials are enclosed for Member's information.

3. To consider including in the guidelines on use of DSE at work a provision requiring employers to allow users of DSE to take rest breaks or perform alternative duties at regular intervals of continuous DSE work.

In paragraph 3.3 of the Health Guide, it has been recommended that a DSE user performs DSE work and non-DSE work alternatively so that the posture can be changed and fatigue arising from prolonged DSE work can be relieved. We will include in the Health Guide the recommendation that, where no alternative duty could be arranged, appropriate rest breaks be provided to DSE users.

4. To provide statistics on the number of occupational sickness reported in relation to the use of DSE at work.

The OSHC conducted a survey in 1997 on the occupational health of computer operators in various trades. It was revealed that in the 12 months preceding the survey, 74% of the operators had eye discomfort, 57% had shoulder discomfort, 56% had neck discomfort, 48% had lower back discomfort, 47% had upper back discomfort, and 9-22% had discomfort in various areas of the arm. The survey further revealed that the work and household performance of 36% of the operators were adversely affected by eye discomfort, and up to 22% by neck, shoulder or back discomfort. Though many of these problems are temporary and may be relieved after work, they can degenerate into chronic health problems if ignored over a considerable period of time. From 1998 to 2000, 206 cases of tenosynovitis (inflammation of tendons or tendon sheaths) affecting the hand or forearm were notified to LD. Of those, 47 cases were likely to have been caused by work related to DSE -

	1998	**1999**	**2000**
Total number of cases	71	54	81
Number of cases likely to have been caused by work related to DSE	7	16	24#

the latest figure

Copy of the report of the OSHC's survey (in Chinese only) is enclosed.

5. To provide definition of "continuous use" of DSE at work.

Under the proposed Regulation, a "user" is an employee who normally uses DSE as a significant part of his normal work. These users are usually highly dependent on the use of DSE at work and use such equipment for long hours more or less every day. Some examples of users are employees whose main duty involves the use of DSE for word processing, typing/secretarial work, data processing, customer enquiry services, accounting/financial operations, computer graphic design,

news-writing/editing and telecommunications.

6. To provide relevant extract of the Health and Safety (Display Screen Equipment) Regulations in the United Kingdom as well as other overseas legislation and guidelines on use of DSE at work, together with a comparison table setting out the various provisions on risk assessment, continuous DSE work, rest breaks and penalties for non-compliance with the provisions.

The following documents are enclosed -

(a) UK: the Health and Safety (Display Screen Equipment) Regulations;

(b) USA: extract of the Ergonomics Program: Final Rule, Code of Federal Regulations;

(c) Canada: extract of the Office Ergonomics, 2nd edition, published by the Canadian Centre for Occupational Health and Safety;

(d) Australia: extract of the National Code of Practice for the Prevention of Occupational Overuse Syndrome and the Guidance Note for the Prevention of Occupational Overuse Syndrome in Keyboard Employment, published by the National Occupational Health and Safety Commission;

(e) New Zealand: extract of the Approved Code of Practice for the Use of Visual Display Units in the Place of Work, published by the Department of Labour;

(f) Singapore: extract of the Guidelines for Work with Visual Display Units, published by the Department of Industrial Health, Ministry of Labour; and

(g) Taiwan: 《精密作業勞工視機能保護設施標準》.

The table at the Annex summarises the criteria for "continuous DSE work", the requirements of risk assessments and rest breaks, and penalties for non-compliance in other countries/regions.

7. To provide information on the provisions in the Occupational Safety and Health Ordinance which stipulates that employers are responsible for safeguarding the safety in workplace, under which actions can be taken for breaching the Regulation.

As explained in paragraphs 4 and 5 in Part I, employers are bound by the "general duties" provision (section 6) of the OSHO. The maximum penalty for non-compliance is a fine of $200,000 and imprisonment for 6

months. The proposed Regulation seeks to elaborate the "general duties" provision by setting out specifically an employer's obligations in respect of safety and health of his employees who normally use DSE at work. It does not, however, imply a lack of control of occupational safety and health standards of DSE workstation under the existing regime. Even before the enactment of the proposed Regulation, failure to provide a suitable workplace to DSE users in terms of the latter's occupational safety and health could have constituted an offence under the "general duties" provision.

Education and Manpower Bureau
February 2001

Annex

Country/ Region	Criteria for "continuous DSE work"	Risk assessment requirement	Rest break requirement	Penalty for non-compliance
UK	• Criteria for DSE "user" - - Dependent on the use of DSE - No choice of whether to use DSE - Specific skills or training needed - Use for continuous spells of at least 1 hour at a time - More or less daily use - Rapid information transfer between the user and screen - Attention and concentration needed	Yes	• Employers to plan users' work activities so that their daily work on DSE is periodically interrupted by breaks or changes of activity • Short, frequent breaks, e.g. 5 - 10 minute break after 50 - 60 minutes continuous DSE work, is recommended	Yes
USA	• "Action trigger" for implementing an ergonomics programme - - the use of a keyboard or mouse in a steady manner for more than 4 hours total in a workday	Yes	• Employers to organise DSE tasks in a way that allows employees to vary DSE tasks with other work activities, or to take micro-breaks or recovery pauses while at the DSE workstation	Yes

Country/ Region	Criteria for "continuous DSE work"	Risk assessment requirement	Rest break requirement	Penalty for non-compliance
Canada	Not defined	Yes	• DSE operators to break up DSE work by doing non-DSE tasks that place different demands on the body by changing body positions • For continuous DSE work, a work break of 5 to 15 minutes per hour is recommended	No
Australia	Not defined	Yes	• DSE users to spend part of the working day on alternative duties or to take work pauses if no suitable alternative duties are available • The length and frequency of work pauses will depend on the individual, the task and other factors, e.g. intensity of the DSE task	No

Country/ Region	Criteria for "continuous DSE work"	Risk assessment requirement	Rest break requirement	Penalty for non-compliance
New Zealand	Not defined	Yes	• Employers to provide DSE operators with short, frequent breaks away from DSE work • Where work is screen-intensive, or when the DSE task requires a high degree of concentration, a 10-minute break every hour may be appropriate	No
Singapore	Not defined	No	• A short rest pause is recommended for every hour of continuous DSE work	No
Taiwan	• The use of DSE for more than 2 hours total in a workday	No	• Employers to provide DSE users with a break of at least 15 minutes for every 2 hours of continuous DSE work	Yes

辦公室工作環境和電腦操作員之職業健康（上集）

摘要

隨著經濟轉型，香港的人力資源逐漸從製造業轉到服務行業，在辦公室工作的人員亦愈來愈多。最近通過的『職業安全及健康條例』，更令全港的辦公室工作人員獲得一個嶄新的安全及健康法例的保障。面對這個轉變，職業安全健康局(簡稱職安局)決定加強對這個佔本港僱員人數重要比例的辦公室人員，進行職業安全健康的宣傳與研究工作。

職業安全健康局與香港理工大學康復治療學系合作，於一九九七年七月至十月期間進行了一項有關辦公室環境與電腦操作員之職業健康的調查，主要是希望能找出(1)本地各行業使用電腦終端機的數據，(2)辦公室的工作環境特點，(3)辦公室從業員最常見的肌腱不適的情況。

調查對象為九類不同行業的辦公室工作人員及需要使用電腦鍵盤操作人員，包括航空公司、旅行社、電訊公司、銀行、金融投資公司、股票行、律師事務所、會計師事務所和則師事務所。調查除了以隨機抽樣形式探訪辦公室外，並對辦公室工作人員進行問卷調查，以了解員工對自己工作環境的意見。問卷的內容包括被訪者的個人資料、肌腱不適的徵狀以及辦公室的傢俬特徵，同時亦對辦公室的環境因素例如噪音、溫度、濕度以及電腦終端機發出的電磁輻射進行測量。

此次調查成功地訪問了96間辦公室，共688名人員。其中百分之三十四(234名)是男性，而女性則佔百分之六十六。大約一半的被訪者年齡在26-35之間，平均高度和體重為165厘米和57公斤。大部分工作人員(98%)經常應用電腦終端機，其中大約一半的被訪者每日使用鍵盤超過6小時。

過去十二個月之內，與鍵盤操作有關的肌腱不適的發生率頗高，包括頸部不適(56%)、肩膊不適(57%)、肘關節不適(9%)、前臂不適(12%)、手腕不適(22%)、手指不適(17%)、背部不適(47%)、腰部不適(48%)和眼睛不適(74%)。徵狀主要為疼痛、肌肉酸痛、抽筋、麻痺和無力等。調查更顯示大約一半的被訪者的工作過於繁重以及工作時間過長等等。

調查顯示百分之九十四辦公室的工作椅的高度是可以調校，絕大部分(98%)的員工有使用背墊習慣，但少過三分之一的人的椅子有手靠。而大約五分之一工作桌並無足夠的腿膝空間。百分之六十的人員在注視螢光幕時採用前傾或後傾的姿勢，只有百分之四十三的人在操作鍵盤時，肘關節的屈曲度維持在90度。

根據調查的結果，我們推論辦公室工作間及桌椅的設計和工作姿勢是引致辦公室人員肌腱不適的主要因素，工作量過多亦是另一個不可忽視的原因。

前言

現代科學技術一日千里，電腦的應用日益增多，在過去的十年間，單在美國就有七仟萬台電腦終端機在各行各業中廣泛使用(Marcus et al. 1996)，估計在公元2000年，在美國使用的電腦將超過一億台。在這個電腦迅速發展的時代，辦公室的工作人員不再只是做文書或案頭的工作，而是與電腦終端機和鍵盤操作分不開。

一般來說，電腦終端機操作員需要在電腦螢光幕前連續鍵盤操作每日最少6小時。因為長期靜態的姿勢、頻繁的上肢動作和長時間注視螢光幕，使得辦公室人員容易患上與工作有關的頸背及上肢的毛病。一般稱為累積性創傷疾患(Cumulative Trauma Disorder)，亦稱為重複性勞損症或職業性過勞綜合症(Armstrong 1990)。

目前香港並沒有關於累積性創傷疾患發生率的調查。一九九零年美國國家職業安全健康研究所(NIOSH)估計，大約15%至20%的

美國在職人士可能患上某些程度的累積性創傷疾患(Harris & Gianacakes 1994)，研究更證明電腦鍵盤操作員患累積性創傷疾患率比非操作員高出12倍(Oxenburgh 1984)，女性比男性更易受影響(Ballard 1993)。邁向公元2000年，隨著全球電腦科技的廣泛應用和發展，可以預計，電腦鍵盤操作員患上累積性創傷疾患的數目將會增加。流行病學和臨床研究指出導致累積性創傷疾患的並非單一因素，而是一連串危險因素相互作用，相互影響而成(Ballard 1993, AlQattan 1993)，其中亦包括非病態的心理因素，例如工作滿足感、角色混淆、角色衝突等等(Dobyns 1995)。

電腦在香港的應用和普及與美國一樣，有一段頗長的時間，但本地關於電腦的應用所帶來的職業安全健康問題的研究卻十分貧乏。隨著新『職業安全及健康條例』的實施，職業安全健康局與香港理工大學康復治療學系職業治療科合作進行一項有關辦公室環境和電腦操作員職業健康的調查。旨在找出(1)本地各行業內使用電腦終端機的數據，(2)辦公室的工作環境特點，(3)辦公室人員最常見的肌腱不適的情況。

研究和分析方法

本調查於一九九七年七月至十月期間進行，根據政府統計處提供的全港機構名單，按照公司業務的分類和規模，進行分層式隨機抽樣。服務業、通訊、金融及商業被選為四類主要目標行業，包括航空公司、旅行社、電訊公司、銀行、金融投資公司、股票證券公司、律師事務所、會計師事務所和建築師事務所，因他們僱有很大比例的辦公室人員，從事與電腦終端機有密切聯系的工作。根據公司的規模分為大中小三類，僱員人數一百人或以上的定為大規模的公司，中型公司的僱員人數則在50至90之間，而小公司的僱員人數則少於50人。Brogmus等人在一九九六年的研究中指出電腦終端機操作員患累積性創傷疾患率約為12%，為取得有代表性的樣本，我們對目標公司根據以下的公式決定樣本的數目，進行隨機抽樣。以下n是所要求的樣本大小，p是辦公室工作人員患累積性創傷疾患的比例，即0.12，選擇可信水平為95% (95% Confidence Level)，誤差率為0.05(d=0.05)。

表一：參予調查的辦公室人員的性別和年齡

年齡(歲)	性別		總數(%)
	男(%)	女(%)	
26以下	67 (28.6)	177 (39.0)	244 (35.5)
26至35	114 (48.7)	211 (46.5)	325 (47.2)
36至45	40 (17.1)	56 (12.3)	96 (14.0)
45以上	13 (5.6)	10 (2.2)	23 (3.3)
總數(%)	234 (100.0)	454 (100.0)	688 (100.0)

表二：參予調查的辦公室人員的公司類別和規模

公司類別	公司規模			總數(%)
	小型(%)	中型(%)	大型(%)	
航空公司	3 (2.0)	5 (4.2)	20 (4.8)	28 (4.1)
旅行社	12 (7.9)	9 (7.6)	40 (9.6)	61 (8.9)
電訊公司	3 (2.0)	5 (4.2)	40 (9.6)	48 (7.0)
銀行	66 (43.4)	40 (33.6)	152 (36.4)	258 (37.5)
金融投資公司	18 (11.8)	25 (21.0)	65 (15.6)	108 (15.7)
股票證券公司	9 (5.9)	5 (4.2)	20 (4.8)	34 (4.9)
律師事務所	23 (15.1)	15 (12.6)	20 (4.8)	58 (8.4)
會計師事務所	12 (7.9)	5 (4.2)	20 (4.8)	37 (5.4)
建築師事務所	6 (3.9)	10 (8.4)	40 (9.6)	56 (8.1)
總數(%)	152 (100.0)	119 (100.0)	417 (100.0)	688 (100.0)

估計樣本大小的公式

$$n = \frac{Z^2 P(1-P)}{d^2}$$

$$n = \frac{(1.96)^2 (0.12)(0.88)}{(0.05)^2}$$

n = 163 樣本

因本調查有四個目標行業，所以抽樣人數為163 x 4 = 652。根據公司的規模，按比例分佈，需訪問92間公司。小公司的被訪人數是3人，中型公司是5人，而大公司則需要訪問10名辦公室人士。每個被選中的公司將獲書面通知，然後約

表三：參予調查的辦公室人員的職位

職位	數目 (%)
文員	402 (58.4)
中層管理人員	109 (15.8)
高層管理及行政人員	85 (12.4)
技術及專業人員	92 (13.4)
總數 (%)	688 (100.0)

表四：參予調查的辦公室人員的任職年期

任職年期	性別	
	男 (%)	女 (%)
少於1年	51 (21.8)	86 (18.9)
1至少於5年	108 (46.1)	226 (49.9)
5至少於10年	47 (20.1)	100 (22.0)
10年或以上	28 (12.0)	42 (9.2)
總數 (%)	234 (100.0)	454 (100.0)

表五：每日操作鍵盤所需時間

每日操作鍵盤所需時間	數目 (%)
2小時以下	82 (11.9)
2至少於4小時	142 (20.6)
4至少於6小時	176 (25.6)
6至少於8小時	187 (27.2)
8小時或以上	101 (14.7)

表六：被訪者在過去一年和最近一週肌腱不適的發生率及對工作/家務的影響

肌腱不適	過去一年數目 (%)	最近一週數目 (%)	影響工作/家務數目 (%)
頸部	387 (56.3)	266 (38.6)	148 (21.5)
肩膊	393 (57.1)	288 (41.8)	153 (22.2)
肘關節	62 (9.0)	44 (6.4)	26 (3.8)
前臂	85 (12.4)	63 (9.2)	34 (4.9)
手腕	154 (22.4)	118 (17.2)	71 (10.3)
手指	116 (16.9)	91 (13.2)	54 (7.8)
背部	322 (46.8)	244 (35.5)	123 (17.9)
腰部	332 (48.3)	268 (38.9)	153 (22.3)
眼睛	509 (74.0)	446 (64.8)	246 (35.8)

定訪問的時間進行調查。

本研究採用標準化的問卷，進行面對面的訪問。問卷的內容包括被訪者個人及職業資料、工作環境和辦公室傢俬及擺設的特徵、最近一週和過去一年身體各部肌腱之不適狀況、工作姿勢等等。問卷更應用圖片來指明各個不同部位的徵狀和工作姿勢。

辦公室環境因素的測量主要包括室內溫度及相對濕度、工作間桌面的照明度和室內噪音水平，此外還對電腦螢光幕所發出的電磁輻射作出測量。使用的儀器包括室內溫度表(Thermo, model 001096)、測光表(Pacer Industries, Model 1076)、噪音表(Bruel & Kjaer, PISPM Type 2236A-009)及電磁波測量表(RF survey meter, Holaday Industries Inc. Serial No. 84097)

調查的結果以電腦軟件SPSS (Statistical Package for Social Sciences)進行單變量和多變量的統計分析。多元邏輯性回歸分析(Multiple Logistic Regression)用來檢驗辦公室工作人員的年齡、性別、職業、工作經驗、每日使用鍵盤的時間、工作環境、壓力和工作姿勢是否與過去十二個月以及最近七日的肌腱不適有關。分析是基於辦公室人員的主訴，在過去十二個月以及最近七日的肌腱不適的主觀徵狀，並未對累積性創傷疾患作出醫學診斷。

為了選擇進入多元邏輯回歸分析的變量，一系列有可能的解釋因素列舉出來，應用卡方檢驗(Chi-square test)來選擇放到回歸方程的變量的基礎，多元邏輯回歸分析在控制其他變量(因素)的同時，對每一個因素進行分析。然後用逐步邏輯回歸法(Stepwise Logistic Regression)的自動篩選過程逐步選出眞正在統計上有顯著意義的變量(因素)以及他們的相對危險性(Relative Risk)。

研究結果

此次調查成功地訪問了96間公司，共688名人員。被訪者中，百分之三十四(234名)是男性而女性佔

表五：肌腱不適症狀的時間 (百分比是基於受影響的被訪者的總數)

徵狀出現的時間	數目 (%)	徵狀出現的頻率	數目 (%)	徵狀發生的時間	數目 (%)
使用鍵盤時	368 (53.5)	持續	15 (2.3)	發生在工作之前	194 (28.2)
使用鍵盤後	298 (43.3)	經常發生	123 (18.8)	加入現在工作之後	444 (64.4)
其他非使用鍵盤工作	289 (42.0)	偶然發生	516 (78.9)	源自以前傷患	74 (10.8)
放工之後	459 (66.7)			工作量多時	440 (64.0)

百分之六十六。大約一半的被訪者年齡在26-35之間(表一)，平均男女的高度分別為172及161厘米，而體重為65公斤及50公斤。他們主要來自銀行和金融投資公司，分別為37.5%和15.7%(表二)，職位主要是文員和中層管理人員(表三)，大部份在同一崗位工作1至5年，不過入職不到一年的人員亦佔全部人士百分之二十(表四)。

絕大部份人(98%)在他們的日常工作需使用電腦終端機，其中百分之九十二的人士是右手支配，仍有百分之四的人是左手支配，其他為雙手同利的。百分之四十的被訪者需要操作鍵盤連續6個小時或以上(表五)。

一. 被訪者肌腱不適的狀況

在過去十二個月內，被訪者患上與鍵盤操作有關的肌腱不適的發生率頗高，徵狀主要為疼痛、肌肉酸痛、抽筋、麻痺和無力等，包括頸部不適(56%)、肩膊不適(57%)、肘關節不適(9%)、前臂不適(12%)、手腕不適(22%)、手指不適(17%)、背部不適(47%)、腰部不適(48%)和眼睛不適(74%)。以行業來看，肌腱不適的投訴以會計師樓人員居多，其次是航空公司和律師樓，主要集中在文員和中層管理人員身上，工作經驗在五至十年之間，大部分為26歲以下的從業員，女性比男性更易有各個部位之肌腱不適徵狀(表六)。

表八：被訪者的肌腱不適影響日常生活情況

	受影響者	不受影響者	不適用	受影響者的百分比 (不適用者除外)
做家務	131	276	281	32.2%
挽重的雜物 (重量超過十磅)	128	164	396	43.8%
梳洗	55	595	38	8.5%
照顧孩子	49	82	557	37.4%
寫字/打電話/拿筷子	109	540	39	16.8%
駕車	31	76	581	28.9%
工餘活動 (看電影、閱報、與朋友逛街)	175	463	50	27.4%
做運動	196	275	217	41.6%

最近七天的主訴徵狀反映了近期的肌腱不適狀況，其發生率雖相對地比過去十二個月的少，但感到眼睛過勞、乾燥或視力模糊者仍高達百分之六十五，而頸部和腰部不適者亦有接近四成。感覺肩膊疼痛、抽筋，肌肉拉緊或無力者則達百分之四十二，實為一個不容忽視的職業健康問題。表六亦顯示了過去十二個月因身體不同部份的肌腱不適而影響工作和家務的情況，其中以眼睛不適者為多，大約有36%的人表示因眼睛疲勞、乾燥或視力模糊而影響他們的工作，甚至做家務；而因頸、肩膊和腰背痛而妨礙工作者則佔兩成多；因上肢的肌腱不適症而影響工作者則相對較少，但是因手腕疼痛、麻木或無力而影響工作則有百分之十。

被訪的辦公室人員發生肌腱不適徵狀的特徵各有不同，很多人於放工之後始感到肌腱疼痛以及其他不適的徵狀（66.7%），超過半數被訪者在使用鍵盤時覺得有肌腱不適，而做其他非使用鍵盤的工作時感覺肌腱不適的有42%。大部分的徵狀是偶然發生的，但是經常感到肌腱不適者有17.9%。關於徵狀與目前工作的關係，大約百分之六十五的被訪者表示他們的肌腱不適是加入目前的工作之後發生的，他們的徵狀亦會因工作量之增多而加重，亦有一部份人（28.2%）在未做目前的工作之前，已經有肌腱不適徵狀，另外大約百分之十一的徵狀是源於以前的舊患。

如表八顯示，肌腱不適在很大程度上影響被訪者的日常生活，大約百分之三十七需照顧孩子的被訪者表示肌腱不適會影響他們照顧孩子的能力。另外有三成的人表示影響他們做家務，而影響挽超過十磅的重物者以及參與運動者則超過四成。影響駕車者的駕車活動達致百分之二十九，其他受影響的日常活動和工作還有寫字/打電話/拿筷子(16.8%)、工餘活動(27.4%)等。 *(待續)*

辦公室工作環境對電腦操作員之影響(下)

二. 工作環境和辦公室人員的工作姿勢及體驗

表九顯示百分之九十四辦公室的工作椅的高度是可以調校，絕大部分(99%)的員工有使用背墊習慣，但只有大約三分之一的人的椅子有手靠。而五分之一的工作桌並無足夠的腿膝空間。大部分人並無使用腳墊(87.5%)。大部分螢幕顯示屏的高度在視線水平或視線之下，不過仍有超過百分之十二的被訪者的電腦螢幕顯示屏的高度在視線之上。大約超過百分之五十八的螢幕顯示屏裝上濾光鏡。使用腕墊和文件架的人員相對比較少，只有3.5%和17.9%。百分之六十的人員在注視螢光幕時採用前傾或後傾的姿勢，只有百分之四十三的人在操作鍵盤時，肘關節的屈曲度維持在90度，而坐時膝關節的屈曲度是90度只有68%(表十)。

從表十一我們可以看出被訪人士對工作的體驗，大約有一半的人士覺得他們的工作量過重，工作時間太長，更有一大部分人(46.9%)覺得過度腦力工作，且工作不受控制，覺得工作無滿足感者的比例亦頗高(29.2%)，更有百分之十九的人擔心失去工作，但是同事間欠缺溝通和缺乏同事支持的經驗就相對少很多，只佔7.8%和8.7%。

表九：工作環境及辦公室傢俬的特徵

工作環境及辦公室傢俬的特徵	數目 (%)
可以調校高度的工作桌	7 (1.0)
可以調校高度的工作椅	651 (94.6)
有背靠的工作椅	680 (98.8)
有扶手的工作椅	248(36.0)
有足夠的腿膝空間	556 (80.8)
有腳踏	86 (12.5)
螢幕顯示屏的高度在視線上	82 (11.9)
螢光屏配有濾光鏡	400 (58.1)
有傾斜度的鍵盤	495 (71.9)
使用手腕承托器	24 (3.5)
使用文件架	123 (17.9)

表十：辦公室人員的工作姿勢

辦公室人員的工作姿勢	數目 (%)
操作鍵盤時肘關節的屈曲度為: 90°	280 (40.7)
大於90°	82 (11.9)
小於90°	326 (47.4)
坐時膝關節的屈曲度為: 90°	468 (68.0)
大於90°	170 (24.7)
小於90°	50 (7.3)
注視螢光幕時: 挺直姿勢	267 (38.8)
向前傾	261 (37.9)
向後傾	160 (23.3)
螢光幕的位置: 於視線水平	453 (65.8)
高於視線水平	65 (9.4)
低於視線水平	170 (24.7)
螢光幕位於: 正前方	262 (38.1)
右側	190 (27.6)
左側	236 (34.3)

三. 影響辦公室工作人員感覺肌腱不適的因素

通過多元邏輯性回歸分析和逐步邏輯回歸的篩選過程，找出顯著影響辦公室人員肌腱不適的一系列因素。正如表十二顯示，影響辦公室人員在過去一年的頸部不適的主要因素是工作量的多少、注視螢光幕的姿勢和螢光幕放置的位置。在過去一年覺得工作量過重的人員，他們的頸部不適是其他人的1.7倍，可信區間為1.16-2.51。注視電腦螢光幕時採取前傾或後傾的人比採取挺直姿勢的人更有可能(1.6倍)產生頸部不適，而螢光幕放置於正前方比放置於左或右方，亦影響頸部的不適。

女性比男性更多投訴肩膊不適(1.6倍，可信區間1.06-2.39)，而工作量重持續影響各個部位的肌腱不適，包括肩膊、肘關節、手腕、背部和眼睛。電腦螢光幕放置於正前方亦影響肩膊的不適。使用文件架可以減輕前臂的不適，不用文件架的辦公室人員比對使用者更易患前臂不適(2.4倍，可信區間為0.98-5.75)。工作椅是否有手靠影響手腕和手指的徵狀(分別是1.6和2.2倍)，女性比男性更易有腰背和肩膊不適的投訴，相對危險性是1.6。而影響腰痛的還有操作電腦終端機時的姿勢，採取前/後傾坐姿的人比挺直姿勢更易感到腰背不適(1.9倍，可信區間1.31-2.89)。工作量過重以及腿膝空間不足夠顯著地影響眼睛的不適。

工作量過重依然是導致近期肌腱不適症的主要原因。引致頸部不適的其他原因是腿膝空間不夠(相對危險性為2.03)，在統計學上有顯著意義。而導致肩膊不適的原因有多種，分別與性別、腿膝空間是否足夠、螢光幕是否放置得過高以及工作量是否過多等等有顯著的關係。過多工作量者的肘關節疼痛不適發生率是工作量正常的5倍(可信區間為1.88-11.72)，座椅是否可以調校和操作鍵盤時肘關節的屈曲度是手臂肌腱不適的其他主要原因；腿膝空間不足夠亦導致手腕與手指不適。而長時間的工作則是腰部、背部疼痛的主要原因之一。注視螢光幕時的姿勢不正確(前傾或後仰)都會令腰部疼痛不適的發生率增加。

過多的工作量和長時間的工作是引致最近七日感覺眼睛疲勞的主要因素。另外，腿膝空間不足夠以及超過6小時的鍵盤操作與眼睛不適有密切的關係。

表十二 過去一年辦公室工作人員工作的調查

工作體驗	數目 (%)
工作量太重	342 (49.7)
工作時間太長	292 (42.4)
用腦過度	323 (46.9)
工作不受控制	224 (32.6)
同事間欠溝通	54 (7.8)
工作無滿足感	201 (29.2)
缺乏同事的支持	60 (8.7)
擔心失業	131 (19)

四. 辦公室的工作環境

本調查對45間辦公室的工作環境進行了全面的測量。我們在距離螢光幕分別30厘米和50厘米處進行電場及磁場強度的測試(FDA 1984)，電磁波測量表所測得的電腦螢光幕電磁輻射的頻率於10KHz-300KHz之間。從表十四中，我們可以看到從螢光幕所發出的電磁輻射的強度遠低於美國政府工業衛生專家協會所建議的電磁場的衛生標準(ACGIH 1997)。測量所得的室內溫度和相對濕度絕大部分在正常範圍(20°C-26°C)之內，只有某間小型旅行社的辦公室中測得室內溫度為27°C。根據觀察，此辦公室地方狹窄，當時人流甚多，加上正值盛夏，通風並不足夠，令室內溫度達致27°C。

在辦公室環境測量噪音時，我們考慮的是噪音造成的滋擾，而不是噪音引致的職業性失聰。平均來說，被訪的辦公室中，大部分的噪音水平是可以接受。但是某辦公室的噪音水平達83分貝(A)，可對辦公室的工作人員造成滋擾。此結果是從某間旅行社的訂票部測量所得，當時有過百的員工負責接聽訂票電話，較高水平噪音相信是由於大量電話對話時所產生的。

根據勞工處的建議，電腦工作間的桌面照明度應界乎300-500勒克司，而對視力要求較高的工作應有較強的照明度，如繪圖可採用750勒克司。在測量辦公室的照明時，我們不但要考慮到照明度，同時亦顧及其他的重要因素，例如工作性質、一般照明以及局部照明、對比度、眩光等等。調查的結果顯示工作間的桌面照明度平均差別相當

表十三 顯著影響辦公室人員過去一年感到肌腱不適的因素
(經多重回歸分析法的最後模型)

	無不適者	不適者	相對危險度 (R.R.)	統計上顯著意義 (P-Value)	可信區間 (95% C.I.)*
頸部					
工作量正常	177	169			
工作量過重	124	218	1.7058	0.0070	1.16-2.51
注視螢光幕時姿勢挺直	136	130			
注視螢光幕時姿勢前傾或後傾	165	256	1.5662	0.0258	1.06-2.32
電腦螢光幕置於正前方	64	110			
電腦螢光幕置於左或右方	130	153	0.6007	0.0144	0.4-0.9
肩膊					
男	118	116			
女	177	277	1.5938	0.0245	1.06-2.39
工作量正常	180	166			
工作量過重	115	227	2.5720	0.0000	1.74-3.54
電腦螢光幕置於正前方	63	111			
電腦螢光幕置於左或右方	126	157	0.607	0.0168	0.4-0.91
肘關節					
工作量正常	326	20			
工作量過重	300	42	3.249	0.0018	1.55-6.81
前臂					
工作量正常	316	30			
工作量過重	287	55	2.0149	0.0190	1.12-3.62
使用文件架	114	9			
不使用文件架	489	76	2.3803	0.0542	0.98-5.75
手腕					
有使用手靠	199	49			
不使用手靠	335	104	1.6017	0.0553	0.99-2.59
工作量正常	288	58			
工作量過重	246	96	2.3588	0.0004	1.47-3.80
手指					
有使用手靠	218	30			
不使用手靠	352	87	2.2058	0.0056	1.26-3.86
上背					
工作量正常	205	141			
工作量過重	161	181	1.9289	0.006	1.32-2.81
腰背					
男	135	99			
女	221	233	1.6316	0.0172	1.09-2.44
工作量正常	198	148			
工作量過重	158	184	1.6962	0.0065	1.16-2.48
挺直坐姿	160	106			
前傾/後傾坐姿	195	226	1.9476	0.0010	1.31-2.89
眼睛					
腿膝空間足夠	158	398			
腿膝空間不足	21	111	2.1699	0.0386	1.04-4.52
工作量正常	119	227			
工作量過重	60	282	2.3457	0.0002	1.5-3.68

*95% C.I.: 95% Confidence Interval

大，界乎174-903勒克司之間。測量中一些照明度較低的辦公室，主要是由於整個辦公室的照明度並不高，加上工作間的隔板過高，引致桌面的照明度不足夠，銀行的辦公室普遍測得較高的照明度，這由於銀行工作需要高度的準確性加上整個辦公室的照明度亦比較充足所致。不適當的工作間照明度是否與辦公室人員的眼睛疲勞不適的高發生率相關，值得進一步探討。

討論

這是一個頗大規模的辦公室工作環境和電腦操作員的職業健康的調查，為了取得有代表性的樣本，減少抽樣的誤差，我們增加了隨機樣本的數目以便能夠成功地取得足夠的樣本。結果顯示樣本來自不同規模的公司和不同職位的辦公室人員，甚具代表性。

本調查採用面對面的個人訪問形式，很多研究證明個人訪問可以

表十四：四十五間辦公室工作環境因素測量結果

	平均	標準差	最低值	最高值	建議之職業衛生標準
電腦螢光幕電磁輻射					
距離50cm電場強度(V/m)	0.38	0.29	0.08	1.48	電場強度: 614V/m
距離30cm電場強度(V/m)	1.25	1.17	0.14	5.45	磁場強度: 16.3/f in MHz (A/m) (ACGIH 1997)
距離50cm磁場強度(mA/m)	14.21	10.89	1.76	60.82	
距離30cm磁場強度(mA/m)	37.23	25.21	6.86	130.08	
室內溫度 (攝氏)	24.23	1.25	20	27	20°C-26°C (勞工處)
相對濕度 (百分比)	53.6	5.43	43	70	40%-70% (勞工處)
噪音度數 (分貝(A))	58.61	5.86	43.7	82.7	
照明 (勒克司)	411.04	165.96	174	903	300-500 Lux (勞工處)

收集到比信訪和電話訪問更充足而全面的資料。然而，個人訪問亦有其缺點，例如可因訪問者問問題和紀錄時的個人傾向或提示而產生偏差，另外，被訪者為了取悅於訪問者，而作出他認為是正確而與事實不符的回答。為了避免訪問者之間的差誤，在調查之前，問卷盡量口語化及標準化，所有訪問者均經過適當的訓練。

本調查的另一局限性是問卷中的身體各部位肌腱不適是根據被訪者的主訴徵狀，未經過嚴格的醫學診斷。鑑於本調查的目標和性質根據徵狀進行分析，從而找出相關的因素。

我們對所收集的資料進行多元邏輯回歸分析(Multiple Logistic Regression)和逐步邏輯回歸分析(Stepwise Logistic Regression)，以探討身體不同部分肌腱不適與工作環境、辦公室人員的個人特性、職業、經驗、電腦終端機操作之工作姿勢、工作量和心理壓力之間的關係。我們可以看到辦公室人員的年齡、所屬的行業、所擔任的職業和從業的經驗與各種徵狀並沒有明顯的關係，反而可以看到工作量過重及時間過長顯著地影響身體各部位肌腱在最近一週及過去一年的徵狀。

辦公室傢俬的特徵例如工作椅是否有手靠、是否使用腳踏和文件架等亦顯著地影響上肢至頸部的不適。另外，電腦螢光幕放置的地方亦與頸部和肩膊徵狀相關。這次調查亦進一步證明操作電腦終端機時，採用前傾或後傾的姿勢將引致頸部及腰背的不適。一些研究指出女性比男性更易患累積性創傷疾患，在我們的調查中，女性明顯地比男性更易感到肩膊及腰背不適。雖然影響過去七天的肌腱不適的原因不太相同，但是工作量過重依然顯著地影響近期各個部份的肌腱不適。另外，工作的姿勢，例如操作鍵盤時是否保持身體挺直，辦公室傢俬的擺設，例如螢光幕的位置是否過高，腿膝空間不足夠，座椅是否可以調校，肘屈曲是否能保持在90°有關。

此次調查的重要啟示，是改善辦公室人員的職業健康，減少發生與工作有關的肌腱毛病，最重要的是管理階層要適當地安排工作，以免工作人員有過多的工作量及過長的工作時間。過量的工作使電腦終端機操作員須作出長時間重複性的動作，而且也在生理上甚至心理上造成壓力。這調查結果顯示相當大部份人在工作中感覺眼睛疲勞或視力模糊，這是否與工作的環境中的照明度不適當有關值得我們作進一步研究。

工作環境和辦公室傢俬的改善是另一個重要的因素，一些簡而易行的改善措施可能已可大大降低辦公室人員的肌腱不適的發生，例如增加工作椅的手靠、應用文件架、增加工作桌下的腿膝空間以及應用腳踏等。

最後，教導電腦操作員以正確的姿勢操作電腦終端機亦是不可忽視的因素，如果能以挺直的坐姿操作電腦終端機，那麼患上頸部和腰背痛的機會就會大大降低。

此次調查為探討辦公室工作環境和電腦終端機操作者的職業健康問題提供了許多重要的資料，數據反映了工作環境、辦公室傢私、工作量及長時間的工作是導致肌腱不適的主要因素。目前這個研究還不能提供足夠的資料以斷定職業性累積性創傷疾患的成因及其如何預防和治療。

職安局將與香港理工大學康復治療學系以及中文大學骨科及創傷學系合作，展開一連串的研究項目，以進一步理解累積性創傷疾患的病因、診斷、預防及治療，提高辦公室人員的職業健康水平。

Record 1 of 1 - OSH-CD Part A
TI: The Health and Safety (Display Screen Equipment) Regulations 1992
ED: Made 5th November 1992. Laid before Parliament 16th November 1992. Coming into force 1st January 1993
PB: London : HMSO 1992
PY: 1992
SE: Statutory Instruments; SI 1992/2792. HEALTH AND SAFETY
[One of the so called 'six-pack' regulations].
IS: ISBN 011025919X
NT: œ1.90 net

Printed in the United Kingdom for HMSO
829 WO2010 C3 11/92 452 7102 O/N 179361
GP: LU-UK-legislation
SC: SIN Statutory-Instruments
UD: 199301
AN: 02592

The Secretary of State, in exercise of the powers conferred on her by sections 15(1), (2), (5)(b) and (9) and 82(3)(a) of, and paragraphs 1(1)(a) and (c) and (2), 7, 8(1), 9 and 14 of Schedule 3 to, the Health and Safety at Work etc. Act 1974 {1974 c.37; sections 15(1) and 50(3) were amended by the Employment Protection Act 1975 (c.71), Schedule 15, paragraphs 6 and 16(3) respectively.} and of all other powers enabling her in that behalf and for the purpose of giving effect without modifications to proposals submitted to her by the Health and Safety Commission under section 11(2)(d) of the said Act after the carrying out by the said Commission of consultations in accordance with section 50(3) of that Act, hereby makes the following Regulations:
Citation, commencement, interpretation and application

1.--(1) These Regulations may be cited as the Health and Safety (Display Screen Equipment) Regulations 1992 and shall come into force on 1st January 1993.
(2) In these Regulations-
(a) "display screen equipment" means any alphanumeric or graphic display screen, regardless of the display process involved;
(b) "operator" means a self-employed person who habitually uses display screen equipment as a significant part of his normal work;
(c) "use" means use for or in connection with work;
(d) "user" means an employee who habitually uses display screen equipment as a significant part of his normal work; and
(e) "workstation" means an assembly comprising-
(i) display screen equipment (whether provided with software determining the interface between the equipment and its operator or user, a keyboard or any other input device),
(ii) any optional accessories to the display screen equipment,
(iii) any disk drive, telephone, modem, printer, document holder, work chair, work desk, work surface or other item peripheral to the display screen equipment, and
(iv) the immediate work environment around the display screen equipment.
(3) Any reference in these Regulations to-
(a) a numbered regulation is a reference to the regulation in these Regulations so numbered; or
(b) a numbered paragraph is a reference to the paragraph so numbered in the regulation in which the reference appears.
(4) Nothing in these Regulations shall apply to or in relation to-
(a) drivers' cabs or control cabs for vehicles or machinery;
(b) display screen equipment on board a means of transport;
(c) display screen equipment mainly intended for public operation;
(d) portable systems not in prolonged use;

(e) calculators, cash registers or any equipment having a small data or measurement display required for direct use of the equipment; or
(f) window typewriters.

Analysis of workstations

2.—(1) Every employer shall perform a suitable and sufficient analysis of those workstations which-
(a) (regardless of who has provided them) are used for the purposes of his undertaking by users; or
(b) have been provided by him and are used for the purposes of his undertaking by operators,
for the purpose of assessing the health and safety risks to which those persons are exposed in consequence of that use.
(2) Any assessment made by an employer in pursuance of paragraph (1) shall be reviewed by him if-
(a) there is reason to suspect that it is no longer valid; or
(b) there has been a significant change in the matters to which it relates;
and where as a result of any such review changes to an assessment are required, the employer concerned shall make them.
(3) The employer shall reduce the risks identified in consequence of an assessment to the lowest extent reasonably practicable.
(4) The reference in paragraph (3) to "an assessment" is a reference to an assessment made by the employer concerned in pursuance of paragraph (1) and changed by him where necessary in pursuance of paragraph (2).

Requirements for workstations

3.—(1) Every employer shall ensure that any workstation first put into service on or after 1st January 1993 which-
(a) (regardless of who has provided it) may be used for the purposes of his undertaking by users; or
(b) has been provided by him and may be used for the purposes of his undertaking by operators,
meets the requirements laid down in the Schedule to these Regulations to the extent specified in paragraph 1 thereof.
(2) Every employer shall ensure that any workstation first put into service on or before 31st December 1992 which-
(a) (regardless of who provided it) may be used for the purposes of his undertaking by users; or
(b) was provided by him and may be used for the purposes of his undertaking by operators,
meets the requirements laid down in the Schedule to these Regulations to the extent specified in paragraph 1 thereof not later than 31st December 1996.

Daily work routine of users

4. Every employer shall so plan the activities of users at work in his undertaking that their daily work on display screen equipment is periodically interrupted by such breaks or changes of activity as reduce their workload at that equipment.

Eyes and eyesight

5.-(1) Where a person-
(a) is already a user on the date of coming into force of these Regulations; or
(b) is an employee who does not habitually use display screen equipment as a significant part of his normal work but is to become a user in the undertaking in which he is already employed,
his employer shall ensure that he is provided at his request with an appropriate eye and eyesight test, any such test to be carried out by a competent person.
(2) Any eye and eyesight test provided in accordance with paragraph (1) shall-
(a) in any case to which sub-paragraph (a) of that paragraph applies, be carried out as soon as practicable after being requested by the user concerned; and
(b) in any case to which sub-paragraph (b) of that paragraph applies, be carried out before the employee concerned becomes a user.
(3) At regular intervals after an employee has been provided with an eye and eyesight test in accordance with paragraphs (1) and (2), his employer shall, subject to paragraph (6), ensure that he is provided with a

further eye and eyesight test of an appropriate nature, any such test to be carried out by a competent person.
(4) Where a user experiences visual difficulties which may reasonably be considered to be caused by work on display screen equipment, his employer shall ensure that he is provided at his request with an appropriate eye and eyesight test, any such test to be carried out by a competent person as soon as practicable after being requested as aforesaid.
(5) Every employer shall ensure that each user employed by him is provided with special corrective appliances appropriate for the work being done by the user concerned where-
(a) normal corrective appliances cannot be used; and
(b) the result of any eye and eyesight test which the user has been given in accordance with this regulation shows such provision to be necessary.
(6) Nothing in paragraph (3) shall require an employer to provide any employee with an eye and eyesight test against that employee's will.
Provision of training

6.—(1) Where a person-
(a) is already a user on the date of coming into force of these Regulations; or
(b) is an employee who does not habitually use display screen equipment as a significant part of his normal work but is to become a user in the undertaking in which he is already employed,
his employer shall ensure that he is provided with adequate health and safety training in the use of any workstation upon which he may be required to work.
(2) Every employer shall ensure that each user at work in his undertaking is provided with adequate health and safety training whenever the organisation of any workstation in that undertaking upon which he may be required to work is substantially modified.
Provision of information

7.--(1) Every employer shall ensure that operators and users at work in his undertaking are provided with adequate information about-
(a) all aspects of health and safety relating to their workstations; and
(b) such measures taken by him in compliance with his duties under regulations 2 and 3 as relate to them and their work.
(2) Every employer shall ensure that users at work in his undertaking are provided with adequate information about such measures taken by him in compliance with his duties under regulations 4 and 6(2) as relate to them and their work.
(3) Every employer shall ensure that users employed by him are provided with adequate information about such measures taken by him in compliance with his duties under regulations 5 and 6(1) as relate to them and their work.
Exemption certificates

8.--(1) The Secretary of State for Defence may, in the interests of national security, exempt any of the home forces, any visiting force or any headquarters from any of the requirements imposed by these Regulations.
(2) Any exemption such as is specified in paragraph (1) may be granted subject to conditions and to a limit of time and may be revoked by the Secretary of State for Defence by a further certificate in writing at any time.
(3) In this regulation-
(a) "the home forces" has the same meaning as in section 12(1) of the Visiting Forces Act 1952; {1952 c.7.}
(b) "headquarters" has the same meaning as in article 3(2) of the Visiting Forces and International Headquarters (Application of Law) Order 1965; {S.I. 1965/1536, to which there are amendments not relevant to these Regulations.} and
(c) "visiting force" has the same meaning as it does for the purposes of any provision of Part I of the Visiting Forces Act 1952.
Extension outside Great Britain

9. These Regulations shall, subject to regulation 1(4), apply to and in relation to the premises and activities outside Great Britain to which sections 1 to 59 and 80 to 82 of the Health and Safety at Work etc. Act 1974 apply by virtue of the Health and Safety at Work etc. Act 1974 (Application Outside Great Britain) Order 1989 {S.I. 1989/840.} as they apply within Great Britain.

Signed by order of the Secretary of State.

Patrick McLoughlin
Parliamentary Under Secretary of State,
Department of Employment.

5th November 1992

THE SCHEDULE Regulation 3

(WHICH SETS OUT THE MINIMUM REQUIREMENTS FOR WORKSTATIONS WHICH ARE CONTAINED IN THE ANNEX TO COUNCIL DIRECTIVE 90/270/EEC ON THE MINIMUM SAFETY AND HEALTH REQUIREMENTS FOR WORK WITH DISPLAY SCREEN EQUIPMENT) {OJ No. L156, 21.6.90, p.14.}

1. Extent to which employers must ensure that workstations meet the requirements laid down in this schedules

An employer shall ensure that a workstation meets the requirements laid down in this Schedule to the extent that-

(a) those requirements relate to a component which is present in the workstation concerned;

(b) those requirements have effect with a view to securing the health, safety and welfare of persons at work; and

(c) the inherent characteristics of a given task make compliance with those requirements appropriate as respects the workstation concerned.

2. Equipment

(a) GENERAL COMMENT

The use as such of the equipment must not be a source of risk for operators or users.

(b) DISPLAY SCREEN

The characters on the screen shall be well-defined and clearly formed, of adequate size and with adequate spacing between the characters and lines.

The image on the screen should be stable, with no flickering or other forms of instability.

The brightness and the contrast between the characters and the background shall be easily adjustable by the operator or user, and also be easily adjustable to ambient conditions.

The screen must swivel and tilt easily and freely to suit the needs of the operator or user.

It shall be possible to use a separate base for the screen or an adjustable table.

The screen shall be free of reflective glare and reflections liable to cause discomfort to the operator or user.

(c) KEYBOARD

The keyboard shall be tiltable and separate from the screen so as to allow the operator or user to find a comfortable working position avoiding fatigue in the arms or hands.

The space in front of the keyboard shall be sufficient to provide support for the hands and arms of the operator or user.

The keyboard shall have a matt surface to avoid reflective glare.

The arrangement of the keyboard and the characteristics of the keys shall be such as to facilitate the use of the keyboard.

The symbols on the keys shall be adequately contrasted and legible from the design working position.

(d) WORK DESK OR WORK SURFACE

The work desk or work surface shall have a sufficiently large, low-reflectance surface and allow a flexible arrangement of the screen, keyboard, documents and related equipment.

The document holder shall be stable and adjustable and shall be positioned so as to minimise the need for uncomfortable head and eye movements.

There shall be adequate space for operators or users to find a comfortable position.

(e) WORK CHAIR

The work chair shall be stable and allow the operator or user easy freedom of movement and a comfortable position.
The seat shall be adjustable in height.
The seat back shall be adjustable in both height and tilt.
A footrest shall be made available to any operator or user who wishes one.
3. Environment

(a) SPACE REQUIREMENTS
The workstation shall be dimensioned and designed so as to provide sufficient space for the operator or user to change position and vary movements.
(b) LIGHTING
Any room lighting or task lighting provided shall ensure satisfactory lighting conditions and an appropriate contrast between the screen and the background environment, taking into account the type of work and the vision requirements of the operator or user.
Possible disturbing glare and reflections on the screen or other equipment shall be prevented by co-ordinating workplace and workstation layout with the positioning and technical characteristics of the artificial light sources.
(c) REFLECTIONS AND GLARE
Workstations shall be so designed that sources of light, such as windows and other openings, transparent or translucid walls, and brightly coloured fixtures or walls cause no direct glare and no distracting reflections on the screen.
Windows shall be fitted with a suitable system of adjustable covering to attenuate the daylight that falls on the workstation.
(d) NOISE
Noise emitted by equipment belonging to any workstation shall be taken into account when a workstation is being equipped, with a view in particular to ensuring that attention is not distracted and speech is not disturbed.
(e) HEAT
Equipment belonging to any workstation shall not produce excess heat which could cause discomfort to operators or users.
(f) RADIATION
All radiation with the exception of the visible part of the electromagnetic spectrum shall be reduced to negligible levels from the point of view of the protection of operators' or users' health and safety.
(g) HUMIDITY
An adequate level of humidity shall be established and maintained.
4. Interface between computer and operator/user

In designing, selecting, commissioning and modifying software, and in designing tasks using display screen equipment, the employer shall take into account the following principles:
(a) software must be suitable for the task;
(b) software must be easy to use and, where appropriate, adaptable to the level of knowledge or experience of the operator or user; no quantitative or qualitative checking facility may be used without the knowledge of the operators or users;
(c) systems must provide feedback to operators or users on the performance of those systems;
(d) systems must display information in a format and at a pace which are adapted to operators or users;
(e) the principles of software ergonomics must be applied, in particular to human data processing.
EXPLANATORY NOTE

(THIS NOTE IS NOT PART OF THE REGULATIONS)
1. Subject to the exception specified in paragraph 2 below, these Regulations give effect as respects Great Britain to the substantive provisions of Council Directive 90/270/EEC on the minimum safety and health requirements for work with display screen equipment (OJ No. L156, 21.6.90, p.14).
2. These Regulations do not purport to give effect to paragraphs 2 and 4 of article 9 of the Directive specified in paragraph 1 above.

3. Regulation 2 requires each employer-
(a) to make a suitable and sufficient analysis of those workstations which-
(i) (regardless of who has provided them) are used for the purposes of his undertaking by users, or
(ii) have been provided by him and are used for the purposes of his undertaking by operators;
(b) to assess the health and safety risks to which those operators or users are exposed in consequence of that use;
(c) to reduce those risks to the lowest extent reasonably practicable; and
(d) in the circumstances specified in paragraph (2) of that regulation, to review (and where necessary change) any assessment such as is referred to in sub-paragraph (b) above.
4. Regulation 1(2) defines not only the words "operator", "user" and "workstation", but also the phrase "display screen equipment".
5. Regulation 3 requires each employer to ensure that any workstation which-
(a) (regardless of who has provided it) may be used for the purposes of his undertaking by users; or
(b) has been provided by him and may be used for the purposes of his undertaking by operators,
meets the requirements laid down in the Schedule to these Regulations. In the case of workstations first put into service on or before 31st December 1992, the employer has until 31st December 1996 to ensure compliance with the above-mentioned requirements.
6. Regulation 4 requires each employer to plan the activities of users at work in his undertaking in such a way that their daily work on display screen equipment is periodically interrupted by such breaks or changes of activity as reduce their workload at that equipment.
7. Regulation 5 requires each employer to ensure that users employed by him are provided-
(a) with initial eye and eyesight tests on request;
(b) at regular intervals thereafter and with the consent of the users concerned, with subsequent eye and eyesight tests;
(c) with additional eye and eyesight tests on request, where the users concerned are experiencing visual difficulties which might reasonably be considered to be caused by work on display screen equipment; and
(d) with appropriate special corrective appliances, where normal corrective appliances cannot be used and any eye and eyesight tests carried out on the users concerned in accordance with regulation 5 show such provision to be necessary.
8. Regulation 6 requires each employer to ensure that-
(a) users employed by him are provided with adequate health and safety training in the use of their workstations; and
(b) users at work in his undertaking are provided with adequate health and safety training whenever their workstations are substantially modified.
9. Regulation 7 requires each employer to ensure that operators and users at work in his undertaking are provided with adequate health and safety information, both about their workstations and about such measures taken by him to comply with regulations 2 to 6 of these Regulations as relate to them and their work.
10. Regulation 8 enables the Secretary of State for Defence to grant certificates of exemption from these Regulations in the interests of national security.
11. Regulation 9 extends the application of these Regulations to and in relation to certain premises and activities outside Great Britain.

Federal Register

Tuesday,
November 14, 2000

Part II

Department of Labor

Occupational Safety and Health Administration

29 CFR Part 1910
Ergonomics Program; Final Rule

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket No. S–777]

RIN 1218–AB36

Ergonomics Program

AGENCY: Occupational Safety and Health Administration (OSHA), Department of Labor.

ACTION: Final rule.

SUMMARY: The Occupational Safety and Health Administration is issuing a final Ergonomics Program standard (29 CFR 1910.900) to address the significant risk of employee exposure to ergonomic risk factors in jobs in general industry workplaces. Exposure to ergonomic risk factors on the job leads to musculoskeletal disorders (MSDs) of the upper extremities, back, and lower extremities. Every year, nearly 600,000 MSDs that are serious enough to cause time off work are reported to the Bureau of Labor Statistics by general industry employers, and evidence suggests that an even larger number of non-lost worktime MSDs occur in these workplaces every year.

The standard contains an "action trigger," which identifies jobs with risk factors of sufficient magnitude, duration, or intensity to warrant further examination by the employer. This action trigger acts as a screen. When an employee reports an MSD, the employer must first determine whether the MSD is an MSD incident, defined by the standard as an MSD that results in days away from work, restricted work, medical treatment beyond first aid, or MSD symptoms or signs that persist for 7 or more days. Once this determination is made, the employer must determine whether the employee's job has risk factors that meet the standard's action trigger. The risk factors addressed by this standard include repetition, awkward posture, force, vibration, and contact stress. If the risk factors in the employee's job do not exceed the action trigger, the employer does not need to implement an ergonomics program for that job.

If an employee reports an MSD incident and the risk factors of that employee's job meet the action trigger, the employer must establish an ergonomics program for that job. The program must contain the following elements: hazard information and reporting, management leadership and employee participation, job hazard analysis and control, training, MSD management, and program evaluation. The standard provides the employer with several options for evaluating and controlling risk factors for jobs covered by the ergonomics program, and provides objective criteria for identifying MSD hazards in those jobs and determining when the controls implemented have achieved the required level of control.

The final standard would affect approximately 6.1 million employers and 102 million employees in general industry workplaces, and employers in these workplaces would be required over the ten years following the promulgation of the standard to control approximately 18 million jobs with the potential to cause or contribute to covered MSDs. OSHA estimates that the final standard would prevent about 4.6 million work-related MSDs over the next 10 years, have annual benefits of approximately $9.1 billion, and impose annual compliance costs of $4.5 billion on employers. On a per-establishment basis, this equals approximately $700; annual costs per problem job fixed are estimated at $250.

DATES: This final rule becomes effective on January 16, 2001.

Compliance. Start-up dates for specific provisions are set in paragraph (w) of § 1910.900. However, affected parties do not have to comply with the information collection requirements in the final rule until the Department of Labor publishes in the **Federal Register** the control numbers assigned by the Office of Management and Budget (OMB). Publication of the control numbers notifies the public that OMB has approved these information collection requirements under the Paperwork Reduction Act of 1995.

ADDRESSES: In compliance with 28 U.S.C. 2112(a), the Agency designates the Associate Solicitor for Occupational Safety and Health, Office of the Solicitor, Room S–4004, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210, as the recipient of petitions for review of the standard.

FOR FURTHER INFORMATION CONTACT: OSHA's Ergonomics Team at (202) 693–2116, or visit the OSHA Homepage at www.osha.gov.

SUPPLEMENTARY INFORMATION:

Table of Contents

The preamble and standard are organized as follows:

References to documents, studies, and materials in the rulemaking record are found throughout the text of the preamble. Materials in the docket are identified by their Exhibit numbers, as follows: "Ex. 26–1" means Exhibit 26–1 in Docket S–777. A list of the Exhibits and copies of the Exhibits are available in the OSHA Docket Office.

I. Introduction

A. Overview

This preamble discusses the data and events that led OSHA to issue the final Ergonomics Program standard (Section II), and the Agency's legal authority for promulgating the rule (Section III). This discussion is followed by a detailed paragraph-by-paragraph summary and explanation of the final rule, including the Agency's reasons for including each provision and OSHA's responses to the many substantive issues that were raised in the proposal and during the rulemaking (Section IV).

The summary and explanation of the standard is followed by a lengthy discussion of the evidence on the health effects that are associated with worker exposure to MSD hazards (Section V). The next section discusses the nature and degree of ergonomic-related risks confronting workers in general industry jobs (Section VI), and assesses the significance of those risks (Section VII). The preamble also contains a summary of the Final Economic and Final Regulatory Flexibility Analysis (Section VIII). Finally, the preamble describes the information collections associated with the final standard (Section XV).

B. The Need for an Ergonomics Program Standard

Work-related musculoskeletal disorders (MSDs) currently account for one-third of all occupational injuries and illnesses reported to the Bureau of Labor Statistics (BLS) by employers every year. Although the number of MSDs reported to the BLS, like all occupational injuries and illnesses, has ~~declined by more than 20% since 1992~~,

Table W-1 - Basic Screening Tool

You need only review risk factors for those areas of the body affected by the MSD incident.

		Body Part Associated With MSD Incident			
Risk Factors This Standard Covers	**Performing job or tasks that involve:**	Neck/ Shoulder	Hand/ Wrist/ Arm	Back/ Trunk/ Hip	Leg/ knee/ Ankle
Repetition	(1) Repeating the same motions every few seconds or repeating a cycle of motions involving the affected body part more than twice per minute for more than 2 consecutive hours in a workday.	√	√	√	√
→	(2) Using an input device, such as a keyboard and/or mouse, in a steady manner for more than 4 hours total in a workday.	√	√		
Force	(3) Lifting more than 75 pounds at any one time; more than 55 pounds more than 10 times per day; or more than 25 pounds below the knees, above the shoulders, or at arms' length more than 25 times per day;	√	√	√	√
	(4) Pushing/pulling with more than 20 pounds of initial force (e.g., equivalent to pushing a 65 pound box across a tile floor or pushing a shopping cart with five 40 pound bags of dog food) for more than 2 hours total per day;	√	√	√	√
	(5) Pinching an unsupported object weighing 2 or more pounds per hand, or use of an equivalent pinching force (e.g., holding a small binder clip open) for more than 2 hours total per day;		√		
	(6) Gripping an unsupported object weighing 10 pounds or more per hand, or use of an equivalent gripping force (e.g., crushing the sides of an aluminum soda can with one hand), for more than 2 hours total per day.		√		

Appendix D-2 to §1910.900: VDT Workstation Checklist

Using this checklist is one, but not the only, way an employer can comply with the requirement to identify, analyze and control MSD hazards in VDT tasks. This checklist does not require that employees assume specific working postures in order for the employer to be in compliance. Rather, employers will be judged to be in compliance with paragraph (k) and (m) of OSHA's standard if they provide the employee with a VDT workstation is arranged or designed in a way that would pass this checklist.

If employee exposure does not meet the levels indicated by the Basic Screening Tool, you may STOP HERE.

WORKING CONDITIONS **The workstation is designed or arranged for doing VDT tasks so it allows the employee's . . .**	Y	N
A. Head and **neck** to be about upright (not bent down/back).		
B. Head, neck and **trunk** to face forward (not twisted).		
C. Trunk to be about perpendicular to floor (not leaning forward/backward).		
D. Shoulders and **upper arms** to be about perpendicular to floor (not stretched forward) and relaxed (not elevated).		
E. Upper arms and **elbows** to be close to body (not extended outward).		
F. Forearms, wrists, and **hands** to be straight and parallel to floor (not pointing up/down).		
G. Wrists and **hands** to be straight (not bent up/down or sideways toward little finger).		
H. Thighs to be about parallel to floor and **lower legs** to be about perpendicular to floor.		
I. Feet to rest flat on floor or be supported by a stable footrest.		
→ **J. VDT tasks** to be organized in a way that allows employee to vary VDT tasks with other work activities, or to take micro-breaks or recovery pauses while at the VDT workstation.		
SEATING **The chair . . .**	Y	N
1. Backrest provides support for employee's lower back (lumbar area).		
2. Seat width and **depth** accommodate specific employee (seatpan not too big/small).		
3. Seat front does not press against the back of employee's knees and lower legs (seatpan not too long).		
4. Seat has cushioning and is rounded/ has "waterfall" front (no sharp edge).		
5. Armrests support both forearms while employee performs VDT tasks and do not interfere with movement.		

KEYBOARD/INPUT DEVICE **The keyboard/input device is designed or arranged for doing VDT tasks so that . . .**	Y	N
6. **Keyboard/input device platform(s)** is stable and large enough to hold keyboard and input device.		
7. **Input device** (mouse or trackball) is located right next to keyboard so it can be operated without reaching.		
8. **Input device** is easy to activate and shape/size fits hand of specific employee (not too big/small).		
9. **Wrists** and **hands** do not rest on sharp or hard edge.		
MONITOR **The monitor is designed or arranged for VDT tasks so that . . .**	Y	N
10 .**Top line** of screen is at or below eye level so employee is able to read it without bending head or neck down/back. (For employees with bifocals/trifocals, see next item.)		
11. **Employee with bifocals/trifocals** is able to read screen without bending head or neck backward.		
12. **Monitor distance** allows employee to read screen without leaning head, neck or trunk forward/backward.		
13. **Monitor position** is directly in front of employee so employee does not have to twist head or neck.		
14. **No glare** (e.g., from windows, lights) is present on the screen which might cause employee to assume an awkward posture to read screen.		
WORK AREA **The work area is designed or arranged for doing VDT tasks so that . . .**	Y	N
15. **Thighs** have clearance space between chair and VDT table/keyboard platform (thighs not trapped).		
16. **Legs** and **feet** have clearance space under VDT table so employee is able to get close enough to keyboard/input device.		
ACCESSORIES	Y	N
17. **Document holder**, if provided, is stable and large enough to hold documents that are used.		
18. **Document holder**, if provided, is placed at about the same height and distance as monitor screen so there is little head movement when employee looks from document to screen.		
19. **Wrist rest**, if provided, is padded and free of sharp and square edges.		
20. **Wrist rest**, if provided, allows employee to keep forearms, wrists and hands straight and parallel to ground when using keyboard/input device.		
21. **Telephone** can be used with head upright (not bent) and shoulders relaxed (not elevated) if employee does VDT tasks at the same time.		

GENERAL	Y	N
22. Workstation and equipment have sufficient adjustability so that the employee is able to be in a safe working posture and to make occasional changes in posture while performing VDT tasks.		
23. VDT Workstation, equipment and accessories are maintained in serviceable condition and function properly.		
PASSING SCORE = "YES" answer on all "working postures" items (A-J) and no more than two "NO" answers on remainder of checklist (1-23).		

Office Ergonomics

2nd Edition

Prepared by the Canadian Centre for Occupational Health and Safety

Canada

1. What is an Office Ergonomics Program?

An office ergonomics program is a systematic approach and a management system to reduce risk from ergonomic hazards. The program must:

- have the support of senior management;
- carry the signature of the highest authority;
- clearly state its objectives and rationale;
- give the steps to be followed and their sequence;
- assign authority, responsibility and deadline for each step.

An office ergonomics program includes the following basic components:

- Hazard identification: worksite evaluation
- Implementation of solutions: improving workplace conditions and work practices
- Training and education of employees: empowering employees to work safely
- Evaluation of the effectiveness of solutions
- Continuous improvement of the program for better results

There is no universal ergonomics program that applies to all workplaces. A suitable program is one which is tailored to meet specific needs of a particular workplace by taking into account production requirements, staff capabilities and the risk of losses due to RMI.

2. How to Identify Ergonomic Hazards

The recognition of ergonomic hazards is important to their prevention. This involves identifying conditions and practices where improvements need to be made.

The hazard recognition process should be coordinated by a team. The members of the team should be representatives of management and workers, health and safety specialists, and engineers, if feasible.

Hazard recognition is an ongoing process. It includes the following steps:

1. Find existing or potential RMI problems at their earliest stages. A good strategy entails, among other things, the use of health surveys and checklists.
2. Ask people specific questions about their health as it relates to their work. (See Appendix A1 for a sample Ergonomics Survey Questionnaire).
3. Repeat a health survey every six months or annually, to monitor whether the RMI situation is getting better or worse. This is especially important if we have made any changes to reduce the risks of RMIs. (See Appendix A2)
4. Use checklists to help identify the features in jobs and workplaces that are potential risk factors for RMIs. (See Appendix A3 for a sample checklist). A checklist may not cover all the problems encountered, but will provide a basis for action. Customize existing checklists to meet the specific needs of different jobs and workplaces.

contributes to stress and alienates people from their work and social environment.

The space allocated to work should encompass more than merely the dimensions of the workstation. It should also allow a person to move around freely and permit interpersonal contact without forcing one person to invade another's personal space.

Organizational Position	Conventional Offices	Open-plan Offices
	in square meters (square feet)	
Executive	28-45 (300-500)	35 (400)
Middle-management Supervisor	9-28 (100-300)	7.5-22 (80-244)
Clerical and support staff	5.5-7 (60-75)	4 (45)/minimum

Source: CCOHS

These guidelines, however, do not take into account the human psychological need for space, and for that reason it may be suitable for the lower values for clerical and support staff to be increased by a factor of 20%.

Work Organization

Work organization determines what jobs we do and how we do them. A good work organization fits tasks to our physical and mental needs. It gives us the flexibility to vary body positions and reduces the time we spend doing the same repetitive or forceful movements. Important components of good work organization are:

- work pace
- work breaks
- rest breaks
- adjustment periods
- training and education

Task Variety

There are at least three ways to vary tasks within a job:

- Job rotation—People move from one task to another according to a schedule.
- Job enlargement—More variety is added to the job.
- Team work—People form a team and each member of the team shares several different tasks.

Work Pace

Too fast a pace of work allows the body little recovery time between repetitive or forceful movements. This increases the risk of developing an RMI.

A good work pace should be determined by the joint efforts of management and workers. Such efforts can help to establish reasonable work quotas, schedules and goals that meet specific needs. Incentive systems that reward workers for the quality of work can also encourage a good work pace. On the other hand, incentives for the amount or quantity of work is likely to increase the risk of error, poor quality and RMI.

Work Breaks

Work breaks are the times when we stop working on one task and start another, allowing us to use different parts of the body. Work breaks can help prevent RMI by allowing us to rest, stretch or change body positions when we need to. For continuous VDT work, a work break of 5 to 15 minutes per hour is generally recommended.

Rest Breaks

Rest breaks are the times we stop working. Besides getting a refreshment, we should use this time to stretch and change body positions.

NATIONAL CODE OF PRACTICE FOR THE PREVENTION OF OCCUPATIONAL OVERUSE SYNDROME [NOHSC:2013 (1994)]

National Code of Practice for the Prevention of Occupational Overuse Syndrome [NOHSC:2013(1994)]

Last update: 17 November 1999

RISK IDENTIFICATION, RISK ASSESSMENT AND RISK CONTROL

5.5 This national code of practice provides guidance on the following three key stages in the process of reducing injuries arising from tasks undertaken in the workplace which involve:

- repetitive or forceful movement or both; and/or
- maintenance of constrained or awkward postures.

The Three Stage Approach to Injury Reduction

- FIRST STAGE: Risk Identification
- SECOND STAGE: Risk Assessment
- THIRD STAGE: Risk Control

[To Up a Level] [To Current TOC] [To Previous Page] [To Next Page]

Last update: 17 November 1999

FIRST STAGE: Risk Identification

The first stage is to identify manual handling tasks which are likely to be a risk to health and safety.

- Analysis of Workplace Injury and Incident Records
- Consultation with Employees
- Direct Observation

[To Up a Level] [To Current TOC] [To Next Page]

Last update: 17 November 1999

SECOND STAGE: Risk Assessment

The second stage is to conduct assessment of particular risk factors.

- Workplalce &Workstation Layout
- Working Posture
- Duration and Frequency of Activity
- Force Applied
- Work Organisation
- Skills and Experience
- Individual Factors

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Last update: 17 November 1999

GUIDANCE NOTE FOR THE PREVENTION OF OCCUPATIONAL OVERUSE SYNDROME IN KEYBOARD EMPLOYMENT [NOHSC:3005 (1996)]

Guidance Note for the Prevention of Occupational Overuse Syndrome in Keyboard Employment [NOHSC:3005 (1996)]

- BIBLIOGRAPHY

Overtime is not recommended because extending the hours of daily keyboard operation increases the risk of occupational overuse syndrome.

Work Pauses/Task Variation

It is desirable for keyboard users to spend part of the working day on alternative duties away from the screen and keyboard. Alternative activities should not be visually exacting or of a static sitting nature. As an example, word processor operators could move away from the keyboard to collect new material, discuss details with authors and collect finished items from the printer on a regular basis.

If there are no suitable alternative work activities, work pauses must be provided.

As noted previously, both physical and psychological factors may be important in the development of occupational overuse syndrome. A number of these factors will influence the need for work pauses:

- the duration and intensity of VDU and keyboard use;
- the maintenance of constrained postures;
- the visual demands;
- psychosocial stressors, including customer liaison, and other sustained mental effort.

The length and frequency of work pauses will depend on the individual, the task and other factors. Frequent short pauses are preferable to infrequent longer pauses.

The need for work pauses, and their frequency and duration, should be determined by management in consultation(1).

Both management and employees need to be aware of the importance of regular work pauses. Supervisors should ensure that operators have appropriate breaks from keyboard work, and that the alternative activities are suitable.

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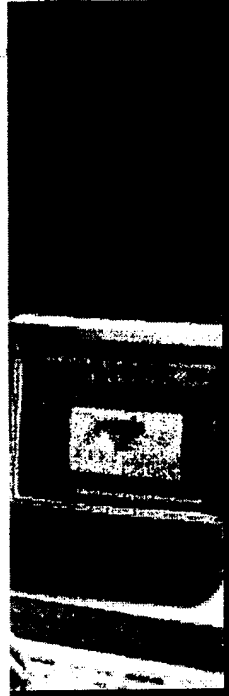
(1) '.. a number of agreements, mainly in the keyboard area, have been negotiated between management and unions which provide for work pauses of up to 10-15 minutes in each hour.' (General Code of Practice)

[To Up a Level] [To Current TOC] [To Previous Page] [To Next Page]

Last update: 17 November 1999



APPROVED CODE OF PRACTICE FOR THE USE OF

VISUAL DISPLAY UNITS

IN THE PLACE OF WORK

OCCUPATIONAL SAFETY & HEALTH SERVICE

DEPARTMENT OF LABOUR

BREAKS

10. Provide opportunities for breaks.

Breaks away from VDU work should be provided to prevent the build-up of fatigue. To be effective, breaks should be short and frequent, and should take place before fatigue occurs.

Where work is screen-intensive, or when the VDU task requires a high degree of concentration, a 10-minute break every hour may be appropriate. For prevention of physical discomfort — muscle aches and pains — micropauses (see below) are preferred.

When an operator takes a break of several minutes, she or he should take a complete break from the VDU work. This may involve doing exercises or other tasks, and should ideally, incorporate the opportunity to move around.

11. Provide for micropauses.

Micropauses are brief pauses for muscle relaxation, built in to the rhythm of the work—a brief pause of 5-10 seconds every 3 minutes. Micropauses are of most value when relaxation is complete, so operators should have training in relaxation. Micropauses take little time out of the working day and add to overall productivity.

STAFF NUMBERS

12. Have enough people to do the job.

This may be an important factor when companies "downsize".

PREGNANCY

13. Consider pregnant operators.

The comfort of pregnant VDU operators should be carefully considered. A transfer to other duties should be considered if the operator wishes to do so and if other duties are available.

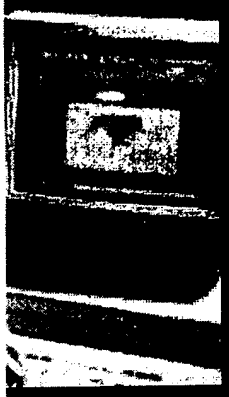
2.4 COMPUTER HARDWARE AND SOFTWARE

This section lists recommendations for the three common items that are part of VDU work — the VDU monitor, the keyboard and the mouse. Alternative devices that provide input to the computer, such as trackballs and the digitiser tablet, and puck are also mentioned briefly.

COMPLIANCE WITH STANDARDS

If your VDU monitor, keyboard and mouse meet the requirements of the appropriate parts of ISO 9241, or a similar standard that provides an equivalent or greater standard of protection for health[1], it will fulfil the requirements of the Health and Safety in Employment Act with regard to the design of this equipment. (ISO 9241 consists of 18 parts. Some are complete, while others are still in development. Appendix B shows the status of the different parts.)

Equipment certified to any standard such as ISO 9241 is tested over a short



PART 4 HOW THIS CODE RELATES TO THE HEALTH AND SAFETY IN EMPLOYMENT ACT

THIS PART CONTAINS

This part of the code outlines the general and specific obligations of employers under the Health and Safety in Employment Act as they apply to the use of visual display units.

The main requirements of the Act are that employers should:

- Design VDU work to be safe, (covered in part 2);
- Use effective, systematic methods to identify and assess any hazards in VDU work faced by each employee;
- Monitor the exposure to the hazard of employees who face any significant hazards from VDU work;
- Monitor the health of employees who face any significant hazards from VDU work (covered in part 3);
- Inform VDU users of all the potential hazards they face; and
- Provide training for the safe use of VDUs.

4.1 INTRODUCTION

The emphasis of the Health and Safety in Employment Act is that employers and others take responsibility for health and safety in places of work under their control. The ultimate purpose of any action addressing VDU health problems at work is the prevention of harm. The absence of harm is the test of any actions taken by employers, who are in the best position to monitor the effects of the preventive efforts they have initiated.

The following is a summary of the obligations imposed. The wording of the Act itself must be consulted in cases of doubt over how the Act applies in any particular case.

GENERAL DUTIES (SECTION 6)

The Act requires employers to take all practicable steps to ensure the safety and health of employees and others while at work.

SPECIFIC DUTIES (SECTION 6A-E)

Employers must take all practicable steps to:

- Provide and maintain a safe working environment;
- Provide and maintain facilities for the safety and health of employees;
- Ensure that machinery and equipment are safe for employees;
- Ensure that working arrangements are not hazardous to employees; and
- Provide procedures to deal with emergencies that may arise while people are at work.

HAZARD MANAGEMENT (SECTIONS 7 - 10)

The Act requires employers to have systems in place for identifying and controlling hazards.

Step 1: Identify hazards (section 7)

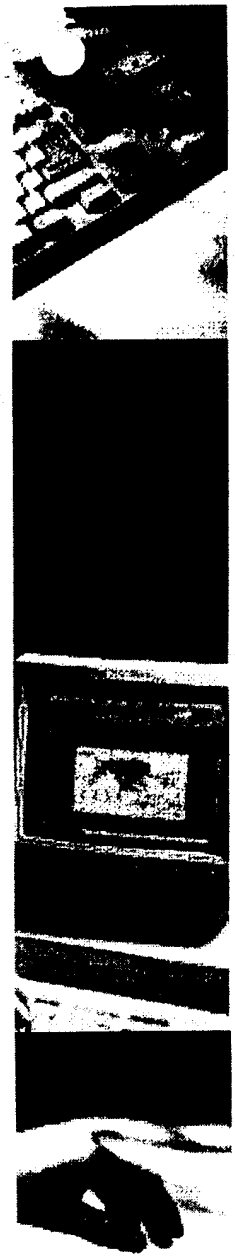
A hazard is an activity, situation, equipment or substance that can cause harm.

Step 2: Assess hazards (section 7)

Employers need to determine which hazards are likely to cause the most harm to people. The Act uses the term "significant hazard".

A "significant hazard" is a cause or potential cause of:

- Serious harm — this includes death, serious injury or disease as defined in the first schedule to the Act;
- Harm — the severity of which depends on how often or how long a person is exposed to the hazard. (For example, exposure to noise over a long period causes gradual, and permanent, deafness.)
- Harm that can't be detected until a significant time after exposure has occurred. (For example, exposure to certain chemicals may cause health problems years later.)

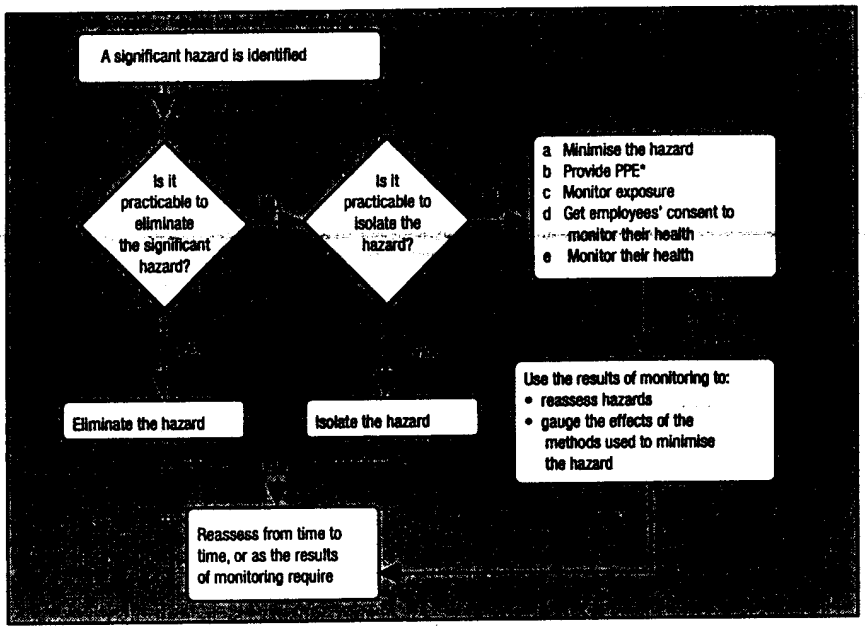


Step 3: Control hazards (sections 8-10)

If the hazard is significant, the Act sets out the process that should be followed to control it.

Figure 18 outlines the required steps.

Figure 18
Employer's duties once a significant hazard is identified



In short, a significant hazard should be eliminated (section 8), isolated (section 9) or minimised (section 10).

Employers must eliminate a significant hazard if it is reasonably practicable to do so. If not, employers must isolate the significant hazard, unless it is not reasonably practicable. When a significant hazard is minimised, additional responsibilities fall to the employer, as shown by figure 18.

4.2 APPLICATION OF THIS CODE

The recommendations set out in part 2 of this code explain how to find and deal with the hazards of VDU work. The recommendations are made on the basis of current knowledge about the problems associated with VDU work. If you follow the recommended actions in this part of the code, you would most likely meet your obligations under the Act.

4.3 INFORMING AND TRAINING EMPLOYEES

The Health and Safety in Employment Act requires that employees are given information about all the hazards in the place of work. The information must be given in a manner that the employee is reasonably likely to understand (section 12).

Published by:
Department of Industrial Health
Ministry of Labour
18 Havelock Road #05-01
Singapore 059763
December 1997

GUIDELINES FOR WORK WITH

VISUAL DISPLAY UNITS

Singapore

4.3 AMBIENT TEMPERATURE AND VENTILATION

If VDU work is carried out in an air-conditioned space, the recommended ambient temperature is 23 - 25°C and the maximum relative humidity is 75%.

The minimum ventilation rate is 13 m^3/h/person and the air velocity should not exceed 25 m/min.

4.4 AMBIENT NOISE LEVEL

The ambient noise level for VDU work should not exceed 55 dBA. Noise generated by printers can be reduced by enclosing them.

5 WORK PRACTICE

As in other work activities, sustained effort in operating a VDU, be it visual, physical or mental, results in fatigue and in severe cases can lead to injury. To minimise visual and muscular fatigue, it is important to include rest pauses and job variation for such work. VDU operators should also be given proper training on the use of computer hardware and software as well as sufficient time to adjust to the work environment.

5 REST PAUSES

5.1.1 A short rest pause is recommended for every hour of continuous VDU work. Short, frequent rest pauses are more effective than occasional pauses of longer interval.

5.1.2 Periods of inactivity or waiting time during VDU use should not be counted as rest pauses.

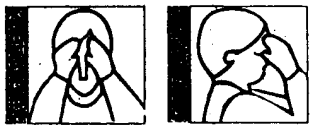
5.1.3 Rest pauses should preferably be taken in a place away from the VDU.

5.1.4 Light stretching exercises may be helpful and could be carried out during rest pauses. Eye relaxation exercises may be done to reduce eye fatigue.

THE 4-STEP REGIME

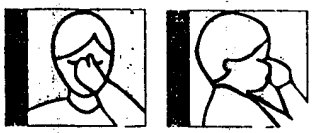
Step 1 Massaging Of "Tianying" Points

- Identify the "Tianying" points located at the medial (inner) aspect of the brows.
- Press your thumbs against the 2 points on place the remaining 8 fingers "bowlike" on your forehead. Massage the points in a circular movement to a count of 8 beats per cycle. Repeat for 8 cycles.



Step 2 Massaging Of "Jingming" Points

- Identify the "Jingming" points which are located on both sides of the nasal bridge.
- Using either your right or left hand, place your thumb and index finger on the point. Press downwards and massage upwards to a count of 8 beats per cycle. Repeat for 8 cycles.



Step 3 Massaging Of "Sibai" Points

- Identify the "Sibai" points on your cheeks by dropping a vertical line from the pupils of your eyes and a horizontal line from the nares (sides) of your nose. The cross point of these 2 lines is where the "Sibai" points is.
- Press your index fingers on the "Sibai" points and support your thumbs on the angles of your jaws with the remaining middle, ring and little fingers on both sides of your chin. Massage the points in a circular movement to a count of 8 beats per cycle. Repeat for 8 cycles.

Step 4 Pressing On "Taiyang" Points And Sliding Round The Eye Sockets

- Identify the "Taiyang" points located at the most hollow areas of your temples.
- Press on the "Tiayang" points with your thumbs and flex the remaining fingers into a fist position.
- Use the knuckles of your index fingers to slide over from medial to lateral aspect of the upper eye sockets for the first 4 beats, and continue to do similarly over the lower eye sockets for the second 4 beats of each cycle. Repeat for 8 cycles.

LOOK AT A DISTANCE FOR A SHORT WHILE, ON COMPLETION OF THE 4-STEP REGIME.
THIS WILL ENSURE TOTAL RELAXATION OF YOUR EYE MUSCLES.

Source: Ministry of Health

精密作業勞工視機能保護設施標準

民國六十四年二月七日內政部訂定發布
民國七十年十二月十四日內政部修正發布
民國八十五年七月三日行政院勞委會修正發布

第一條　本標準依勞工安全衛生法第五條及第十一條規定訂定之。

第二條　本標準適用於從事精密作業之有關事業。

第三條　本標準所稱精密作業，係指雇主使勞工從事左列凝視作業，且每日凝視作業時間合計在二小時以上者。

一　小型收發機用天線及信號耦合器等之線徑在〇．一六毫米以下非自動繞線機之線圈繞線。

二　精密零件之切削、加工、量測、組合、檢試。

三　鐘、錶、珠寶之鑲製、組合、修理。

四　製圖、印刷之繪製及文字、圖案之校對。

五　紡織之穿針。

六　織物之瑕疵檢驗、縫製、刺繡。

七　自動或半自動瓶裝藥品、飲料、酒類等之浮游物檢查。

八　以放大鏡或顯微鏡從事記憶盤、半導體、積體電路元件、光纖等之檢驗、判片、製造、組合、熔接。

九　電腦或電視影像顯示器之操作或檢視。

十　以放大鏡或顯微鏡從事組織培養、微生物、細胞、礦物等之檢驗或判片。

十一　記憶盤製造過程中，從事磁蕊之穿線、檢試、修理。

十二　印刷電路板上以人工插件、焊接、檢視、修補。

十三　從事硬式磁碟片（鋁基板）拋光後之檢視。

十四　隱形眼鏡之拋光、切削鏡片後之檢視。

十五　蒸鍍鏡片等物品之檢視。

第四條　雇主使勞工從事精密作業時，應依其作業實際需要施予適當之照明，除從事第三條第八款至第十一款之作業時，其照明得酌減外，其作業台面局部照明不得低於一千米燭光。

第五條　雇主使勞工從事第三條第一款至第三款及第十一款至第十五款規定之作業時，作業台面不得產生反射耀眼光線，其採色並應與處理物件有較佳對比之顏色。

第六條　雇主使勞工從事第三條第六款、第七款規定之作業，如採用發光背景時，應使光度均勻。

第七條　雇主使勞工從事精密作業時，其工作台面照明與其半徑一公尺以內接鄰地區照明之比率不得低於一比五分之一，與鄰近地區照明之比率不得低於一比二十分之一。

第八條　雇主採用輔助局部照明時，應使勞工眼睛與光源之連線和眼睛與注視工作點之連線所成之角度，在三十度以上。如在三十度以內應設置適當之遮光裝置，不得產生眩目之大面積光源。

第九條　雇主使勞工從事精密作業時，應縮短工作時間，於連續作業二小時，給予作業勞工至少十五分鐘之休息。

第十條　雇主使勞工從事精密作業時，應注意勞工作業姿態，使其眼球與工作點之距離保持在明視距離約三十公分。但使用放大鏡或顯微鏡等器具作業者，不在此限。

第十一條　雇主應採取指導勞工保護眼睛之必要措施。

第十二條　本標準自發布日施行。