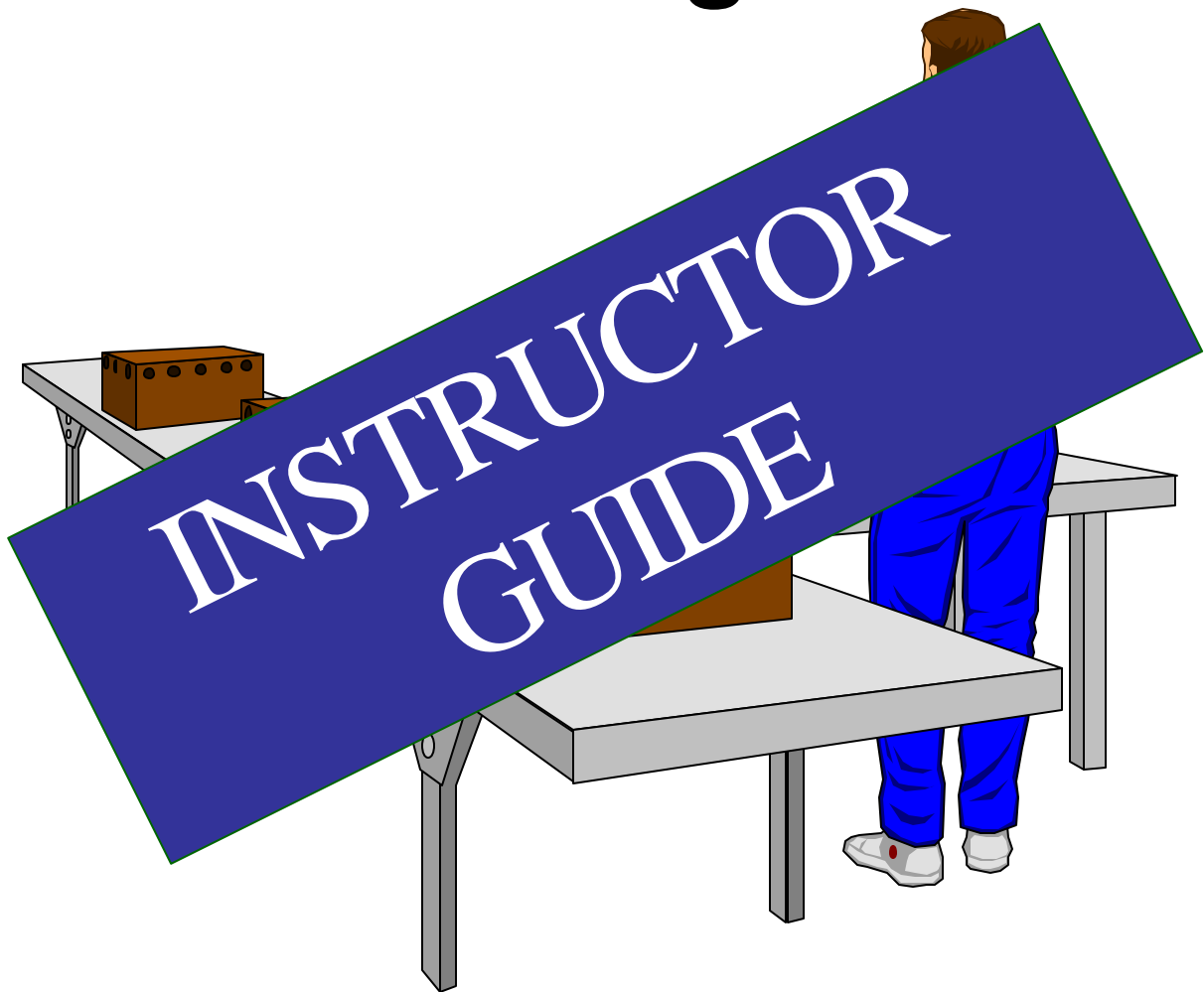


*Introduction to the Ergonomics of*

# ***Manual Materials Handling***



Presented by the Public Education Section  
Department of Business and Consumer Business  
Oregon OSHA



## OR-OSHA Mission Statement

To advance and improve workplace safety and health for all workers in Oregon.

### Consultative Services

- Offers no-cost on-site safety and health assistance to help Oregon employers recognize and correct safety and health problems in their workplaces.
- Provides consultations in the areas of safety, industrial hygiene, ergonomics, occupational safety and health programs, new-business assistance, the Safety and Health Achievement Recognition Program (SHARP), and the Voluntary Protection Program (VPP).

### Enforcement

- Offers pre-job conferences for mobile employers in industries such as logging and construction.
- Provides abatement assistance to employers who have received citations and provides compliance and technical assistance by phone.
- Inspects places of employment for occupational safety and health rule violations and investigates workplace safety and health complaints and accidents.

### Appeals, Informal Conferences

- Provides the opportunity for employers to hold informal meetings with OR-OSHA on workplace safety and health concerns.
- Discusses OR-OSHA's requirements and clarifies workplace safety or health violations.
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

### Standards & Technical Resources

- Develops, interprets, and provides technical advice on safety and health standards.
- Provides copies of all OR-OSHA occupational safety and health standards.
- Publishes booklets, pamphlets, and other materials to assist in the implementation of safety and health standards and programs.
- Operates a Resource Center containing books, topical files, technical periodicals, a video and film lending library, and more than 200 databases.

### Public Education & Conferences

- Conducts conferences, seminars, workshops, and rule forums.
- Presents many workshops that introduce managers, supervisors, safety committee members, and others to occupational safety and health requirements, technical programs, and safety and health management concepts.

### Additional Public Education Services

- Safety for Small Business workshops
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## **Ergonomics of Manual Material Handling (1005)**

### **Instructors Notes**

First of all a little background about the workshop. In the early 90s MMH was being taught by our Ergonomists and the main focus was on teaching the students how to calculate the NIOSH lifting formula. The workshop was too technical and students were leaving with a bit more understanding of back safety but were very frustrated as well. When I put this together the idea was to focus on first the costs to get their attention and then to dispel the serious myth that the major problem causing back injuries is the weight of the object and/or design of the container. The major problem first is that we do not understand the role that our physical characteristics play in our ability to lift. Our own height, weight, physical conditioning, whether we warm up before lifting. Second, we need to eliminate the twist in the middle of a lift. Third the location of the object to be lifted plays a major role, knuckle height to shoulder height needs to become the norm.

**Page 1:** Basic Introduction, About OSHA, Workshop Purpose, and Objectives

**Page 2:** Define MMH as given and add Definition of Ergonomics (not given): Ergonomics can be defined as “the laws or principles governing work design. The study of the design of work in relation to the physiological and psychological capabilities of people.” In other words, how the work environment affects the worker both physically and mentally.

Demonstration (to set the students at ease and let them see that they know the basics risks already): (I usually set up a simple demonstration with a empty box) I am moving the box from location to location as if in an assembly line. At first the box is on a chair that is turned back to me forcing me to reach over the back to lift it (reaching, bending at waste, lifting). Once in the air, I pause for a couple of seconds (holding). Next I twist (twisting) at the waste while turning to move to the table and I place the box at one end of the table. Now I push the box from one end all the way down the table to the other end (pushing). Once at the other end I pick up the box and turn 270 degrees to my right and carry the box (carrying) all the way back to the chair and then start all over.

I have them answer the true false questions in the middle of the page, but I've been skipping the bottom chart.

**Page 3:** Injury and Illness Costs: I spend some time going over the statistics. The emphasis is that those employers that say they don't have any money are just fooling themselves because they are already spending it in injury costs.

**Page 4:** Exercise. I have the table groups complete the exercise. I usually assign the employer to one table, the supervisor to another table, and the employee to a third table and continue until everyone is working on one of the three. I emphasize that I am not looking for only the dollars but also the quality of life impacts. Enter into a discussion about their lists. I am trying to remind everyone that it's not just a worker getting hurt and then getting the production back up and running. The effects of an injury are universal.

**Page 5:** Five Activities Involved in MMH. Exercise: Have the groups list as many actual example of the five activities as they can in 5 minutes. Hold a discussion with the tables sharing their examples. The idea behind this is to have them create a list of things that they will look at when then get back to the work place.

**Page 6:** This page is just to review the definitions of the activities and to provide and opportunity for question and answer.

**Page 8:** I usually review the issue of forces on the lower back by using this page. This is a quick lecture format. Emphasize that L-5 dist is the weakest link in the spine.

**Page 9:** I use these graphics to explain the function of the disc and the proximity of the nerves to the vertebrae and discs. Compression of the disc, when extreme, can cause herniation or rupture at the bulge. Pain can be experienced even in the case of no damage because of the proximity of the nerves to the discs and vertebrae if the area become irritated or inflamed.

**Page 10:** The Great Herniated Tomato Experiment: Just a fun visual of what might happen if a tomato (sudo-disc) were to be compressed beyond in capacity.

I continue at the bottom of the page with discussion about the Cumulative Trauma and it's relationship to the one time injury lift. The end result (injury is similar in that the cost and pain and suffering are about the same and the cumulative damage is about the same as well.

**Page 11:** The idea here is to get the students thinking about angles. The pivot point for A is the hip or lower back. The farther away from vertical the higher the forces on the lower back. The pivot point for B is the shoulder and the wider the angle the more force on the lower back. The pivot point for C is the elbow and the wider the angle the greater the force on the lower back. As I go over each of these I demonstrate the changing angles by using the empty box.

Regarding the formula at the bottom. This is a simplified explanation of the Biomechanical formula (the actual formula is in the appendices.) The point to be made is that the subject (workers) weight and height are factored into the force equation 4 times based on angle A. Angle B is factored three times. Angle C is factored twice and the object weight is only factored once. This is a serious indication as to why most back training is not effective. The emphasis has been on reducing the object weight with very little discussion regarding the angles, the weight of the upper body and the height of the individual.

The graphic at the bottom of the page is just another way to look at the formula to make the point

**Page 12:** Exercise: Here again is an attempt at getting the students to think about their work activities and to write down examples that have to do with angles. I have them discuss their examples with the class.

**Page 13:** The Physiological Approach (second principle of NIOSH) has to do with the repetitions per minute and the weight of the object. I discuss briefly the information at the top and then give them an example at the bottom. I usually use 12 lbs. I have them locate the 12 on the left side of the chart and have them draw a line from there horizontally to the arch from left to right. At the point where the line touches the arch draw a straight line down to the numbers on the bottom. The down line should touch around the 5. This means that based on the simple chart the maximum frequency of lifts of a 12 pound object would be 5 times per minute. You can use other examples to validate the understanding of the workings of the chart.

**Page 14:** This page is pretty straight forward. Mostly lecture with Q and A. The discussion to emphasize the role that the physical condition plays in a worker's ability to maintain a given workload based on the Aerobic activity and the nature of the effort.

**Page 15:** Exercise: A third attempt at getting the students to make a list, this time having to do with repetitive lifting. Discussion to follow.

**Page 16:** The NIOSH model is addressed briefly here. I know that this is extremely oversimplified but this is about all the students can take at this juncture of the workshop. I skim through these two pages, explaining that later I will give them the address for NIOSH and they can order the whole lifting guide if they want.

**Page 17:** Once the NIOSH calculations have been made they can be plotted on the chart on page 17. I just explain the three zones on the chart in case someone come across the chart again somewhere. It is not a stand alone chart and without the full NIOSH calculation means little if anything so I don't spend much time here.

**Page 18:** Factors that Influence MMH: I have an open discussion regarding these characteristics. I usually have the students tell me examples of the characteristics and I list them on a flip chart or white board.

- \* Worker Characteristics would include: Height, weight, reach, age, physical conditioning, prior injury etc.
- \* Task Characteristics / Work Practices: Frequency of lifts, travel distance, location of object, ease of access, available assistance, policies procedures and enforcement
- \* Material / Container: Soft, hard, flexible, weight, power, etc. Shape, makeup, handholds, size etc.

**Page 19:** Safe Lifting Guidelines: Here I go over each of the five guide lines and again demonstrate with the empty box. I used to ask the students to help demonstrate but I stopped because of liability issues.

Next I have them describe what is wrong with each of the pictures on the bottom of this page and on page 20 and have them tell me how they could reduce the risk using Engineering, Administrative, and PPE if applicable.

**Page 20:** Exercise continued.

**Page 21:** Page 21 is a review of the 5 lifting guidelines and a discussion about body mechanics. I use the weight lifter as an example to see if the students can tell us how the weight lifter keeps from getting hurt. Next I have the students give examples of different ways to lift an object based on worker characteristics, weight of object, and location of object.

**Page 22:** I just quickly go over the graphics to validate what the students said and the end of page 21.

**Page 23:** The MMH Survey: The survey was added at the request of students when the workshop was first created. All it is a summary of all the key elements of the workshop, put in a form that could be taken into the workplace and used to remind the person conducting the survey of what to look for. Page 24 through 30 are repeats of the survey with different pictures at the top of hazardous practices. These were also added at the request of students so that they could have other reminders of what to look for. Frankly the surveys are not of great help other than just as a reminder.

**Page 33:** Appendices

33: Definitions

34 thru 36: Equipment, Materials, Container Characteristics

37 The Biomechanical Model (actual formula)

37 thru 40: More on the NIOSH lifting formula **The NIOSH address is at the bottom of this page.**

38 A blank, generic survey.