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**APPROVED**

By Decree No. 2-3/18  
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# **Occupational Safety Instructions for Operating a Computer**

## **No. 5 (DAI - 5)**

## 1 General requirements

- 1.1. The present Occupational Safety Instructions is a normative document and stipulates work safety measures and tasks, health requirements, work procedures and the minimum knowledge amount that an employee must possess and apply during the work process. As the responsible person dedicated for complying with the requirements pursuant to this instructions is the employee operating the personal computer. Employees may be held responsible for failure to comply with this instruction according to working regulations of Rīga Stradiņš University and the existing legislation.
- 1.2. Preconditions for execution of work:
  - 1.2.1. induction training - upon recruitment;
  - 1.2.2. briefings (trainings) at the workplace - initial, as well as repeated later ones as per Minister Cabinet regulations;
  - 1.2.3. training and knowledge assessments - in workers' professional domain, occupational health and safety, electrical safety, fire safety and any others stipulated by legislation;
  - 1.2.4. employees must attend compulsory health checks in accordance with employer standards;
  - 1.2.5. employees must participate in meetings, trainings and briefings organized by the employer;
  - 1.2.6. employees are prohibited from execution of any other work without authorization and a special briefing;
  - 1.2.7. employees must know the basic requirements for computer workstation arrangement (Annex 1) "Minimum Requirements for Arrangement of a Computer Workstation";
  - 1.2.8. employees must possess the knowledge of and conform to interdependence of working and resting modes based on the amount of working hours, work category and workload (Annex 3) "Regulated Breaks for Operating a Computer";
  - 1.2.9. employees must know and execute exercises for reduction of physical and mental fatigue (Annexes 6, 7, 8, 9: „Recommended Exercises”);
  - 1.2.10. employees must know and execute exercises for reduction of eye fatigue (Annex 5: „Eye Exercises”);
- 1.3. Upon recruitment, computer-operating employees must familiarise themselves with the following:
  - 1.3.1. legislative requirements regarding labour relations, occupational health and safety, electrical safety and fire safety in their respective and professional domains;
  - 1.3.2. workstation technical equipment level and operating requirements, as well as measures necessary for work, and safe and correct usage thereof;
  - 1.3.3. safe, correct, tried and tested work procedures in order to avoid hazardous conditions for themselves and safe working practices;
  - 1.3.4. collective and individual work safety measures and correct usage thereof in accord with assessment results of the work environment hazards.
- 1.4. Potential hazards at a work environment
  - 1.4.1. inadequate workstation arrangement and equipment layout (Annex 1: "Minimum Requirements within Computer Workstation Arrangement", and Annex 2: „Computer Workstation Arrangement in Respect to Premise Windows”);
  - 1.4.2. inadequate or insufficient workstation illumination (minimum 500 lx for reading, writing, typewriting, data processing);
  - 1.4.3. increased noise levels: noise level inside a computer room must not hamper being able to focus and talk freely; equivalent noise levels in working

- environment - employer must ensure its employees with hearing protection whenever noise level reaches 80 decibels (dBA);
- 1.4.4. physical overload (Annex 3: "Regulated Breaks for Operating a Computer");
  - 1.4.5. psycho-emotional burdens;
  - 1.4.6. ergonomically unsuitable work postures;
  - 1.4.7. impacts of electric current upon touching energized conductive parts;
  - 1.4.8. computer work conditions under increased visual strain (Annex 1: „Ergonomic Requirements for a Computer Screen”);
  - 1.4.9. fire and explosion hazard in case of fire;
  - 1.4.10. defective equipment, machinery and appliances;
  - 1.4.11. unfavourable microclimate inside the premises;
  - 1.4.12. adherence to effective working and resting periods;
- 1.5. Complaints about health problems (mainly vision) may occur after a few months of working, serious health issues may be observed after 5 or more years.
  - 1.6. In communication with computer, employees may manifest following 7 health impairments (Annex No. 4)
    - 1.6.1. Visual Overload Syndrome (VOS)
    - 1.6.2. Carpal Tunnel Syndrome (CTS)
    - 1.6.3. Spinal column syndrome (SCS)
    - 1.6.4. Breathing or respiratory syndrome (SARS)
    - 1.6.5. Blood Congestion Syndrome (BCS) in the head, abdominal organs, lower limbs
    - 1.6.6. Skin Problems Syndrome (SPS): contact dermatitis, eczema, etc.
    - 1.6.7. Chronic Fatigue Syndrome (CFD).

*Requirements for Workspace Microclimate Depending on Workload:*

| No. | Period of the year  | Work Category   | Air temperature (C°) | Relative air humidity (%) | Airflow velocity (m/s) |
|-----|---|-----------------|----------------------|---------------------------|------------------------|
| 1   | Cold period of the year (average outdoor air temperature +10°C or less) | I <sup>1</sup>  | 19.0–25.0            | 30-70                     | 0.05-0.15              |
|     |   | II <sup>2</sup> | 16.0-23.0            | 30-70                     | 0.1-0.3                |
| 2   | Warm period of the year (average outdoor air temperature +10°C or more) | I <sup>1</sup>  | 20.0-28.0            | 30-70                     | 0.05-0.15              |
|     |   | II <sup>2</sup> | 16.0-27.0            | 30-70                     | 0.1-0.4                |

Notes

1 Category I - work that is not associated with physical efforts or requires very slight or slight physical efforts (for example, all mental work, operating a variety of control panels, work that is done sitting, standing or in motion and by moving light objects (up to 1 kg).

2 Category II - work that is associated with medium or increased physical efforts (for example, constant lifting and moving of heavy loads (up to 10 kg), welding, metal work.

- 1.7. Fire- and explosion hazard requirements:
  - 1.7.1. prohibition to handle open fire in the workplace;
  - 1.7.2. smoking allowed only in the specifically designated spaces;
  - 1.7.3. prohibition to carry and store explosive, flammable and other dangerous substances that are not required or do not facilitate work processes, inside work premises;
  - 1.7.4. avoiding conduct that may result in a fire, knowing locations of fire extinguishers and being able to operate them;
  - 1.7.5. knowing escape directions in accordance with evacuation plans as well as preventing clogging up escape passages by placement of interfering objects.
- 1.8. Requirements for electrical safety:

- 1.8.1. following instructional requirements and operational rules during operation of electrical equipment and tools;
  - 1.8.2. visual check-up of electrical and equipment wiring condition on a regular basis. Immediate cease of working in case of faulty electric appliances, installations or tools (i.e. damaged wire insulation, faulty sockets or plugs, sparks, smell of burning) and notifying the direct supervisor and alerting other persons about the situation. Continuation of work only after the damage is eliminated;
  - 1.8.3. prohibition to operate non-industrially manufactured electric appliances and tools;
  - 1.8.4. prohibition to place various foreign objects on the electric appliances;
  - 1.8.5. prohibition to leave electrical equipment and apparatus switched on and unattended;
  - 1.8.6. prohibition to perform arbitrary repairs of electrical wires, switches, contacts, appliances; prohibition to touch energized electrical appliances, switches, outlets and wiring with moist (wet) hands;
  - 1.8.7. workstation must be arranged in such a way that no employee would have to contact wiring.
- 1.9. Collective and individual work safety measures against dangerous and harmful work environment factors:
- 1.9.1. ensuring proper ventilation, air temperature and relative humidity in working area;
  - 1.9.2. ensuring adequate illumination at the work area (at least 500 lv for reading, writing, typewriting and data processing);
  - 1.9.3. safety warnings and marking;
  - 1.9.4. curtains (blinds) for reduction of computer screen glare;
  - 1.9.5. thick curtains for reduction of noise levels;
  - 1.9.6. wet cleaning of the premises on a regular basis.

## **2. Occupational health and safety requirements upon starting a working task**

- 2.1. If necessary - receive orders and instructions from your direct supervisor.
- 2.2. Ventilate the premises and turn on the ventilation, if such is installed.
- 2.3. Select and apply necessary personal protective equipment for the respective working process in accord with assessment results of the work environment hazards.
- 2.4. Upon workstation preparation, perform visual check of the following:
  - 2.4.1. computer case, keyboard, screen, printer and other equipment;
  - 2.4.2. condition of connecting cables and wires;
  - 2.4.3. adequate lighting conditions of the workstation;
  - 2.4.4. presence and condition of auxiliary working equipment;
  - 2.4.5. remove all unnecessary and flammable materials.
- 2.5. Adjust the following:
  - 2.5.1. local workstation illumination;
  - 2.5.2. your table and seat for comfortable seating and working posture;
  - 2.5.3. computer screen and document holder as per individual eyesight properties.
- 2.6. Do not indulge in work in the following cases:
  - 2.6.1. workstation is inappropriately or insufficiently lit;
  - 2.6.2. computer casing covers are removed, damaged or not fastened;
  - 2.6.3. in case of imminent and serious danger that sets worker's/s' and immediate person's/s' health and life under risk;
  - 2.6.4. in case of perceptible illness symptoms, alcohol or substance intoxication, in case of damaged electrical appliances, equipment, or in case any other hazardous

conditions are detected. The detection or presence of the aforementioned conditions must be immediately notified to the direct supervisor.

- 2.7. Employees are prohibited from arbitrary repair of defective electric appliances and tools. In case of detected damages co-workers and direct supervisors must be informed, and the respective specialist summoned. Any work procedures may only be restarted after the permit of the respective competent specialist, along with an appropriate record in maintenance log of the corresponding electric appliance.
- 2.8. Employees are prohibited from usage of tools and electric appliances, if such are not mandated by their direct job responsibilities.
- 2.9. Upon starting work with a new appliance, the employee must familiarise him/herself with its operational and work safety provisions, if necessary - a corresponding training and/or additional briefing must be provided.

### **3. Occupational health and safety requirements during a working task**

- 3.1. Employees must adhere to fire safety regulations of the respective work premises.
- 3.2. Employees must adhere to electrical safety regulations of the respective work premises.
- 3.3. Employees must be cautious and careful and not disturb other employees during working hours with a computer.
- 3.4. In order to avoid monotonous labour exposure, working operations must be altered - from text editing to figures, from text editing to data entry, etc.
- 3.5. Employees must rest in accord with their regulated break periods. Employees should perform relaxation and fatigue reduction exercises during their breaks and activity pauses (Annex 3: "Regulated Breaks for Operating a Computer");
- 3.6. Upon noticing other employees that do not comply to work safety and procedure regulations, one must not remain indifferent. The respective employee must be warned regarding his/her non-compliance to the regulations and rules.
- 3.7. While operating equipment or technical appliances, employees must strictly adhere to instructions, hygiene and operation provisions and never initiate work without prior acquirement of knowledge and respective instructions in work safety. Employees must never use damaged equipment.
- 3.8. All employees must use collective and individual safety measures in accord with the results of work environment hazard assessment and employer requirements.
- 3.9. Employees must pay adequate attention and comply precisely with their personal hygiene norms.
- 3.10. Employees must know and use safe and proper work practices in order to avoid hazards for themselves and safe working environment.
- 3.11. Foreign objects must not be placed on appliances and auxiliary equipment; employees must exert continuous care not to allow foreign and interfering items at their workstations.
- 3.12. Employees must observe communication provisions in accord with normative documents and employer requirements.
- 3.13. Employees are prohibited from performing arbitrary repair of electric appliances, cables, switches, outlets and other equipment. Employees are prohibited from touching energized electrical appliances, switches, outlets and wiring with moist (wet) hands;
- 3.14. Employees are prohibited from use of defective equipment. Employees are required to deliver any defective equipment for repair or place it where it does not obstruct and is not available for use to co-workers and visitors.
- 3.15. Employees are required to keep windows shut during storms and strong winds. Employees are required not to create conditions that promote occurrence of drafts.

- 3.16. Employees are prohibited from carrying and storing explosive, flammable and other dangerous substances that are not required or do not facilitate work processes, inside work premises;
- 3.17. Employees are required to use safety appliances that the workstation and working equipment is provided with, as well as observe regulations of safety markings (manufacturer's instructions, chemical substance and solution safety data sheets, radiation zone signs, etc.).
- 3.18. Employees that perform work that is lengthy, tiring and forcefully non-ergonomic, or causes increased psychological strains, must know and perform exercises to reduce physical and mental fatigue (Annexes 5, 6, 7, 8, 9: „Physical and Mental Fatigue Reduction Exercises”).
- 3.19. Employees that have work duties associated with lengthy and increased eye fatigue, must know and use eye exercises (Annex 5: „Eye Exercises”).
- 3.20. Employees must adhere to their personal hygiene norms, eat only in designated areas, and wash hands prior to eating.
- 3.21. During work it is **prohibited to:**
  - 3.21.1. leave electrical equipment and apparatus on and without attendance;
  - 3.21.2. carry on working procedures after detection of hazardous conditions that set employees' or other persons' health and life under risk.

#### **4. Work safety requirements upon finishing the work**

- 4.1. Employees must turn off the computer and put the workstation in order.
- 4.2. Employees must remove all excess and inflammable items.
- 4.3. Employees must check the premises for computers that are switched on, excess waste paper, packaging, etc.
- 4.4. Employees must, upon leaving, close all windows, turn off the ventilation (if possible), air conditioning, lighting, and lock the doors. Employees must take any other necessary security measures in accordance with regulatory documents and employer requirements.
- 4.5. Employer or the direct supervisor must be promptly notified of all and any detected shortcomings and deficiencies.

#### **5. Employee conduct in dangerous situations**

- 5.1. In case of a workplace accident, work must be immediately stopped, all persons must be evacuated from the endangered zone, as well as measures to avert further hazards and to allow accident clean-up must be taken in order to avoid hazards to human health and safety.
- 5.2. In case an employee, a co-worker or a visitor experiences an accident or an illness, following measures must be taken:
  - 5.2.1. Work procedures must be immediately stopped;
- 5.3. Situation must be assessed and, considering personal safety, the hazard must be averted (in case of electric shock, the victim must first be freed from impact of electric current by cutting off the power supply or using non-conductive materials);
- 5.4. The victim must be moved to a safe location;
- 5.5. The victim must be administered first aid (or self-help);
- 5.6. If necessary, ambulance must be called (ph. No. 03 or 112/113) and other emergency services;
- 5.7. The employer must be notified about the accident;

- 5.8. The accident location must be left intact unless it generates additional hazards. If necessary, the hazardous zone must be demarcated or other measures must be taken to prevent persons from entering it.
- 5.9. In case of fire, employees must act in accordance with "Procedures in Case of Fire". In case of a detected gas leak, the direct supervisor must be immediately notified and the appropriate emergency service must be called by dialling 04, 114 or 112. Activities that might cause gas ignition must be avoided, any immediate persons must be warned about the hazardous situation.

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## MINIMUM REQUIREMENTS FOR ARRANGEMENT OF A COMPUTER WORKSTATION

### 1. Work process planning

Work procedures must be planned in such a way that the character of the work duties is regularly altered, for instance, a work requiring sitting posture should be changed to a standing posture and later to work that requires some physical efforts.

If for various reasons this kind of organization is not possible (intensive data entry or reading from computer screen etc.), it is necessary to comply with a regular break schedule that is included in working hours. Break type and duration

It is not recommended to operate a computer for more than 2 hours continuously. Short, regular breaks are much more effective than long and irregular breaks.

It is recommended to take a 5-10 minute break every hour, or a 15 minute break every 2 hours. During the breaks it is not recommended to be near the computer screen. In cases where labour involves data reading off the screen, it is recommended to avoid eye tension during the breaks. Alternatively, if the work involves heavy data entry, it is recommended to avoid similar palm and wrist movement during the breaks. It is recommended to perform various exercises during the break.

### 2. Eyesight correction

In case the computer operator has impaired eyesight and needs eyesight correction, it is recommended to purchase suitable glasses. Usage of contact lenses is recommended only in case they pose no health problems for prolonged working periods. Employees older than 40 years of age immediately after the first eyesight complaints (presbyopia, or age farsightedness) are advised to choose glasses that facilitate comfortable and easy discerning of keyboard, text and computer screen from a distance of 45–75 cm. Type of lenses or glasses is recommended by a physician in accordance with the respective eyesight defect. It is advised that glass lenses are coated with a special anti-glare coating, which ensures more than 98% light transmission and eliminates undesirable reflections.

**Always remember to inform the physician about your computer-related occupation!**

### 3. General workstation requirements

Recommended workplace temperature is  $22^{\circ}\text{C} \pm 2^{\circ}$  during the cold season, and  $24,5^{\circ}\text{C} \pm 1,5^{\circ}$  during the warm season. Recommended relative air humidity is from 40 to 60%.

In case the same premise must be equipped with more than one computer, the following recommendations apply:

- computer screens should be placed back to back;
- distance from the back surface of one screen to the viewing surface of the second screen should be more than 2,0 m;
- distance from side surfaces of the screens should be more than 1,2 m.

### 4. Illumination

Upon selecting workstation illumination, one must consider character of the work task (off-screen reading, reading of printed materials, text entry, etc.) and individual eyesight peculiarities. Recommended light intensity is 200–500 lux. If necessary, workstation must be equipped with local artificial illumination. Light source should be located outside the direct line of sight of the employee. In order to sufficiently illuminate the workspace (i.e., used materials, keyboard, etc.), lamps with adjustable light beam direction may be used. Light

should not shine directly onto the computer screen or into employee's eyes. Fluorescent lamps should be covered with lenses (diffusers).

## 5. Computer placement

Workstation should be arranged in such a manner that light from the windows does not shine directly onto the computer screen. Screen surface should be located perpendicular to the window. Windows of the premise are advised to face towards the North.

## 6. Glare

Glare dazzles computer operators and disturbs seeing the image on the screen. As a result, eyesight tension is increased, something that may cause eyesight impairment. Upon arrangement of a workstation, glares on the screens should be minimized. These can result from windows, lamps, walls, cubicle walls, ceilings, floor, other office appliances and accessories, employees' clothes, furnishings etc. Glare is most often experienced when screens are located inadequately, for instance, one facing another, or facing a window.

**Computer screen glare can be minimised by following measures:**

- fitting windows with blinds or curtains;
- correct placement of general and local light sources;
- adjustment of computer screen position;
- choosing mat surfaces.

In case the measures mentioned above do not provide the desired effect, special anti-glare screen filters may be used, yet their eventual image quality deterioration and eyesight discomfort should be considered. In order to reduce glare, computer screens with special anti-glare coating should be opted for.

## 7. Electromagnetic and electrostatic fields

Both electromagnetic and electrostatic fields are formed around various types of electric and office appliances. The greatest contributor to electromagnetic field (EMF) inside an office is the computer screen. The intensity of EMF is tiny, and wears off with increasing distance. The harmful health effects of EMF can be averted by correct arrangement of the workstation even without usage of protective filters.

Electrostatic field may cause accumulation of dust on computer screens and their close vicinity, hence the picture quality may be gradually decreased. The effects of the electrostatic field can be reduced by regular cleaning of the screen, preferably with anti-static cleaning agents, as well as by ventilating and (wet) cleaning the premises. Upon selecting your premise furnishings and personal wardrobe, it is crucial to consider these items may themselves act as a source for electrostatic field. Natural materials are therefore advised.

## 8. Office chair

**Backrest** - backrest should support one's back at least in lumbar and sacral regions and should also comply with the shape of the sitter's back. The backrest should preferably support the sitter's back in its full length according to the natural spine curvature (Illustr. No. 2). At its best, a backrest should secure safe support even when the person sitting in the chair changes his/her position - leans forward, tilts back, etc. (Illustr. No. 1).

**Seating height** - correct choice of seating height (Illustr. No. 3) is vitally important in securing a comfortable seating position. In case the seating position is too high, the seat cushion may compress the higher thigh superficial blood vessels. In case the seating position is too low, an artificial and compulsory bodily posture is formed: angle of both elbow and knee joints becomes less than 90°, shoulder zone is lifted up, and the head becomes too tilted as the computer screen is located too high in respect to eye level. An adequate seat height is

as follows: front edge of the seat is at the level of the popliteal pit, knee joint angle is greater than  $90^{\circ}$ , feet are planted firmly on the floor.

**Seating depth** - seating depth must be smaller than the distance from hip to knee joint, but the distance from the front edge of the seat to the posterior surface of the lower leg at knee level must comply with the width of the worker's wrist (Illustr. No. 4). In order not to depress leg superficial blood vessels while seated, the frontal edge of a chair should be rounded.

**Footrests** (Illustr. No. 5) - if the working surface is higher than optimum and can not be adjusted, the seating height should be adjusted instead. In case the worker's feet are not firmly planted on the ground, footrests should be used (Illustr. No. 5a). These have adjustable height (0–150mm) and angle (0–20°). Surface of the footrest (Illustr. No. 5b) should be sufficiently large and comfortable, covered with non-slippery material

**Armrests** (Illustr. No. 8) - it is recommended to opt for a chair with armrests. The best armrests have adjustable height and distance between the supports so they can be adapted to each worker individually and according to the work to be performed (Illustr. No. 7). If the armrests become bothersome, they can be removed.

## 9. Work table and work surface

Surface of the working table should be non-reflective and large enough to easily place computers and other equipment necessary for work - documents and so on. Minimum dimensions – 1200x800 mm, preferably 1600x1000 mm. To reduce arm muscle tension, a table should have a location that supports palms and lower arms. Table edges and corners should be rounded to avoid injuries and discomfort.

The keyboard should be placed in accord with the level of the worker's elbows (elbow joint bent at a  $90^{\circ}$  angle); shoulder zone should not be lifted (Illustr. No 7). It is advisable to use a table with adjustable height in order to adapt it for work in sitting and standing position. An advantage should be given to tables that have separate adjustable surface for keyboard and mouse and a separate one - for the screen. In case table height is non-adjustable, it may not be lower than 720 mm (Illustr. No. 6). Such a workstation must be fitted with an adjustable chair and footrest. *Space under the table surface* - upon arranging a workstation one should consider leaving sufficient free space under the table (Illustr. No. 12) to allow free changes of working position, for standing up and sitting down. Following parameters are advised for the space under the table surface:

- depth - at least 70 cm; in case the working surface is inclined - at least 50 cm at the level of worker's knees and 70 cm at the foot level (Illustr. No. 11.)
- width - at least 50 cm;
- height - at least 60 cm.

## 10. Document holder

Document holder must be stable and freely adjustable in order to reduce unnecessary eye and head movements; it must be placed exactly next to the screen.

## 11. Computer screen

**Screen placement** – a screen must be easily turnable and tiltable in order to adequately adjust the distance and angle from worker's eyes to it (illustrated angle between 9 and 9a). Optimum distance from eyes to the screen is  $60\text{cm} \pm 15\text{cm}$  (Illustr. No. 9a). The upper edge of the screen should be located at eye-level or slightly lower, vertical viewing angle should be  $35^{\circ}$  (Illustr. No. 9).

**Image quality** – symbol size on the screen and spaces among the characters should be adequately large and easily discernible from the proper distance. It is recommended to use simple writing fonts, such as *Arial*, *Times New Roman*. The electric power supply of the

computer screen should provide such image stability that any flickering would not be distinguishable to the eye. In case the screen is mostly used for text processing, it is advised to use dark letters on light background. The contrast and brightness (luminosity) should be easily adjustable.

## **12. Keyboard**

Both size and layout of the keyboard should be such that allow easy and effective work. Keyboard should be easily moveable on the table surface and stable under usage, the connecting wire should be sufficiently supple and long enough to allow adequate placement and distance in front of the screen. Keyboard case should not have any sharp corners and/or edges. Symbols on the keyboard should be easily readable and highly contrasted. The keyboard should be placed approximately 45–75 cm from the worker's eyes (Illustr. No. 9b). In front of the keyboard there should be at least 10 cm of free space (Illustr. No. 10) for placement and resting of palms. The recommended angle of the keyboard in respect to the horizontal surface ranges from 0 to 25°.

## **13. Mouse**

Mouse wire should be adequately long and supple to allow for free and comfortable movements. The mouse requires a specific operating surface, preferably a mouse mat. It should be placed as close as possible to the keyboard to avoid forced working movements in the wrists. Left-handed users need to adjust the mouse, using programmable buttons.

## COMPUTER WORKSTATION ARRANGEMENT IN RESPECT TO PREMISE WINDOWS

Workstations with computers should be placed towards the apertures of windows in such a way that the natural light would be falling sideways, preferably from worker's left side.

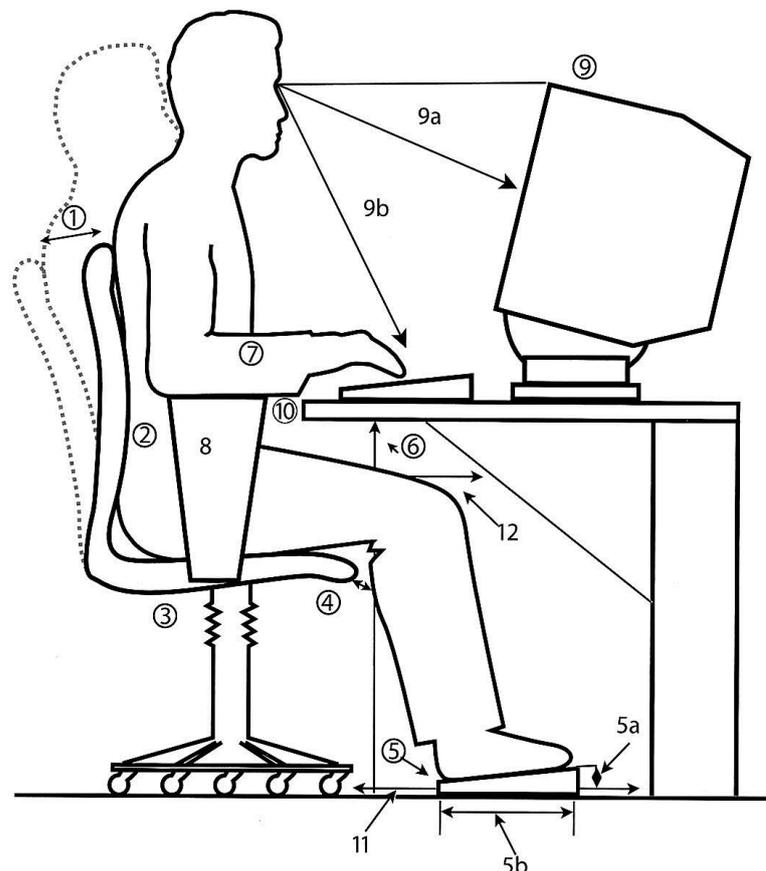
Following distances should be considered when arranging workstations with computers:

- distance between the tables with computers, counting from the rear surface of one computer to the screen of the next computer, should be no less than 2.0 m;
- distance between computer side surfaces - no less than 1.2 m;
- minimum aisle width between computers positioned in a single row – 1 m, in two rows – no less than 1.2 m;
- minimum distance from the wall - at least 1 m;
- minimum distance between computer workspaces – no less than 1.5 m.

Workstations with computers in which computer operators perform creative work with reasonable mental tension and high focusing requirements should be isolated from one another with partition walls that are at least 1.5 – 2.0 m high.

Disks, floppy disks, parts, computer backup units, etc., as well as tools should be stored in cabinets, safes or shelves.

To avoid reflections, which can reduce one's perception abilities, workstations should not be placed directly under the light sources.



**REGULATED BREAKS FOR OPERATING A COMPUTER**

| <b>Working shifts duration:<br/>(in hours)</b> | <b>Work category</b> | <b>Working hours duration:</b>  | <b>Break duration:<br/>(in minutes)</b> |
|--|----------------------|---|---|
| 8  | I                    | Every 2 hours from start of the work  | 15                                      |
| 8  | I                    | Every 2 hours from the lunch break  | 15                                      |
| 8  | II                   | Every 2 hours from start of the work<br>Or after every work hour                    | 15<br>10                                |
| 8  | II                   | Every 2 hours from the lunch break<br>Or after every work hour                      | 15<br>10                                |
| 8  | III                  | After 1.5 – 2.0 hours from start of the shift<br><b>or</b><br>after every work hour | 20<br>15                                |
| 8  | III                  | After 1.5 – 2.0 hours from the lunch break<br><b>or</b><br>after every work hour    | 20<br>15                                |
| 9 - 12   | I - III              | After every work hour   | 15                                      |

**WORK CATEGORIES and load amounts during a shift operating a computer**

| <b>Work Category</b> | <b>Group A<br/>(symbol amount)</b> | <b>Group B<br/>(symbol amount)</b> | <b>Group C<br/>(hour amount)</b> |
|----------------------|------------------------------------|------------------------------------|----------------------------------|
| I                    | Up to 20 000                       | Up to 15 000                       | Up to 2.0                        |
| II                   | Up to 40 000                       | Up to 30 000                       | Up to 4.0                        |
| III                  | Up to 60 000                       | Up to 40 000                       | Up to 6.0                        |

**Clarifications:**

1. Forms of activity are divided in groups:
  - 1.1. **Group A** - work with the information reading from computer screen after a prior request;
  - 1.2. **Group B** - work with information administration;
  - 1.3. **Group C** - creative work of both input and output communication with the computer.
2. Activity types are divided according to work load and tension level while operating a computer:
  - 2.1. **Categories I - III for Group A** – accordingly to the aggregated readable characters per a work shift, but not more than 60 000 symbols;
  - 2.2. **Categories I – III for Group B** accordingly to the aggregated readable characters per a work shift, but not more than 40 000 symbols;
  - 2.3. **Categories I – III for Group C** accordingly to the aggregated hours spent at a computer per a work shift, but not more than 6 hours per shift;
3. In case the employee performs various tasks and types of work, as the basic amount shall be denoted the work with computer which constitutes at least 50% of the aggregated work shift or day

**POSSIBLE HEALTH DISORDER CAUSES FOR PERSONS  
OPERATING A COMPUTER**

| Complaints   | Potential causes   |
|--|--|
| Ocular discomfort:<br>dry eye syndrome<br>(excessive tear production, nibbling sensations or changes of visual acuity, eye fatigue or redness, etc.) | <ul style="list-style-type: none"> <li>✓ Poor screen image (dirty, dusty screen or filter, reduced or excessive image contrast, too small character size, complex shapes of letters)</li> <li>✓ Inappropriate lighting (insufficient or excessive)</li> <li>✓ Reflection, glare and dazzling (improperly positioned or adjusted screen or light source)</li> <li>✓ Uncorrected vision (untested eyesight or poorly chosen glasses)</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> <li>✓ Inadequately chosen distance from the eyes to the screen, keyboard or document holder</li> <li>✓ Document holder is not used during intensive data entry</li> <li>✓ Low premise air humidity</li> <li>✓ Dusty premises (workroom not sufficiently cleaned up)</li> </ul> |
| Neck pain  | <ul style="list-style-type: none"> <li>✓ Computer screen positioned too high</li> <li>✓ Chair positioned too close or too low in relation to the monitor</li> <li>✓ Document holder is not used during intensive data entry</li> <li>✓ Monitor or document holder positioned too far and/or not directly in front of the worker</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> <li>✓ Uncorrected vision (untested eyesight or poorly chosen glasses)</li> <li>✓ Inappropriate lighting (insufficient or excessive)</li> </ul>  |
| Shoulder pain  | <ul style="list-style-type: none"> <li>✓ Excessive elevation of the keyboard/mouse work surface</li> <li>✓ Mouse positioned too far (aside) from the keyboard</li> <li>✓ Arm rests positioned to high, too far/close</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> </ul>  |
| Pain in the lumbar-sacral region   | <ul style="list-style-type: none"> <li>✓ Lacking or insufficient lumbar support</li> <li>✓ Excessive elevation of the seating position</li> <li>✓ Working surface too low</li> <li>✓ Insufficient space below the work surface</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> <li>✓ Screen glare causing wrong working posture</li> </ul>  |
| Wrist joint pain   | <ul style="list-style-type: none"> <li>✓ Repetitive wrist and finger joint movements (from operating keyboard and mouse)</li> <li>✓ Excessive angle between the working surface and the keyboard (physiologically wrong wrist position is formed)</li> <li>✓ Insufficient wrist joint support</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> </ul>   |
| Elbow joint pain   | <ul style="list-style-type: none"> <li>✓ Excessive elevation of the working surface</li> <li>✓ Mouse positioned too far (aside) from the keyboard</li> <li>✓ Lack of arm rests</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> </ul>  |
| Forearm pain   | <ul style="list-style-type: none"> <li>✓ Excessive elevation of the working surface</li> <li>✓ Sharp working surface edges</li> <li>✓ Insufficient forearm support</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> </ul>  |
| Lower leg discomfort (pain, tingling, fatigue, etc.)   | <ul style="list-style-type: none"> <li>✓ Prolonged sitting</li> <li>✓ Working surface too low</li> <li>✓ Seat with excessive depth</li> <li>✓ Front edge of the seat is not rounded</li> <li>✓ Seat too high, lack of footrest</li> <li>✓ Sitting with legs crossed</li> <li>✓ Insufficient space below the work surface</li> <li>✓ Insufficient rest periods</li> <li>✓ Excessive working hours</li> </ul>  |

## Visual Overload Syndrome (VOS)

Eye overload is regarded as the most harmful side-effect from operating a computer:

- Employees may experience accelerated visual fatigue. Already after 6 hours of intensive work without breaks employees will start complaining about pain in their eyeballs, excessive tearing, blurred or double vision, headaches, pain in back of their heads.
- Experts from World Health Organization have found that in these cases workers may develop "dry eye" syndrome, progressive myopia, inflammation of cornea and conjunctiva, eyelid itching and swelling. Sharpness of vision is affected.
- Electrostatic field generated by the computer is yet another cause of visual discomfort. Dust-coated screens cause eye irritation and simultaneous sudden shortness of breath.

There is a pronounced difference between reading text off paper or off screen. Eye will perceive much more peacefully something read off the paper compared to computer screen:

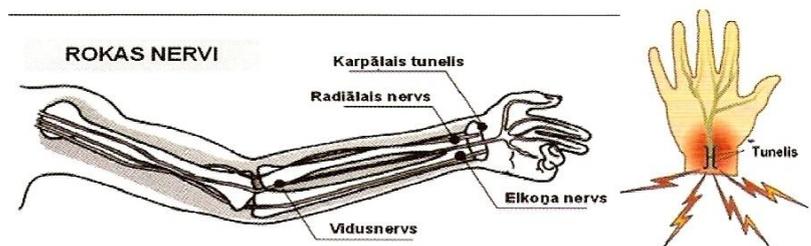
- screen emits light itself, instead of reflecting light of images and characters;
- computer screen has less contrast than paper: contrast is further reduced with increase of screen brightness;
- screens that are built on cathode radiation tubes (conventional CRT monitors) have another negative property - image flickering. It causes a stroboscopic effect to the worker (eyes decrease their adaptability to distinguish light, eyes start to hurt). Liquid crystal diode screens are not affected by this negative flickering;
- image or letters on the screen are formed out of distinguishable points (pixels).

## Carpal Tunnel Syndrome (CTS)

Not only eyes are overstrained while operating a computer. Increased tension is also applied to arm muscles (due to work with keyboard and mouse). High levels of discomfort are created by repeated, monotonous hand movements while clicking a mouse or operating a keyboard. Also wrong working posture, tension and lack of bodily activity cause serious overstraining of the leading working hand.

Family physicians, neurologists, surgeons and other doctors must treat patients daily with complaints of tingling and pain in the hands, wrist disorders, decrease of muscle strength. One of the causes of such complaints are the so-called compression neuropathies.

The most often compression neuropathy for the employees is the carpal tunnel syndrome (CTS). In case of CTS, the central nerve is being compressed - one that runs through the tunnel at the base of the palm. For this nerve both sensory and fibre movement disorders are observed. Compression of the nerve or its branches is caused by often and prolonged movements in the base of the wrist. As a result, not only nerves get gradually compressed, but also blood vessels in the region of thumb base tendons.



Palm sensitivity and muscle strength deteriorates, a functional failure is formed. Tendons and muscles of the hand's distal parts are overloaded. An occupational disease - CARPAL TUNNEL SYNDROME - may develop. Development of CTS is affected by employees' labour duration (months, years), work intensity, cervical spine deformities and psycho-emotional conditions.

Manifests of the Carpal Tunnel Syndrome:

- Discomfort appears in wrist, hands and fingers. After some time - tingling sensations and finger pain. Pain and tingling is particularly intensive during the night as humans do not control their arm positions during sleep.

- Muscle weakness in fingers and palms is accomplished with feeling of heaviness in the affected arm.
- Clumsiness of wrists and fingers makes it difficult to write. Wrist dysfunctionality advances, quality of work and life suffers.

### **Spinal column syndrome (SCS)**

The spinal column performs multiple functions: protects spinal cord, serves as a support for muscles, organs, body tissues, keeps one's head upright, participates in the making of thoracic, abdominal and pelvic walls.

At present, more and more children communicate with the help of the computer. Employers recruit young people whose spinal column is not yet well established.

**Spinal column syndrome** occurs in computer operators and results from a forced working position. It manifests itself as the following:

cervical spine diseases (degenerative dystrophic changes, pathology of craniospinal joints, problems of vertebral blood circulation, occipital migraine, brachial plexopathy, etc.);

affective or mood disorders (nerve impulse interlinking between human brain stem parts and spinal cord nerve pathways suffer. In case a computer operator's cervical or neck regions suffer, it may manifest as pain in the mentioned areas, depressive mood with anxiety along with sleep disorders);

optical syndrome (changes in vision sharpness and field of vision, twinkling in front of one's eyes);

imbalance syndrome (nausea, decrepit walk, difficulties to coordinate activities at the computer, etc.);

syndrome of vegetative seizures (fainting, palpitations with perspiration, etc.);

cervical-cranial or posterior sympathetic syndrome (computer operators experience subjective discomfort - constant tension of head and neck muscles, pain, dizziness, obsessive fear while working at the computer).

Computer operators may develop not only postural disorders, but also poise and internal organ disturbances. This can be explained with the fact that in case of pathological curvature or damage of separate fragments of spinal column, nerve roots are injured running from spinal cord to various organs.

### **Remember!**

Spinal cord should be straight in its frontal plane. Otherwise, the employee may develop posture disorders or scoliosis.

While working at the computer, its operator is in the position defined by the workplace.

### **Breathing or respiratory syndrome (SARS)**

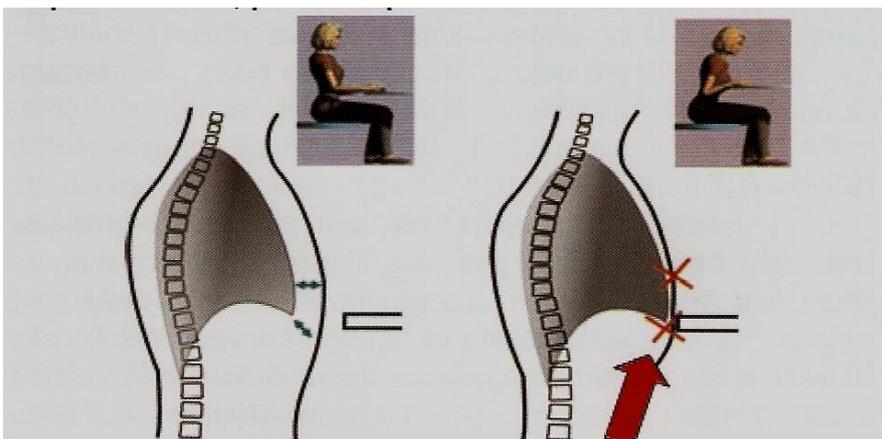
This syndrome has to do with the way humans breathe.

During breathing with one's breast, lung volume changes in the direction from front to rear (lungs move between the spine and the sternum).

In abdominal breathing, lung capacity is changed in direction from top to bottom - in accordance with the diaphragm movement.

Mixed breathing - if the lung movement happens in all directions.

### **Lung capacity is limited as a result of incorrect sitting!**



Researchers in many countries have demonstrated that respiratory diseases in computer users increase. It is therefore essential to breathe properly during working hours and during breaks. Deep breathing enriches lungs with oxygen and other vital substances.

Prolonged forced working position compresses the chest and organs in abdominal cavity, thus severely limiting lung movement and oxygen from entering them. Insufficient oxygen can cause headaches, fatigue, chronic bronchitis, asthma.

### Blood Congestion Syndrome (BCS)

This is related to chronic sitting/working at the computer in a certain pose, sometimes - for years, and performing intensive work tasks in such positions.

Human circulatory system functions based on principle of hydraulics. The system consists of tubes (blood vessels) and pumps that pump the fluid (blood). The main pump is the heart. Blood is transferred through the blood vessels from the heart to the organs, tissues, and then - pumped back to the heart.

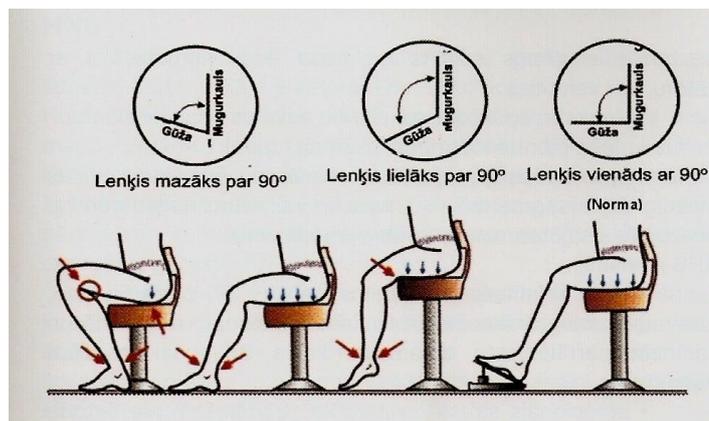
Unlike muscle/venous pumps, the heart pump pumps blood continuously. During standing or sitting, leg muscles are not active, muscle/venous pumps do not work. When humans move, their leg muscles presses on their veins.

While sitting in a rigid or tense pose at the computer, no contraction and relaxation takes place in the leg muscles. Thus, legs of a computer operator build up a lot of blood and veins eventually expand. Gradually, varicose vein disease (chronic ischemic leg vascular insufficiency) develops.

### Formation of BCS syndrome in legs

BCS syndrome may also be caused by mechanical pressing of the blood vessels. It is proven that in case of forced postures and intense, stressful work, computer operators' lower leg muscles are constantly under tension. Oftentimes a person will work at the computer with eyesight riveted tense to the screen, with legs crossed or convulsively pressed together. Pelvic and leg blood circulation suffers. Following issues may occur - varicose leg veins, feet swelling, failures of abdominal and urogenital organs, hemorrhoidal veins.

**Circulatory problems in the legs occur due to incorrect working postures.**



### **Skin Problems Syndrome (SPS)**

This syndrome has to do with human skin. Due to communication with the computer, following issues may occur:

- skin inflammations in palm, lower arm, elbow;
- itching (contact dermatitis, eczema, etc.);
- inflammation of shoulder and spatula area muscles (respective skin areas suffer; following issues may develop - hyperemia, burning and itching sensations, trophic disturbances).

Causes of the SPS:

- Low relative air humidity ( $W < 30\%$ ) in the working environment, which leads to a higher electrostatic field near computers and can lead to inflammation of facial and neck skin (redness, itching);
- Computer operator's emotional stress and overload, which may lead to high arterial blood pressure, spastic pain in the head and eyeballs, and manifest itself as hyperemia of the facial skin and scalp itching.

### **Chronic Fatigue Syndrome (CFS)**

CFS has to do with employee's mental and ocular tension during work at the computer, followed by fatigue.

Communication with the computer at the beginning of the working day exacerbates sensory ability, but the end of a workday exhaustion occurs; perception, response and thinking are all slowed down. After prolonged work at the computer employees develop stress overload and accumulate fatigue expressions. Depressed mood may develop.

Emotional tension arises from stressful thinking, constant new challenges, the need to simultaneously perform a variety of cognitive activities and maintain attention, and comply to given tasks and time limits (temporal strain).

Ocular tension usually occurs simultaneously with emotional tension. This tension has a synergistic effect on top of emotional tension and reinforces it.

**Action plan** in case of visual overload, carpal tunnel, spinal, respiratory, circulatory congestion, problematic skin and chronic fatigue syndrome

1. The employee must notify the employer about experienced health problems caused by operating a computer at a workplace.
2. The employer must consider the risks and take necessary measures.
3. Health status of employee's leading working hand must be evaluated at the workplace, diagnosing its functional abilities and muscle strength. Several methods are available for this purpose, such as electromyography, miotonometry, etc. It is also advised to assess health status of employee's cervical spine section.
4. Computer operators should be equipped with special pedalling training devices or pneumatic carpet-trainers. This will allow the workers sitting at a computer and performing various tasks move their feet on the trainer simultaneously. This will prevent circulatory problems in the legs and small pelvis.
5. The employer, in cooperation with experts, should develop a particular arm, hand and spine recovery program.
6. **Perform regular physical and eye exercises.**
7. Regularly monitor air humidity in premises with computers.
8. The employer should assess hazards of psycho-emotional and visual overload during the work at the computer.
9. Employees should perform eye-exercises every 20 minutes (eye squinting, eyeball articulation, etc.) along with folding back their spine and stretching.
10. Every 45 minutes employees should deeply inhale through nose while counting to six, and then - exhale through mouth while counting to eleven.
11. It is advised to instruct the employees to maintain a schedule with microbreaks during the working hours, and to perform posture exercises during those - alternatively stretch and relax muscle groups (clench and unclench fists, tighten and relax shoulder blade area and shoulders, employ facial and mimicry muscles, etc.).

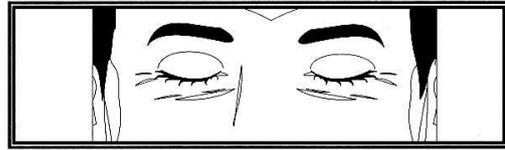
## RECOMMENDED EXERCISES

### Eye Exercises

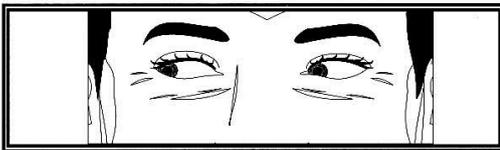
Every exercise should be repeated 5 times.



- One - raise your eyes upwards, hold for 3 seconds;



- Two - close your eyes tightly and relax for 10 - 15 seconds.



- One - without turning your head, turn your eyes to the right;
- Two - look straight ahead;



- Three - without turning your head, turn your eyes to the left;
- Four - look straight ahead.

Repeat the same for up and down.



- One - close your right eye while keeping the left eye open;



- Two - close your left eye while keeping the right eye open;

Perform the exercise in a quick pace (5 - 10 seconds).



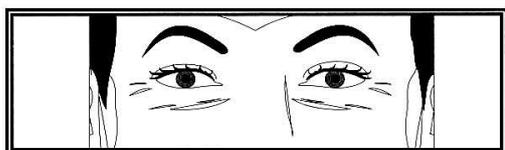
- One - place your index finger on your nose and focus your sight on it for 3 - 5 seconds;



- Two - look into the distance for 10 - 15 seconds.

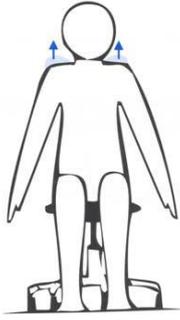
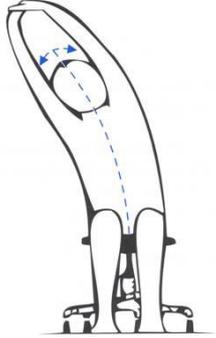
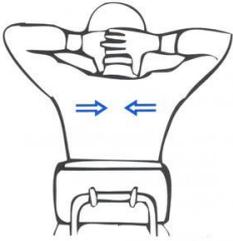


- One - close your eyes without tensioning the eye muscles (10 - 15 seconds);

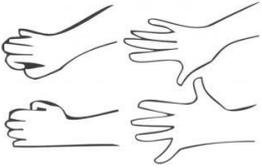
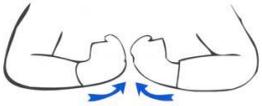
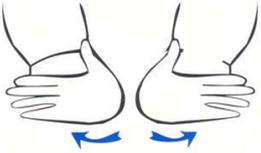
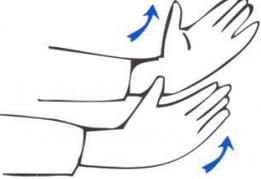
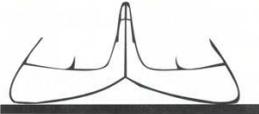


- Two - look into the distance for 10 - 15 seconds.

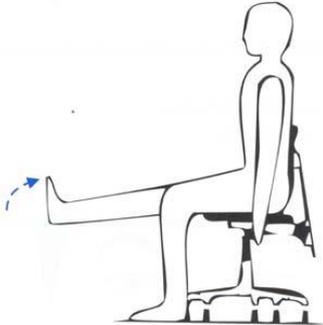
### Stretching Exercises

|   |   |
|---|---|
|    | <p>Sitting position, arms along the sides of the body.</p> <p>One - rise your shoulders until you feel a slight tension.<br/>Remain at this pose for 3 - 5 seconds</p> <p>Two - return to the initial state</p> <p>Repeat the exercise for 5 - 10 times.</p>  |
|    | <p>Sitting position, back supported against the backrest.</p> <p>One - slowly circle your shoulders forward (5 times)</p> <p>Two - slowly circle your shoulders backwards (5 times)</p> <p>Repeat the exercise for 3 - 5 times.</p>   |
|  | <p>Sitting position with a straight back without resting it to the backrest.</p> <p>One - interlace your fingers, raise your arms over your head, straighten your elbows and bend your hands backwards as far as possible</p> <p>Two - slowly lean right</p> <p>Three - slowly lean left</p> <p>Repeat the exercise for 3 - 5 times.</p>  |
|  | <p>Sitting position, palms behind your head, fingers interlaced.</p> <p>One - move your shoulder blades together until you feel tension, remain in this pose for 5 - 10 seconds</p> <p>Two - relax</p> <p>Repeat the exercise for 5 - 10 times.</p>   |
|  | <p>Sitting position.</p> <p>One - place one arm behind your head with elbow facing upwards and touch the opposite shoulder blade with the palm.</p> <p>Two - using the other hand, pull the elbow of the lifted arm until you feel a slight tension</p> <p>Three - remain at this pose for 10 - 15 seconds</p> <p>Repeat the same with the other arm. Repeat the exercise for 5 - 10 times.</p> |

### Finger and Palm Exercises

|   |  |
|---|--|
|    | <p>Arms extruded forwards, palms facing downwards.</p> <p>One - stretch your fingers until you feel tension, hold for 5 seconds</p> <p>Two - relax your hand muscles</p> <p>Three - clench fists until you feel tension, hold for 5 seconds</p> <p>Four - relax your hand muscles</p> <p>Repeat the exercise for 5 - 10 times.</p> |
|    | <p>Arms bent in elbows, fists clenched, thumbs facing upwards.</p> <p>One - by tensioning palm muscles, turn palms inwards</p> <p>Two - relax your hand muscles</p> <p>Repeat the exercise for 5 - 10 times.</p>   |
|   | <p>Arms bent in elbows, palms parallel one another, thumbs facing upwards.</p> <p>One - tension palm muscles and turn palms outwards</p> <p>Two - relax your hand muscles</p> <p>Repeat the exercise for 5 - 10 times.</p>   |
|  | <p>Arms bent in elbows, palms parallel one another, thumbs facing upwards.</p> <p>One - sway your palms to the right</p> <p>Two - sway your palms to the left</p> <p>Repeat the exercise for 5 - 10 times.</p>   |
|  | <p>Extrude your arms forward, palms facing down.</p> <p>One - bend your palms downwards until you feel tension. Remain at this pose for 3 - 5 seconds</p> <p>Two - now bend upwards until you feel tension. Remain at this pose for 3 - 5 seconds</p> <p>Repeat the exercise for 3 - 5 times.</p>                                  |
|  | <p>Straighten your arms forward, palms facing down.</p> <p>One - slowly turn your palms inwards until you feel tension. Remain at this pose for 35 seconds</p> <p>Two - return to the initial state</p> <p>Repeat the exercise for 3 - 5 times.</p>  |
|  | <p>Sitting position, palms facing one another, elbows planted on the table.</p> <p>One - forcefully move your palms towards each other until you feel maximum tension. Remain at this pose for 5 - 7 seconds</p> <p>Two - relax your hand muscles</p> <p>Repeat the exercise for 3 - 5 times.</p>                                  |

### Leg Musculature Exercises

|  |  |
|--|--|
|   | <p>Sitting position with straight back without resting it upon the backrest, feet firmly on the floor.</p> <p>One - straighten a leg and lift it a couple of centimetres above the ground. Remain at this pose for 5 seconds</p> <p>Two - lower your foot back on the ground</p> <p>Repeat the same with the other leg. Repeat the exercise for 3 - 5 times.</p> |
|  | <p>Sitting position, back supported against the backrest.</p> <p>One - straighten a leg in the knee joint</p> <p>Two - bow your foot downwards, hold for 5 seconds</p> <p>Three - lift your foot upwards, hold for 5 seconds</p> <p>Repeat the same with the other leg. Repeat the exercise for 5 - 10 times.</p>  |

## Physical and Mental Fatigue Reduction Exercises

### Breathing Exercises

**Exercise 1 (repeat 4 - 5 times) in a slow, steady pace** Initial position: feet placed shoulder-width apart. And 1 - hands up, stretch, deep inhale, and 2 - lower your arms, exhale.

**Exercise 2 (repeat 4 - 5 times ) in a slow, steady pace -** Initial position: basic pose, hands placed on your waist. And 1 - while moving elbows forward, compress the chest, exhale fully, and 2 - while drawing your elbows backwards, lean backwards and deeply inhale.

**Exercise 3 (repeat 4 - 5 times) in a steady pace -** Initial position: basic pose, hands down your sides. 1 – circle your right arm, deeply inhale. 2 – circle your left arm, fully exhale.

**Exercise 4 (repeat 4 - 5 times) in a steady pace -** Initial position: basic pose, hands down your sides. 1 - straighten your arms with palms facing upwards above your head, inhale, 2 - cross your arms in front of you, hug your shoulders, exhale.