

FESHM 4120: OCCUPATIONAL ERGONOMICS PROGRAM

Revision History

Author	Description of Change	Revision Date
Kelly Dombrowski, Steve Carlson	Revision 3. Editorial and definition updates. Added working from home guidance and reminders (Appendix 1). Adjusted general contact expectations to reflect industrial hygiene group inclusion.	February 2021
Robert Bushek	Revision 2. Incorporated comments from the new Fermilab Occupational Medical Office. Added additional risk factors. Updated chapter to FESHM 4120. Removed the technical appendix. Updated how the record review is distributed.	January 2015
Bridget Scerini	Revision 1. Added direction on obtaining additional ergonomic information through training or division ergonomic representatives.	September 2011
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1.0 INTRODUCTION

The purpose of this chapter is to assist management in preventing work-related musculoskeletal disorders (WMSDs) by controlling worker exposure to physical workplace risk factors.

2.0 DEFINITIONS

Occupational Ergonomics - Fitting the workplace to the worker. Ergonomics is the study of human work that considers the physical capabilities and limitations when interacting with equipment and completing job tasks.

Work-related Musculoskeletal Disorder (WMSD) – An injury or disorder of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs that was not caused by a slip, trip, fall, motor vehicle accident, or similar workplace incident. WMSDs are those that develop from exposures to physical workplace risk factors that decrease blood flow to muscles, nerves, or joints; compress nerves; damage tendons or tendon sheaths; sprain or strain muscles, tendons, or ligaments; or damage joints.

Musculoskeletal disorder (MSD) –injury or disorder of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs. MSDs may include epicondylitis, tendonitis, DeQuervian’s disease, trigger finger, Reynaud’s syndrome, carpal tunnel syndrome, and back strain.

Physical Workplace Risk Factors – Aspects of a job or task that impose biomechanical stress on a worker. They include awkward or static postures, frequent or awkward forceful exertions (e.g. lifting), compression, repetition, vibration, and duration.

[Note: other workplace conditions like intensity, temperature, organizational issues, and stress can contribute to but do not cause WMSDs]

Personal Risk Factors – personal aspects that can contribute to but do not cause WMSDs. They include age, sex, hobbies, previous injuries, physical or medical conditions, smoking, and fatigue.

Work Activities Analysis Form - Form completed by supervisor prior to initial hiring as well as before every periodic medical exam for each person they supervise. The form identifies the expected frequency of workplace exposures.

3.0 RESPONSIBILITIES

3.1 Division/Section/Project Manager

The Division/Section Head or Project Manager shall ensure compliance with this chapter.

3.2 Supervisors

Supervisors are responsible for completion of a Work Activities Analysis Form prior to the initial hiring of an employee as well as before every periodic medical exam. Supervisors shall identify work that will require Computer Workstation Ergonomics training or Industrial Ergonomics training and ensure their employees are appropriately trained for the work they are expected to perform. Supervisors shall refer to the ergonomics page on the industrial hygiene webpage and ensure that actual or potential WMSDs are reported to the medical for evaluation(s). Contact the Industrial Hygiene Group for ergonomics evaluations and recommendations.

3.3 Employees

Employees are responsible for reporting occupational ergonomics concerns, symptoms, and injuries to their supervisor and the Occupational Medical Office as soon as they occur. Employees are expected to implement their ergonomics training while working at the laboratory, at home, or any other facility in which working on behalf of FNAL. Employees should refer to the Fermilab ergonomics training materials and the ergonomics page on the industrial hygiene webpage for assistance with hazard prevention and control. Contact the Industrial Hygiene Group for ergonomics evaluations and recommendations.

3.4 Industrial Hygiene Group

The Industrial Hygiene Group shall provide expertise in evaluating workplace design and offer recommendations for workplace improvements. The industrial hygiene group shall also deliver or coordinate training in such areas as computer workstation ergonomics, industrial ergonomics, and back safety

3.5 Fermilab Occupational Medical Office

The Fermilab Occupational Medical Office is responsible for assessing the worker's ability to perform the essential functions of the job in consideration of potential occupational exposures and medical history. The Fermilab Occupational Medical Office is responsible for communicating with management, supervisors, and the respective Division Safety Officer (DSO) regarding the worker's ability to work and any restrictions placed on the worker. The Fermilab Occupational Medical Office will assist in workplace evaluations as requested; reinforce proper body mechanics and proper workstation design.

4.0 PROGRAM DESCRIPTION

Fermilab's Occupational Ergonomics Program consists of four activities: workplace analysis, hazard prevention and control, medical management, and training.

4.1 Workplace Analysis

4.1.1. Work Activities Analysis Form

A [Work Activities Analysis Form](https://www-esh.fnal.gov/pls/cert/waaf.html) (<https://www-esh.fnal.gov/pls/cert/waaf.html>) shall be completed prior to initial hiring and before every periodic medical exam for each person. This form is used to collect the supervisory impression of expected exposures to physical workplace risk factors and other conditions that can contribute to the development of WMSDs. A list of workplace risk factor considerations (listed section 4.1.3 of this chapter) should be taken into consideration when filling out the form. Upon completing the Work Activities Analysis Form, supervisors will receive input from the Fermilab Occupational Medical Office regarding the worker's ability to perform detailed work. Supervisors can contact the Industrial Hygiene Group for assistance as needed.

4.1.2. Records Review

An annual Records Review identifies jobs, workstations, and associated tasks that may contain physical workplace risk factors and other conditions that have contributed to the development of WMSDs or associated patterns related to potential injury; its intent is to help recognize actual or potential injury patterns to ensure job and workstation needs are adequately addressed. Results of this review will be shared at the FESHCom meeting and placed into iTrack.

Records that should be considered for review:

- CAIRS Reports (Accident/Incident Reports)
- Worker's Compensation claims
- Job titles and descriptions

The following list should be considered for the record review:

- Description of injury or illness, including affected body parts
- Job title or position title of the worker
- Any previous job titles or job descriptions of the worker
- Department where worker works
- Time on the job
- Date of injury or illness
- Description of equipment used on that job

The list below shall be used to track and trend the records review:

- **Analyze** the data gathered and group together similar injury types, body parts, severity of injuries, etc.
- **Calculate** the incidence rate: the number of new incidents of injuries/illnesses in a given period of time
- **Calculate** the severity rate: the cost of injuries/illnesses, either in terms of dollars or physical severity, in a given time period
- **Rank** the departments, jobs, or equipment in descending order, starting with the highest injury rate and severity rate based on the incidence and severity rate information
- **Investigate** jobs further to identify the risk factors present. This should include input from workers as well as observers.

4.1.3. Workstation Evaluations

A representative of the Industrial Hygiene Group can conduct a formal workstation evaluation. These evaluations can be performed at the request of employees, supervisors, the DSO, or the Fermi Occupational Medical Office. They may also be prompted by a review of records or an audit. There is an optional pre-assessment form [4120-1](#) available for evaluators. This form is to be filled out by the worker being evaluated, and then returned to the evaluator before the assessment. The form [4120-2](#) is used for evaluating computer workstations (*Computer Workstation Ergonomics Review*) and form [4120-3](#) for evaluating industrial work activities (*Industrial Workstation Ergonomics Review*).

A workstation evaluation should be considered whenever:

- The workplace moves to a different location. Note: for ergonomics guidance and reminders for working from home, see Appendix 1.
- Workplace configurations change.
- New equipment is purchased and installed.
- Work methods or procedures change.
- The worker complains of musculoskeletal disorders or injuries.
- A worker is aware of poor posture of the back or extremities.

Signs of WMSDs may include:

- Painful joints
- Pain in wrists, shoulders, forearms, knees, etc.
- Pain, tingling or numbness in hands or feet
- Fingers or toes turning white
- Shooting or stabbing pains in arms or legs

- Back or neck pain
- Swelling or inflammation
- Stiffness
- Burning sensations
- Heaviness
- Weakness or clumsiness in hands

Workplace Risk Factor Considerations – (Can serve as a general guide in filling out the Work Activities Analysis Form):

- Awkward Postures – Working with various parts of the body (e.g., limbs, joints, back) in bent, extended or flexed position rather than in a straight or neutral position.
- Static Postures – staying in one position for a prolonged duration.
- Force – heavy, frequent, or awkward lifting, pushing, or pulling
- Compression (contact stress) – the contact of the body with any hard surface or edge that results in the pinching or crushing of tissue
- Repetition – performing the same motions many times, continuously. Repetition becomes most problematic when combined with other risk factors that don't allow for muscle recovery.
- Vibration – working on or with equipment that vibrates a single point or the whole body. Hand-arm vibration is vibration that goes through the hand and arm, and then travels through the rest of the body.
- Duration – the amount of time it takes to perform a task.

Other Workplace Condition Considerations – (Can serve as a general guide in filling out the Work Activities Analysis Form)

- Temperature extremes – working in conditions that are very cold or very hot.
- Inadequate recovery or rest
- Lighting – the amount of workspace light.
- Poorly fitted gloves – reduces dexterity and feeling, resulting in a need to use stronger muscle force.
- Stress on the job – when personal in nature, can be outside the realm of mitigation without an active wellness program.

Evaluation Tools to help identify physical workplace risk factors (at least two should be used to ensure a more thorough analysis):

- Employee interview - used to get the worker's opinion of risk factors present on the job
- Work Activities Analysis Form (WAAF) – filled out by supervisor and used by the Occupational Medical Office to assess risk factors in individual jobs

- Pre-Assessment Form, Industrial Workstation Ergonomic Review or Computer Workstation Ergonomic Review– forms used by the division/section Ergonomic Subcommittee member conducting the ergonomic evaluation
- Video recording - video recording a job from different angles for a period of time (typically 10-20 minutes or at least three complete work cycles) and then viewed later
- Narrative Review - watching the work for a period of time and writing a detailed description of the observations found

Identify physical workplace risk-factors and contributing workplace conditions. Determine whether the risk factor stems from:

- The *method* used or required to do the task
- The *effort or strength* required to do the task
- The *location* of the parts, equipment or tools
- The *position* of parts, equipment or tools
- The *speed or frequency* of the work
- The *duration or repetition* of the tasks
- The *design* of the parts, equipment or tools
- The *environmental factors*, such as light, noise, temperature and air quality
- The *habits* of the individual
- The physical condition of the individual

4.2 Hazard Prevention and Control

After the worksite analysis is completed, all reasonable steps need to be taken so that the jobs, workstations, tools and environment fit the worker. The changes made should eliminate or reduce the risk of injury using engineering controls, work practice controls, personal protective equipment and/or administrative controls.

Risk factors are eliminated or reduced using three types of controls:

- Engineering controls
- Work practice controls
- Personal protective equipment

4.2.1. Engineering Controls

- Preferred method of control
- Makes permanent changes that eliminate hazards at the source
- Can be more expensive than other controls, but effect is often more significant
- Examples include; workstation design, work methods design, tool and equipment design

An “Ergo Lab” is in Wilson Hall on the Ground Floor behind the Service Desk. A variety of chairs, keyboards and mouse trays are available from which individuals can select. Contact the Industrial Hygiene Group for additional information or to schedule an appointment with the Occupational Medical Office

4.2.2. Work Practice Controls

- Procedures for safe and proper work that are used to reduce the duration, frequency or severity of exposure to a hazard
- Standard operating procedures (SOPs) should allow for enough workers to complete the tasks. Evaluations of the procedures should occur regularly
- Worker’s input should be incorporated into the problem-solving process
- Controls should be understood and followed by managers, supervisors and workers.
- Examples of work practice controls include; work methods training, gradual introduction to work, monitoring, recovery pauses, job rotation, job design, maintenance and housekeeping, and stretching and/or changing positions frequently

Examples of Work Practice Controls

Work methods training – Three ergonomic training classes are available to employees: *Computer Workstation Review*, *Industrial Ergonomics*, and *Backworks*. Employees are provided a general awareness of how to perform their job with the least amount of physical stress, while maintaining good body position and using good body mechanics. They will also be instructed on how to handle materials, tools and equipment safely.

Gradual introduction to work - For tasks that involve prolonged repetitive motion, new and returning workers are introduced slowly to a full workload to improve work capacity. (*See Medical Management*)

Monitoring - Jobs are regularly monitored to see if specified safe work practices are being used, and to ensure that risk is reduced.

Recovery pauses - Workers can perform other activities that involve different muscle groups during pauses from the original activity.

Job rotation - Workers are rotated into different jobs/work activities that use different muscle-tendon groups, thus preventing fatigue.

Administrative Controls – A job or activity is divided among a number of workers rather than having one worker perform the entire job or activity. For example, four workers may perform an activity two hours each rather than one worker performing the activity for the entire eight hours.

Job design - Jobs can be designed or redesigned to incorporate good ergonomic practices. This includes providing relief from frequent repetitive motions, static or awkward postures, excessive forceful exertions, and mental/muscular fatigue.

Maintenance and housekeeping – ensure tools and equipment are in good condition and perform to expectations.

4.2.3. Personal Protective Equipment

Personal Protective Equipment (PPE) should be used to control a hazard until permanent controls can be implemented, or to supplement existing controls. Personal Protective Equipment should be used only when other methods to control the hazard are not considered feasible. For example, using a tool or making an administrative change to reduce physical strain to the worker should be thoroughly evaluated prior to using PPE.

Note on back belts: No back belts are to be used by Fermilab personnel without prior review by the Fermi Occupational Medical Office. A written note from a personal physician may be required if a back belt must be worn as part of a prescribed rehabilitation treatment for a personal injury. Comprehensive studies to date have found no evidence that back belts are effective in reducing back injuries.

Note: The Fermi Occupational Medical Office strongly recommends that no individual worker should physically pick up a load greater than 50 pounds.

4.3 Medical Management

The goals of medical management are the effective use of health-care resources to prevent or reduce work-related musculoskeletal injuries and manage them to limit further injury once they occur. Also, to facilitate full recovery in changing habits to prevent future injuries.

4.3.1. Injury Prevention

Detailed written job descriptions are needed for each job category. This is primarily the supervisor's responsibility. The descriptions should clearly define the qualifications, essential functions and physical requirements of the job. This is a good step in identifying ergonomic risk factors and eliminating them.

Supervisors will encourage suggestions from workers concerning job improvement. This will help to provide a direct source of ideas about injury prevention.

4.3.2. Management/Early Intervention

The focus here is to diagnose and treat the injury or illness during its early phase with the goal minimizing pain and symptoms, time lost, and ensuring a safe return to work. Workers need to be encouraged to report injuries/illnesses to their supervisor as soon as they occur, who in turn should direct the employee to the Fermi Occupational Medical Office. When an actual or potential WMSD is reported to the employee's supervisor, the Fermi Occupational Medical Office medical personnel will report the incident to the DSO and the Industrial Hygiene ergonomics representative and request that a workstation evaluation take place.

4.3.3. Chronic Injury

The goals in cases of chronic injuries are to ensure a safe return to work without further complications, to prevent disability, and fully recover if possible. Chronic injury intervention should begin under one or more of the following conditions:

- The employee has not returned to work and the claim remains unresolved.
- The employee has not returned to work and does not show demonstrated improvement from the *Management/Early Intervention* phase.
- The employee has returned to work with limited duties, but without resolution of the claim.

The injured worker's recovery status should be re-evaluated by Fermi Occupational Medical Office before returning to work. All barriers should be reviewed that are preventing the worker from returning to work.

4.4 Training and Education

The Ergonomics Program shall be introduced during New Employee Orientation. Additional training is provided to all employees and support personnel through a coordinated effort of the Industrial Hygiene Group. Those employees and support personnel that need ergonomic training are identified through the Individual Training Needs Assessment (ITNA).

Discussion of any new ergonomics related hazards or risks should also occur between the supervisor and employee(s) whenever new processes, equipment or procedures are introduced into the workplace, and in some instances, should be addressed in the Hazard Analysis.

Four classes are being offered to laboratory employees in TRAIN and are tracked in the ITNA. The ITNA contains questions that, when answered in the affirmative, indicate the need for one, two or all relevant training classes, which may include *Computer Workstation Review and Industrial Ergonomics*, and cover the following:

- Signs and symptoms of musculoskeletal disorders
- Where to report symptoms

- Risk factors and examples of associated work
- How to report risk factors to the supervisor and/or the Industrial Hygiene Group.

Training and educating employees on work-related musculoskeletal disorders is important to the success of the ergonomics program. It gives both workers and managers an understanding of the potential risk of injuries, their causes, symptoms, prevention and treatment.

5.0 APPENDICES

Appendix 1 – Working from Home – Ergonomics Guidance and Reminders

Working from Home – Ergonomics Guidance and Reminders

Work Surface (may include keyboard height if keyboard can remain ~ 2" above thighs when seated)	Possible Solution	Reminder
Fixed surface height → >28" Adjustable surface height → 23-28" Surface thickness → ≤ 2" Surface width → ≥ 30"	Adjust height of surface or chair.	<i>Elbows should fall naturally to side of the body and forearms should be parallel to the floor. Wrists should be straight/level.</i>
Monitor Screen	Possible Solution	Reminder
Distance → 18-24"	Adjust monitor distance.	<i>Monitor should be positioned in front of users at or below eye level. Screens should be free of glare and reflections. Users should not forget to use prescription lenses if they require them. Consider refocusing on distant objects for at least 20 seconds every 20 minutes. Dark colors contrasted with a light background is preferred.</i>
Leg Clearance	Possible Solution	Reminder
Width (when seated) → ≥ 24" Depth from knee (when seated) → ≥ 15" Thigh clearance (when seated) → 1-2"	Find a wider table or remove obstruction. Find a table with deeper clearance or remove obstruction.	Hips should be at the same level or slightly higher than the knees. Feet should be flat on the floor and users should not feel overwhelmingly compelled to lean forward. The head should be in a comfortable over the shoulders.
Laptop Computer Guidance - working from home with no desk/work surface		
Find a chair that is comfortable and that you can sit back in		
Position laptop in the lap for the most neutral wrist posture that you can achieve. Try to keep wrists straight and not overly flexed or extended.		
Angle the laptop screen so that you can see with the least amount of neck deviation. Try to keep your head comfortable over your shoulders.		
Take microbreaks as needed or whenever fatigue is noticed (at minimum, 2-3 minutes every 45 minutes is recommended)		
Laptop Computer Guidance - working from home with desk but no supplemental equipment (monitor/docking station/etc.)		
Position laptop on desk/work surface in front so that one can see the screen without bending the neck. It may be helpful to elevate the laptop off the desk surface using a stable support surface (using a separate keyboard and mouse to help ensure a neutral posture through the wrist).		
If frequently working from home, consider supplemental equipment (docking station, monitor, keyboard, mouse)		
Take microbreaks as needed or whenever fatigue is noticed (at minimum, 2-3 minutes every 45 minutes is recommended)		

Note: Although size selections presented here are recommendations, they are interpreted from anthropometric data to help proactively accommodate most of the working population (some exclusions may apply). These design criteria are not meant to supersede any other FESHM requirement. Special considerations may be necessary for special medical or personal conditions. Should the need arise, employees may consult the Industrial Hygiene group or Occupational Medical Department for a formalized assessment and supplemental equipment recommendations.

6.0 REFERENCES

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