

# Ergonomic Risk Analysis



# Ergonomic Risk Analysis

- *Similar to a job analysis, an ergonomic analysis examines job tasks and the physical demands associated with those job tasks. Job analysis and ergonomic analysis are not necessarily mutually exclusive*
- *An ergonomic analysis does not establish essential functions, nor does it detail all of the physical demands associated with a given job position.*
- *An ergonomic risk analysis identifies and quantifies ergonomic risk factors associated with job tasks, which have the potential to cause musculoskeletal injuries*
- *Usually, modifications designed to reduce the risk of injury are included in the written report.*
- *Useful for injury prevention, but also may be used with the injured employee prior to return to work, or to add insight on possible causation of a work related injury.*

# Ergonomic Red Flags that should trigger an Ergonomic Assessment

- Job appears to have a high risk for MSD's
- Claim or claims involving MSD's specific to an individual, job class, or a task.
- Employee has a PMHx of MSD's (frequent flyer)
- OSHA 300 log, medical records, insurance records or employer reports reveal moderate / high rate of MSD's, possibly related to a few specific tasks.
- Demographic group within the organization is experiencing a moderate to high rate of MSD's

# Ergonomic Red Flags that should trigger an Ergonomic Assessment

- Has the organization increased workloads recently?
- Are there productivity quotas or standards?
- Are employees under stress on the job?
- Concerns regarding re-injury of employee upon return to work
- Contribution to work related injury / causation

# OSHA RISK FACTORS FOR MSD's

## 1. Forceful Exertions

- Lifting
- Pushing / pulling
- Gripping
- Pinching

## 2. Postures

- Awkward
- Prolonged

## 3. Repetition

## 4. Vibration

## 5. Contact Stress

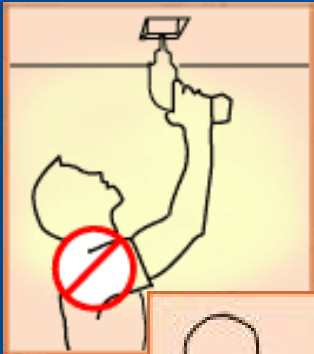


# Forceful Exertions

- **Consider**
  - Weight of load
  - Frequency of lift
  - Start and finish heights
  - Lifting technique / posture
- **Forces at Work**
  - lifting
  - pushing / pulling
  - gripping / squeezing
  - pinching
  - torque



# Awkward Postures / Positions:

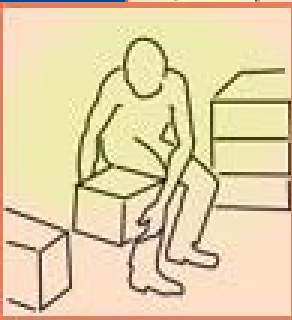


**Hand/wrist** – flexed, extended or deviated increases stress, decreases strength, compresses carpal tunnel, decreases circulation



**Elbow** – locked out or fully flexed decreases muscle efficiency, fully pronated or supinated increases stress

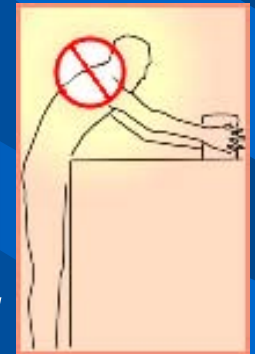
**Shoulder** – beyond arms length, above shoulder level, abducted or reaching behind increases stress



**Back/neck** – rounded spine, looking up or down more than 15°, twisting most stressful to joints and soft tissues



**Legs** – excessive knee flexion, hyperextension, body facing different way than task torques hips and knees



# What body parts are in awkward positions?



Is this habit or job demand?

# Repetition

- Same motion over and over
- Number of reps per min, hour, day, week?
- Combined with forceful exertion increases risk
- Faster motions increase risk
- Is there recovery time?
  - Allows muscles/tissues to recover
  - Improves circulation
  - Reduces inflammation



# Vibration

- Amount of vibration?
- Duration of exposure?
- How often?
- Recovery time
- Full body vs. upper extremity
- Vibration restricts blood supply to hands/fingers



# Contact stress

- Mechanical pressure over sensitive soft tissues, nerves or blood vessels
- Leaning against fixed objects
- Using hand as hammer, kicking objects with foot to move them, etc.
- In some circumstances, can be reduced with padding or PPE



# Contact Stress



Suggested modifications?

# Quantifying Risk Factors for MSD's:

Modified WISHA Caution / Hazard Checklist\*

- Repetition

- Using the same motion of the hands, elbows or wrists with little or no variation every few seconds (excluding keying activities),

- More than 2 hours total per day: **CAUTION**

- More than 6 hours total per day: **HAZARD**

\*Bernard, Thomas. *Washington State WISHA Screening Tool (Modified)*, version 2.0, Jan, 2010. Web 24 September 2010.

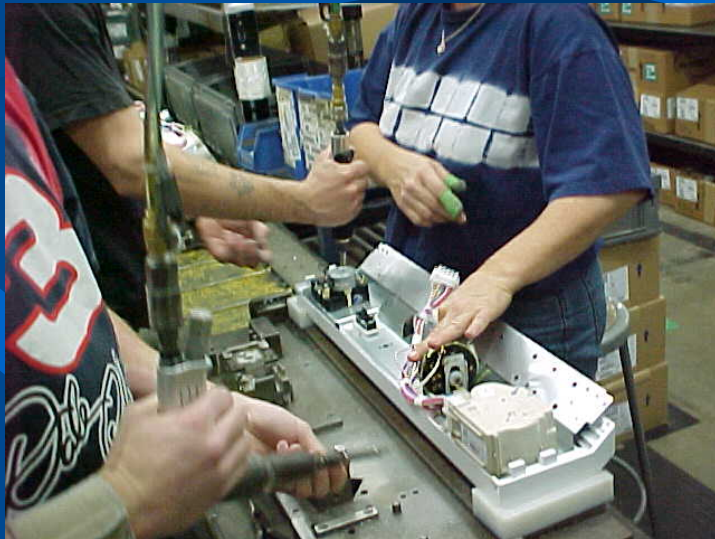
# Quantifying Risk Factors for MSD's:

- **CAUTION:** some risk present. Continue to monitor for changes that could increased risk, and for actual injuries or symptoms. Modification should be considered.\*
- **HAZARD:** “..a work related musculoskeletal disorder (WMSD) hazard exists, and immediate action (further analysis or intervention) is recommended.”\*

\*Bernard, Thomas. *Washington State WISHA Screening Tool (Modified)*, version 2.0, Jan, 2010. Web 24 September 2010.

# Quantifying Risk Factors for MSD's:

- Repetition
  - More than 4 hours total per day: **CAUTION**
  - More than 7 hours total per day: **HAZARD**



Any other concerns with this individual?

# Quantifying Risk Factors for MSD's:

- Awkward Postures
  - Neck
    - Neck bent more than 45°
      - More than 2 hrs. total per day: **CAUTION**
      - More than 4 hrs. total per day: **HAZARD**
  - Trunk
    - Working with the back bent forward more than 45 °
      - More than 2 hrs. total per day: **HAZARD**

45° neck flexion



45° trunk flexion



# Quantifying Risk Factors for MSD's:

- Awkward Postures
  - Reaching: repeatedly raising or working with hands above head OR elbows above shoulder
    - More than 2 hours total per day: **CAUTION**
    - More than 4 hours total per day: **HAZARD**



# Quantifying Risk Factors for MSD's:

- Force
  - Lifting
    - >75# one or more times per day: **CAUTION**
    - >10#, more than 2x/minute, more than 4 hours per day total: **HAZARD**
  - WISHA lifting analysis is recommended

More than 75#?



More than 10#, more than 2x / min



More than 4 hrs. total per day

## Quantifying Lifting: WISHA Lifting Analysis\*

- Actual weight lifted of 50 lbs > calculated weight limited of 32.3 lbs—this is considered hazardous!
- Suggested modifications:
  - Reposition product to eliminate twisting while lifting
  - Repackage product into smaller packages to reduce weight lifted
  - Re-position product and / or shelves to decrease start height of lift, ideally at waist level
  - Reduce horizontal distance from the body
  - Job rotation to decrease number of lifts performed per day
  - Redesign to eliminate or reduce lifting: rolling conveyor, chutes, slides mechanical assist / lift

\*[http://personal.health.usf.edu/tbernard/HollowHills/WISHA\\_Lifting.pdf](http://personal.health.usf.edu/tbernard/HollowHills/WISHA_Lifting.pdf)

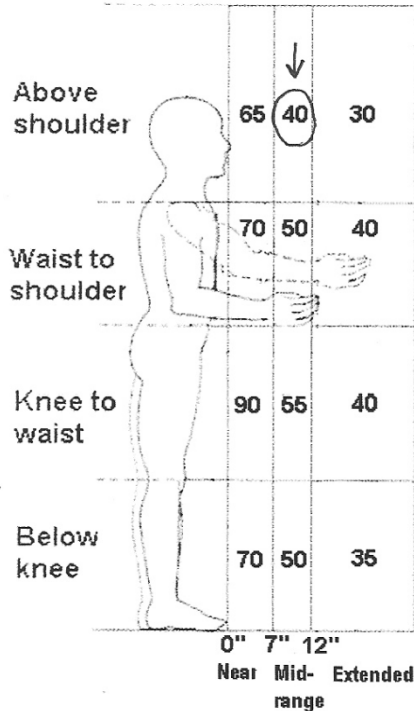
\*<http://www.lni.wa.gov/wisha/ergo/evaltools/ergocalc.pdf>

WISHA: Washington Industrial Safety and Health Administration

**Step 1** Find out the actual weight of objects that the employee lifts.

Actual Weight = 50 lbs.

**Step 2** Determine the Unadjusted Weight Limit. Where are the employee's hands when they begin to lift or lower the object? Mark that spot on the diagram below. The number in that box is the Unadjusted Weight Limit in pounds.



Unadjusted Weight Limit: 40 lbs.

**Step 3** Find the Limit Reduction Modifier. Find out how many times the employee lifts per minute and the total number of hours per day spent lifting. Use this information to look up the Limit Reduction Modifier in the table below.

How many lifts per minute?	For how many hours per day?		
	1 hr or less	1 hr to 2 hrs	2 hrs or more
1 lift every 2-5 mins.	1.0	<u>0.95</u>	0.85
1 lift every min	0.95	0.9	0.75
2-3 lifts every min	0.9	0.85	0.65
4-5 lifts every min	0.85	0.7	0.45
6-7 lifts every min	0.75	0.5	0.25
8-9 lifts every min	0.6	0.35	0.15
10+ lifts every min	0.3	0.2	0.0

Note: For lifting done less than once every five minutes, use 1.0

Limit Reduction Modifier: .95

**Step 4** Calculate the Weight Limit. Start by copying the Unadjusted Weight Limit from Step 2.

Unadjusted Weight Limit: = 40 lbs.

If the employee twists more than 45 degrees while lifting, reduce the Unadjusted Weight Limit by multiplying by 0.85. Otherwise, use the Unadjusted Weight Limit

Twisting Adjustment: = .85

Adjusted Weight Limit: = 34 lbs.

Multiply the Adjusted Weight Limit by the Limit Reduction Modifier from Step 3 to get the Weight Limit.

Limit Reduction Modifier: .95

Weight Limit: = 32.3 lbs.

**Step 5** *★* Is this a hazard? Compare the Weight Limit calculated in Step 4 with the Actual Weight lifted from Step 1. If the Actual Weight lifted is greater than the Weight Limit calculated, then the lifting is a WMSD hazard.

*Actual wt. lifted = 50# > 32.3# considered HAZARD!*

Note: If the job involves lifts of objects with a number of different weights and/or from a number of different locations, use Steps 1 through 5 above to:

1. Analyze the two worst case lifts -- the heaviest object lifted and the lift done in the most awkward posture.
2. Analyze the most commonly performed lift. In Step 3, use the frequency and duration for all of the lifting done in a typical

- Vibration

- Using tools/equipment with high vibration

- More than 30 min per day: **CAUTION**

- More than 1 hour per day: **HAZARD**



# Can also be applied to...

- Pinching
- Gripping
- Contact Stress



# Effect of risk factors...

- Effect on circulation
- Microtrauma / wear and tear
- Cumulative in nature
- Combined with lifestyle and aging...
- Eventually tissues can fail

