Ergonomic Guidelines for Manual Material Handling

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CHARLOTTE, NC

Ergonomic Guidelines for Manual Material Handling

The Team

- EASE Council - MHIA
- Cal/OSHA Consultation Services
- NIOSH
- University of California, Davis
- UC Berkeley Ergonomics Program
- Ergonomics Center of North Carolina
- Johnson & Johnson
- CNA

Ergonomic Guidelines for Manual Material Handling

MMH Guideline Advantages

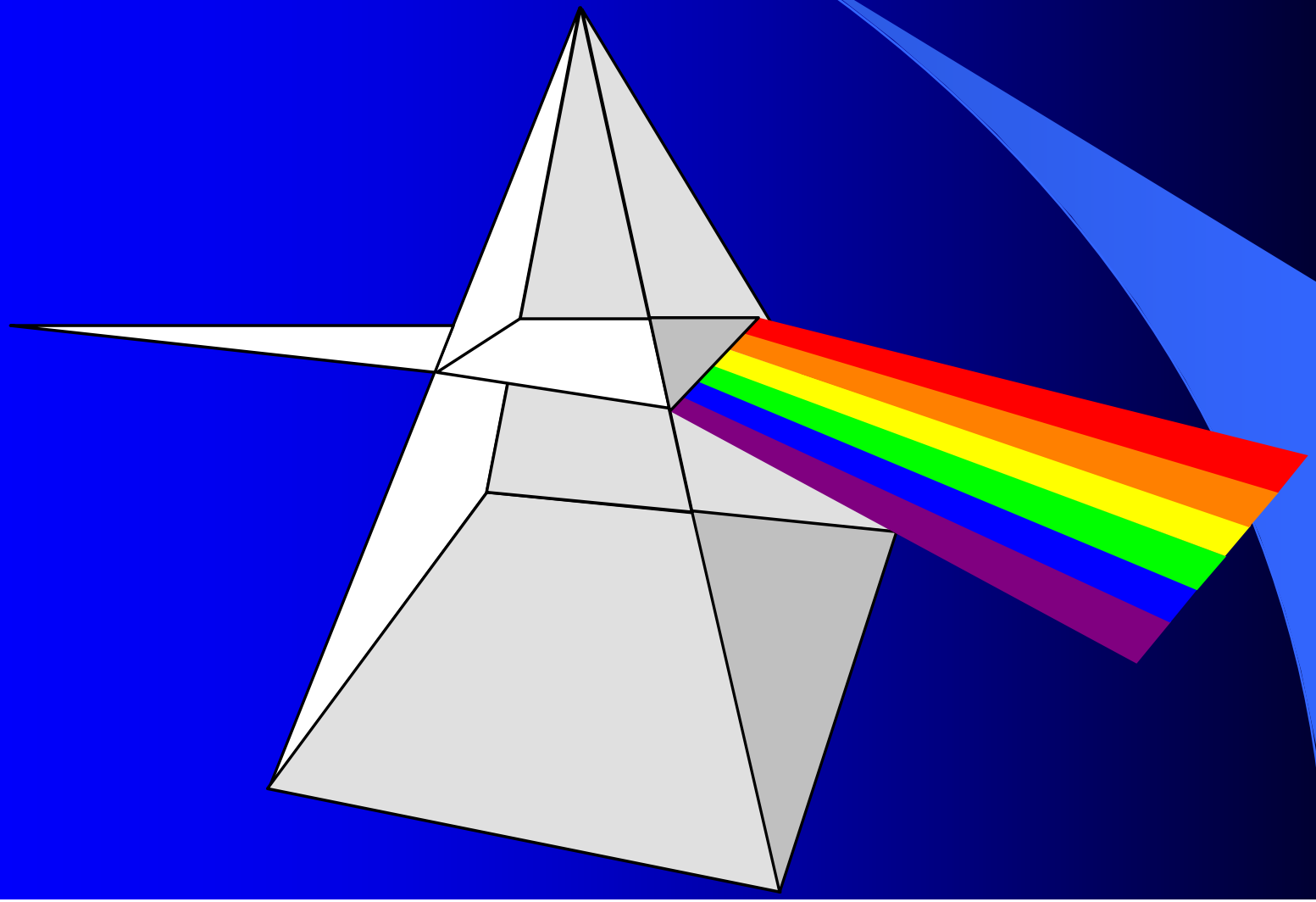
- Focuses On Improvements Not Problems
- “Best Practices “ Approach
- Practical & Non-regulatory

MANUAL MATERIAL HANDLING

ART AND SCIENCE

- The Movement, Storage, Control & Protection of Goods and Materials
- Throughout Manufacture, Distribution, Consumption and Disposal

Why Address Manual Material Handling ?

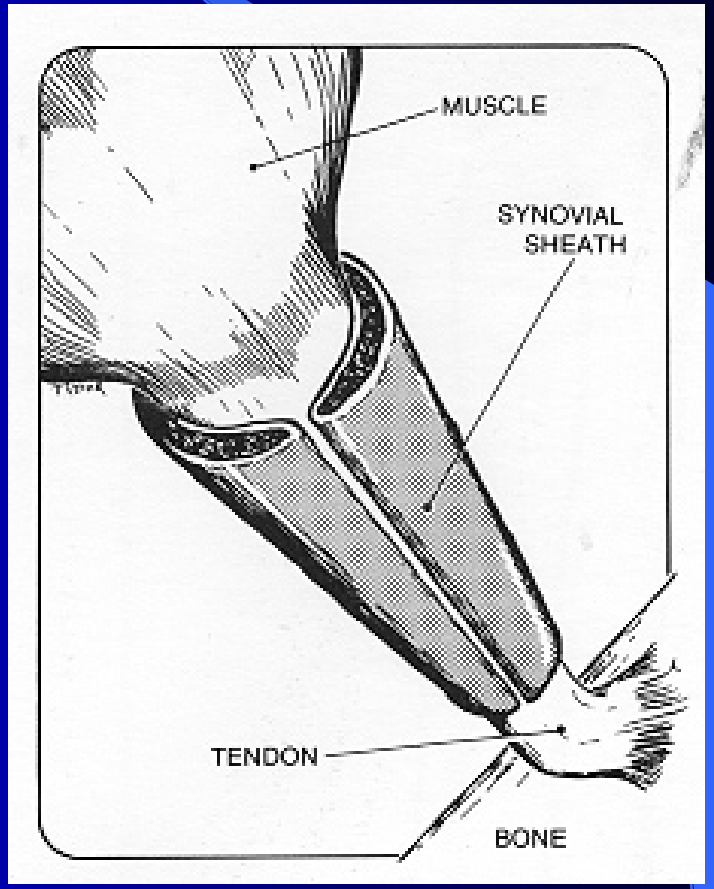


MUSCULOSKELETAL DISORDERS

- PHYSICAL PROBLEMS
  - pain, swelling
  - numbness, tingling
  -  ROM and strength
  - change of skin color
- CHARACTERISTICS
  - acute or chronic
  - no early medical findings
  - factors from home / workplace

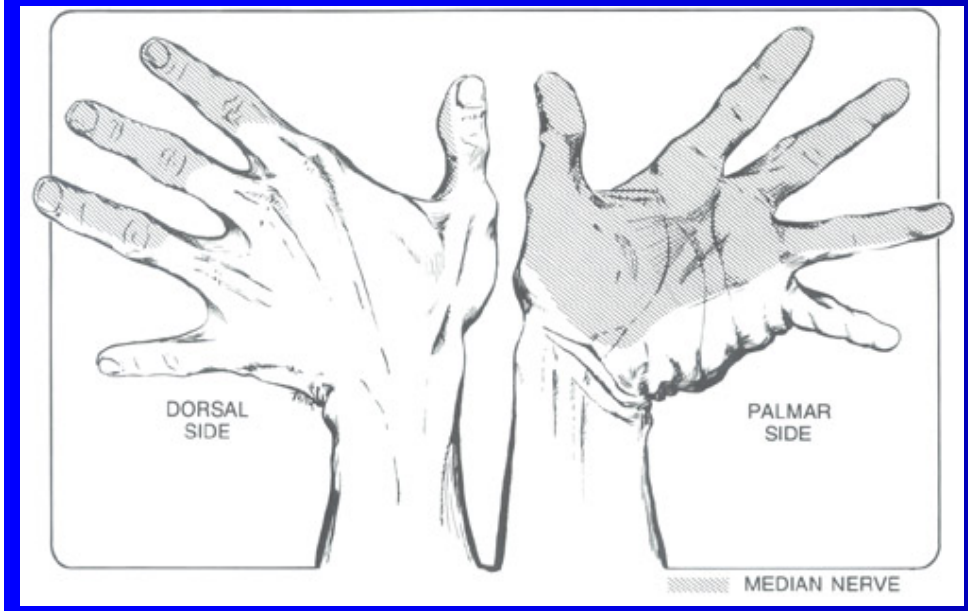
MUSCULOSKELETAL DISORDERS

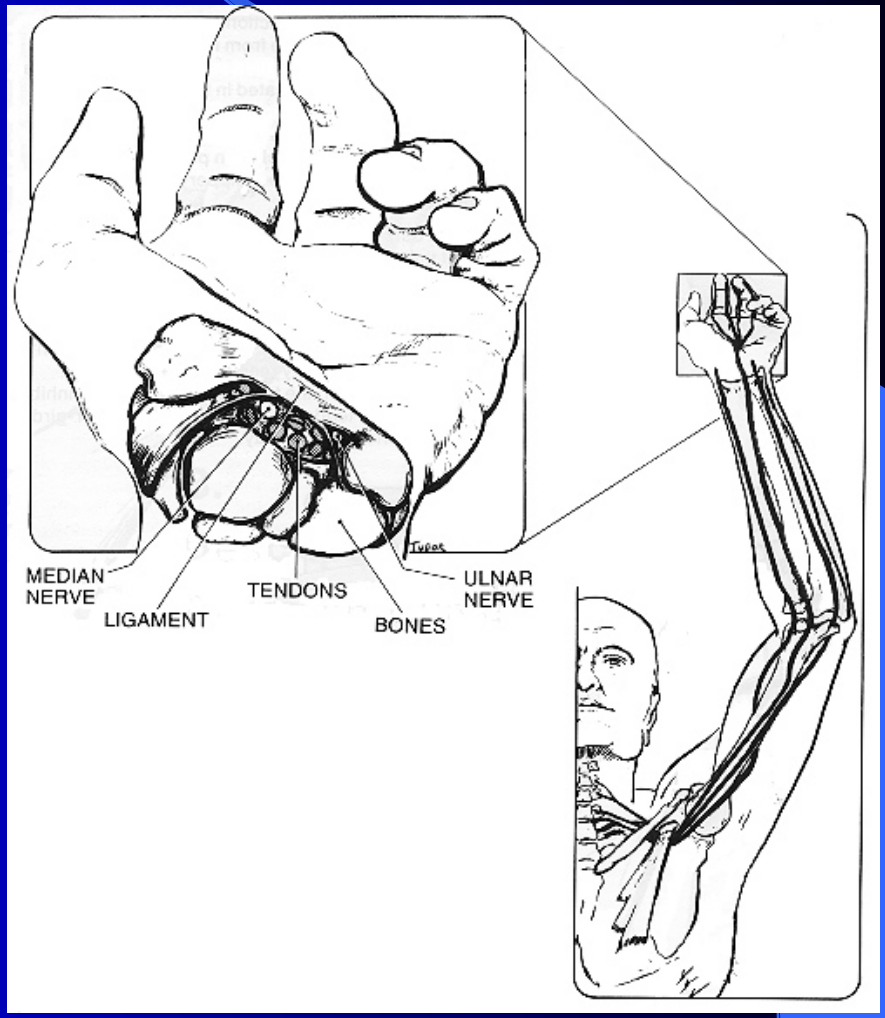
- GENERAL
  - SPRAINS & STRAINS
  - MYALGIA
  - TENDINITIS
  - TENOSYNOVITIS



MUSCULOSKELETAL DISORDERS

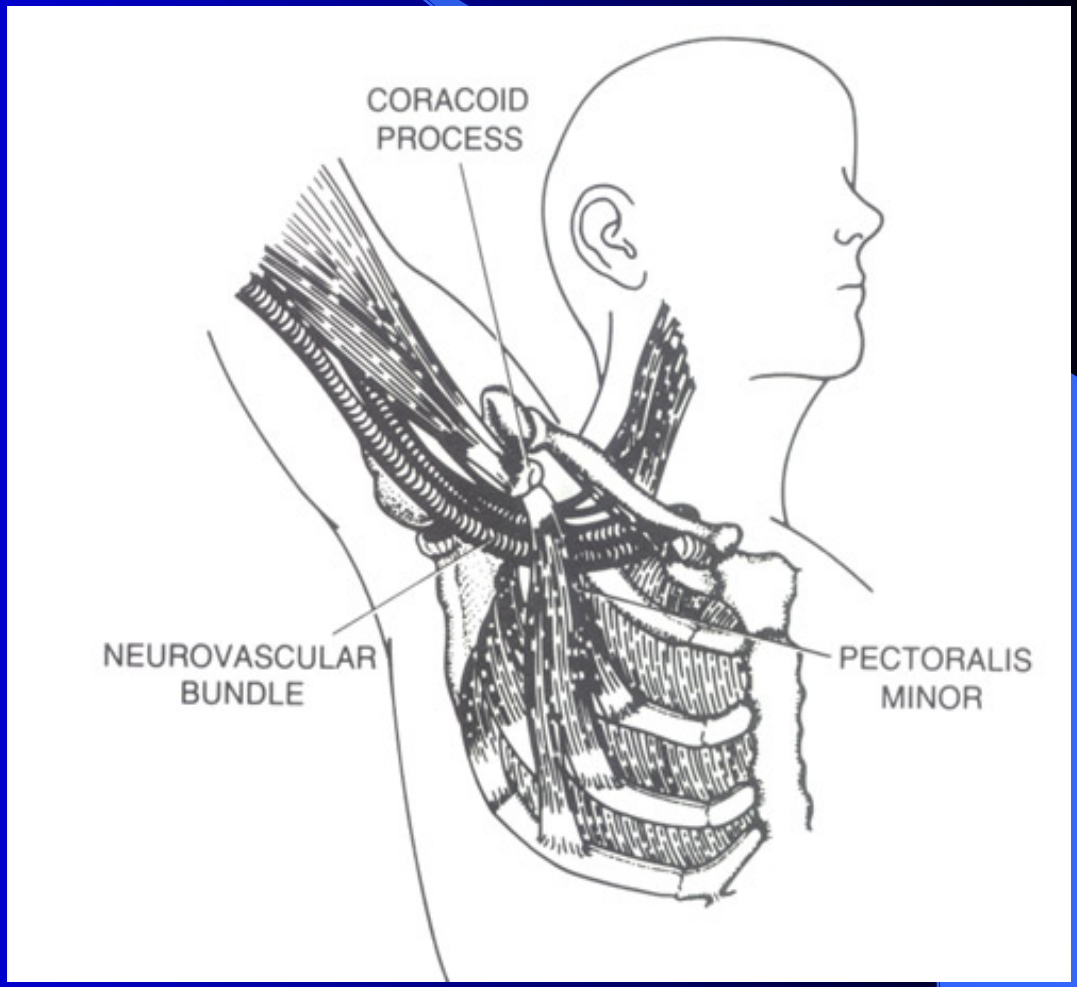
- SYNDROMES
  - CARPAL TUNNEL





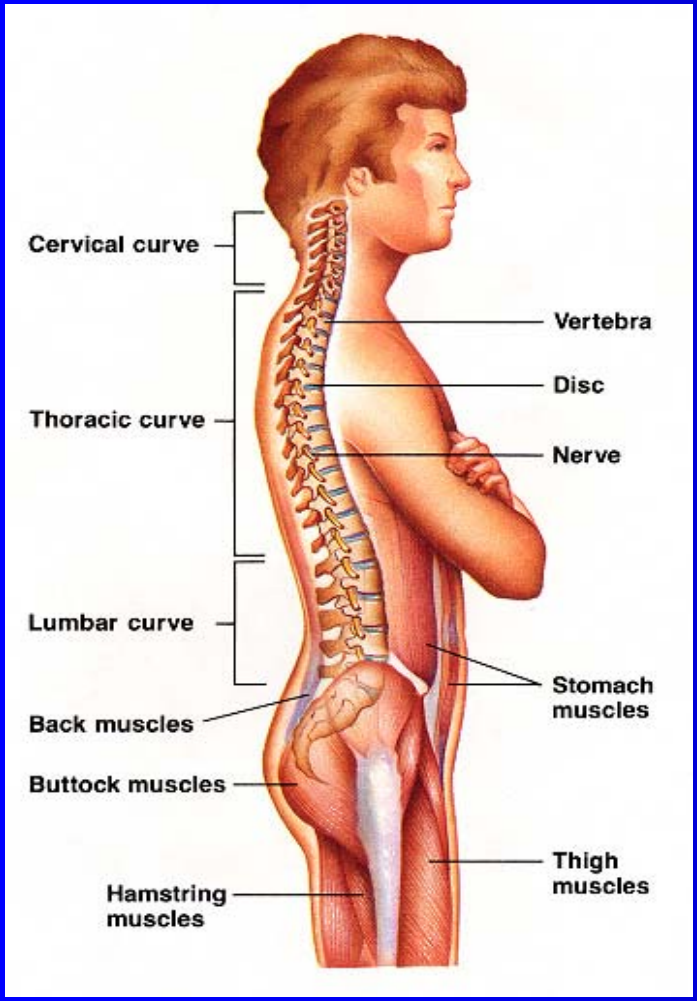
MUSCULOSKELETAL DISORDERS

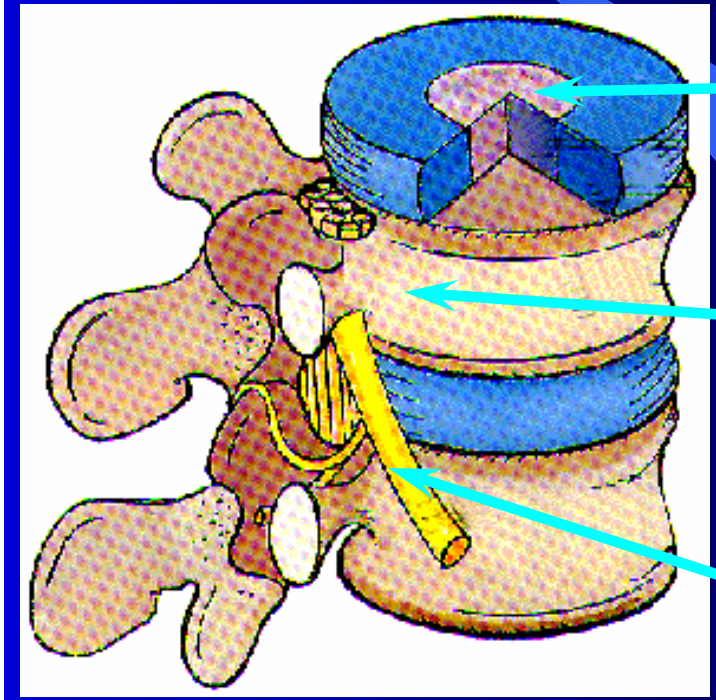
- SYNDROMES
  - THORACIC OUTLET



MUSCULOSKELETAL DISORDERS

- BACK PROBLEMS

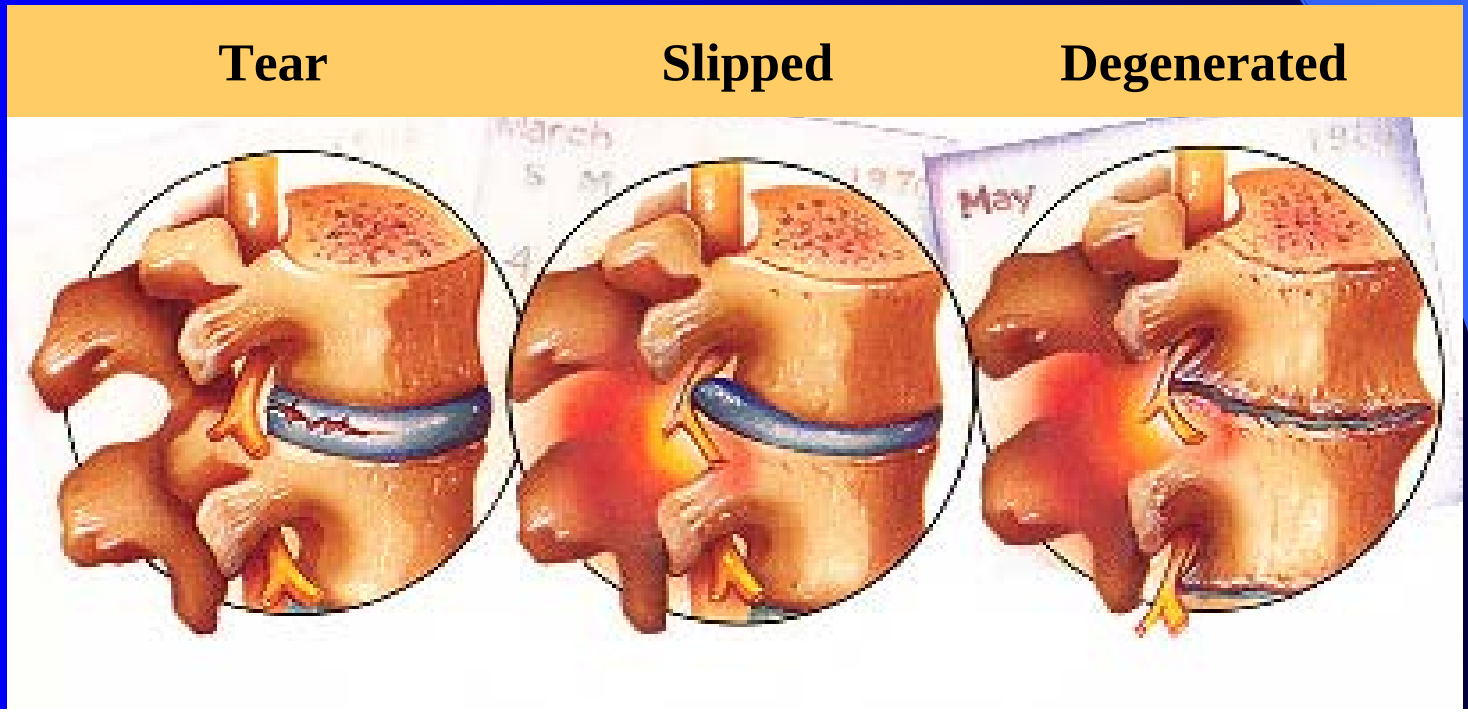




MUSCULOSKELETAL DISORDERS

- BACK PROBLEMS

- DISCS
- SCIATICA
- OSTEOARTHRITIS



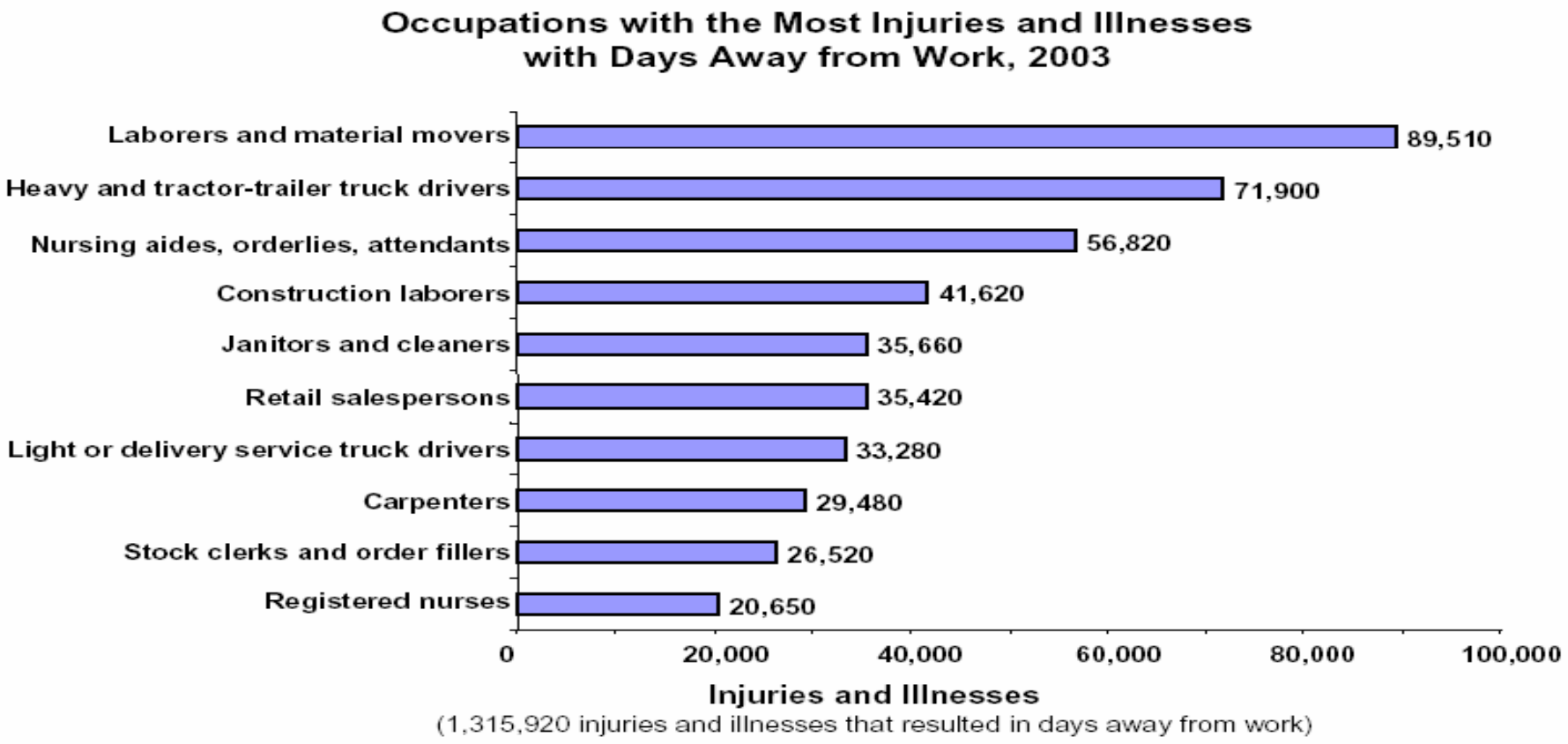
Why Address Manual Material Handling ?

- PHYSICAL DEMANDS OF WORK
  - REPETITION
  - FORCE / WEIGHT
  - AWKWARD POSTURE
  - VIBRATION
- TOOLS & EQUIPMENT
  - POOR GRIPS / HANDLES
  - EXCESSIVE
    - FORCE / WEIGHT
    - VIBRATION
    - REPETITION
  - AWKWARD POSTURE
    - WRIST / ARM
    - UPPER BODY

Why Address Manual Material Handling ?

- THE WORK ENVIRONMENT
  - COLD
  - HOT
  - LIGHTING
  - NOISE
  - HOUSEKEEPING
- THE SET UP OF WORK
  - ROTATING SHIFT WORK
  - LACK OF TASK VARIETY
  - EXCESSIVE
    - OVERTIME
    - WORK PACE / DURATION
  - POORLY COMMUNICATED
    - EXPECTATIONS
    - JOB DEMANDS

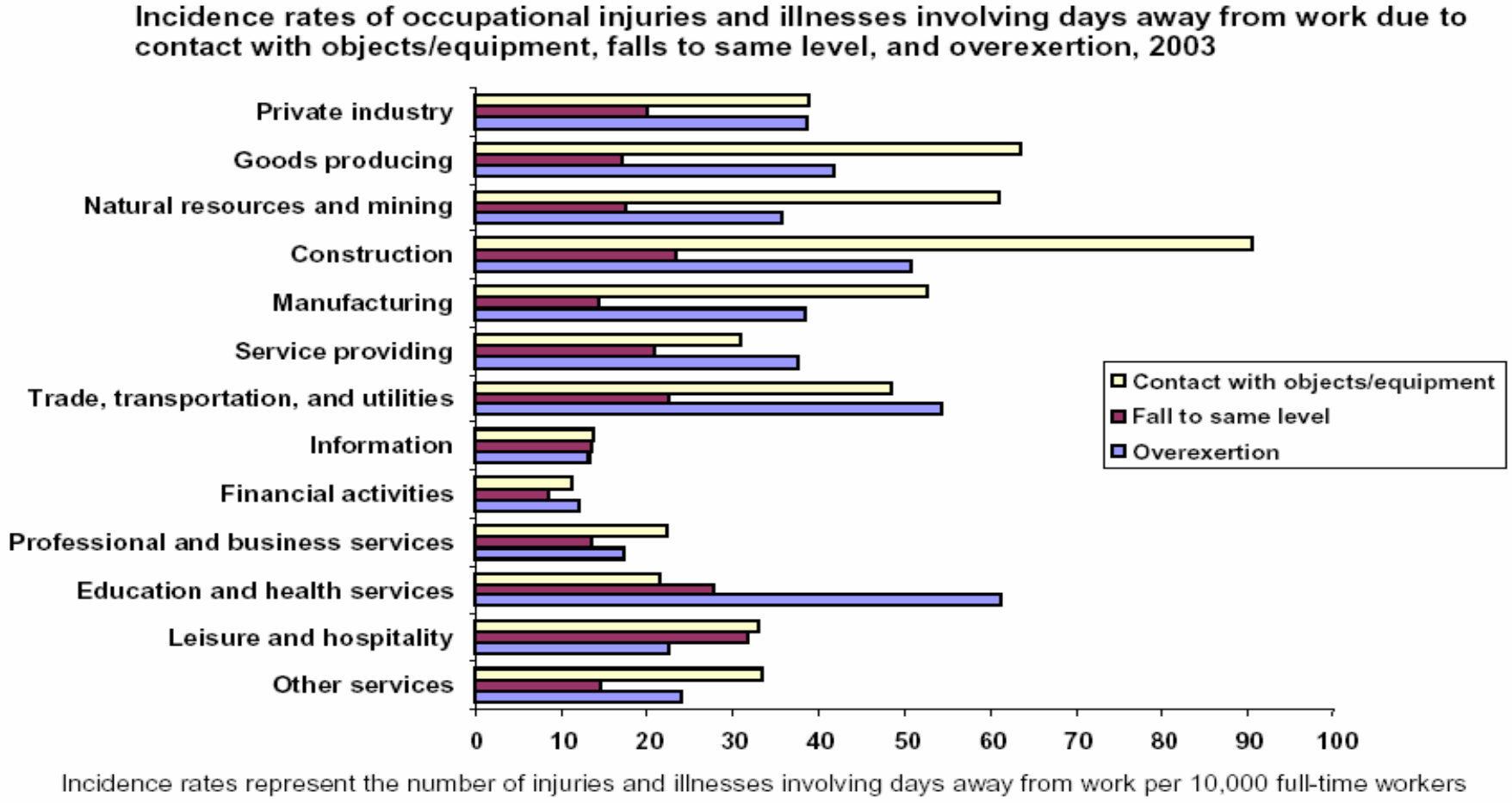
Why Address Manual Material Handling ?



Laborers and Material Movers Suffered the Most Injuries & Illnesses With Days Away From Work

SOURCE: Bureau of Labor Statistics, U.S. Department of Labor, Survey of Occupational Injuries and Illnesses.

Why Address Manual Material Handling ?

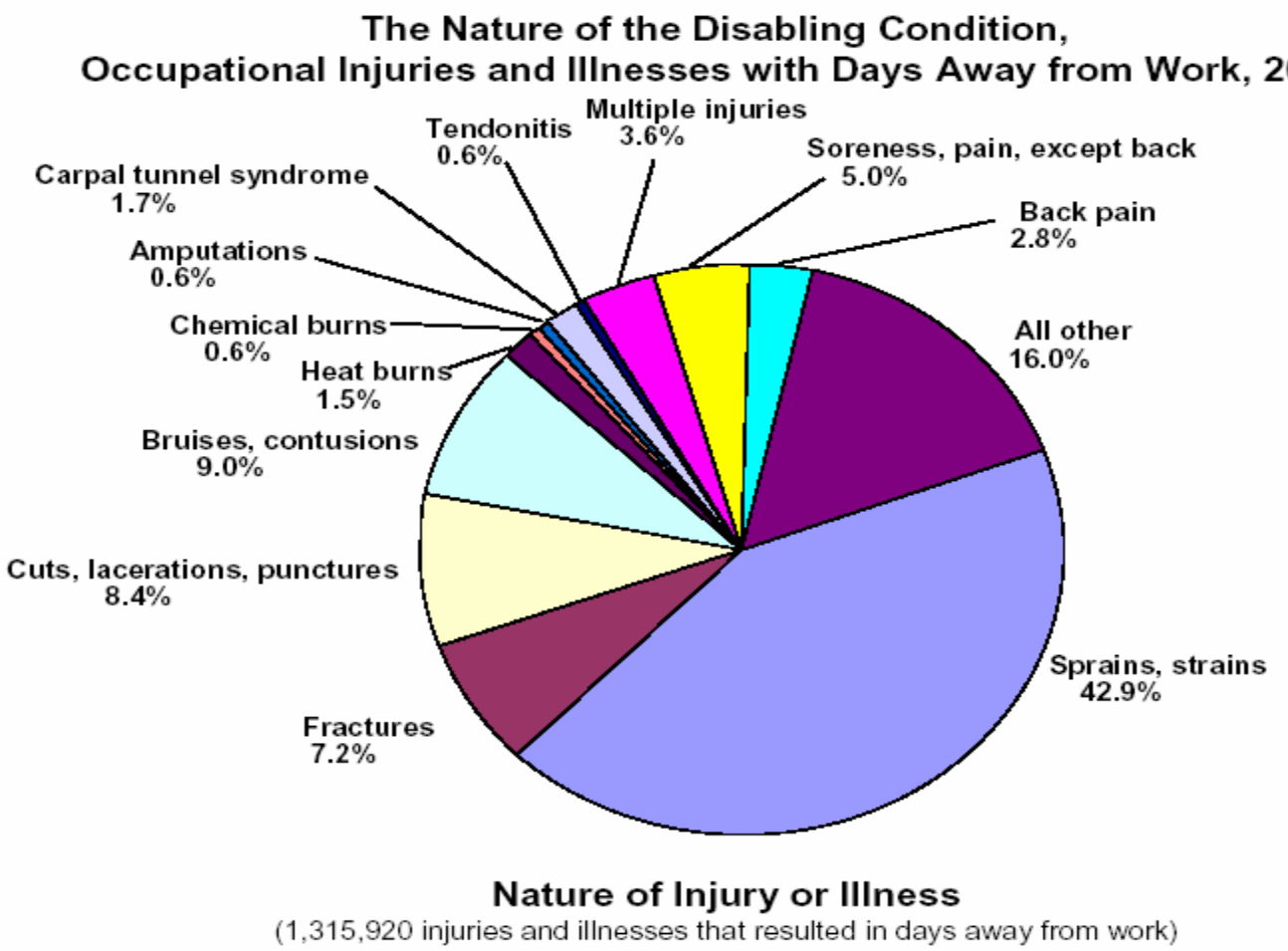


In all of Private Industry and in Goods Producing & Service Providing Industries,

Overexertion was a leading cause of injuries & illnesses

SOURCE; Bureau of Labor Statistics, U.S. Department of Labor, Survey of Occupational Injuries and Illnesses

Why Address Manual Material Handling ?



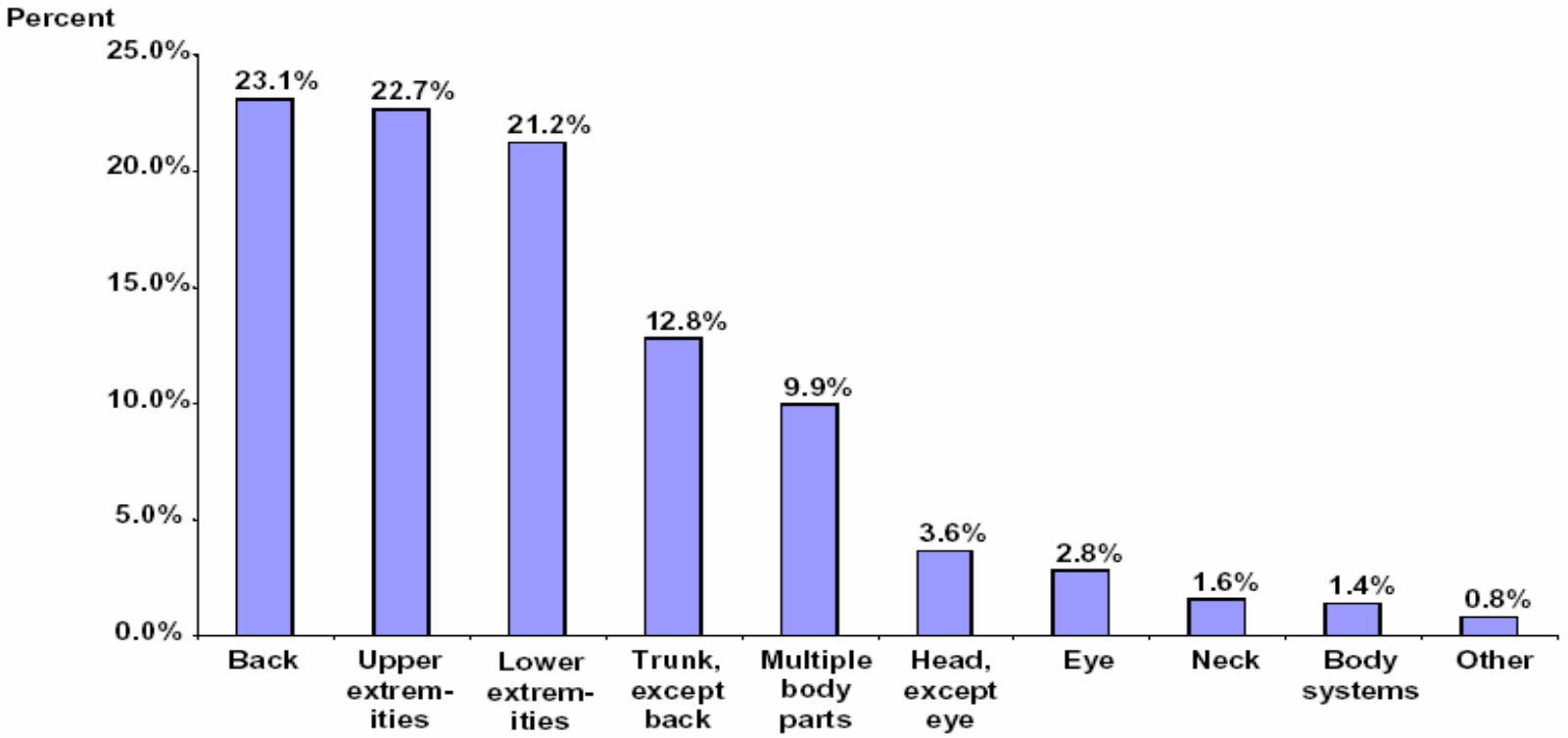
Sprains & Strain, Back Pain, Soreness & Pain , Tendonitis and CTS

Accounted for 53% of All Lost Time Injuries & Illnesses

SOURCE; Bureau of Labor Statistics, U.S. Department of Labor, Survey of Occupational Injuries and Illnesses

Why Address Manual Material Handling ?

The Part of Body Affected,
Occupational Injuries and Illnesses with Days Away from Work, 2003

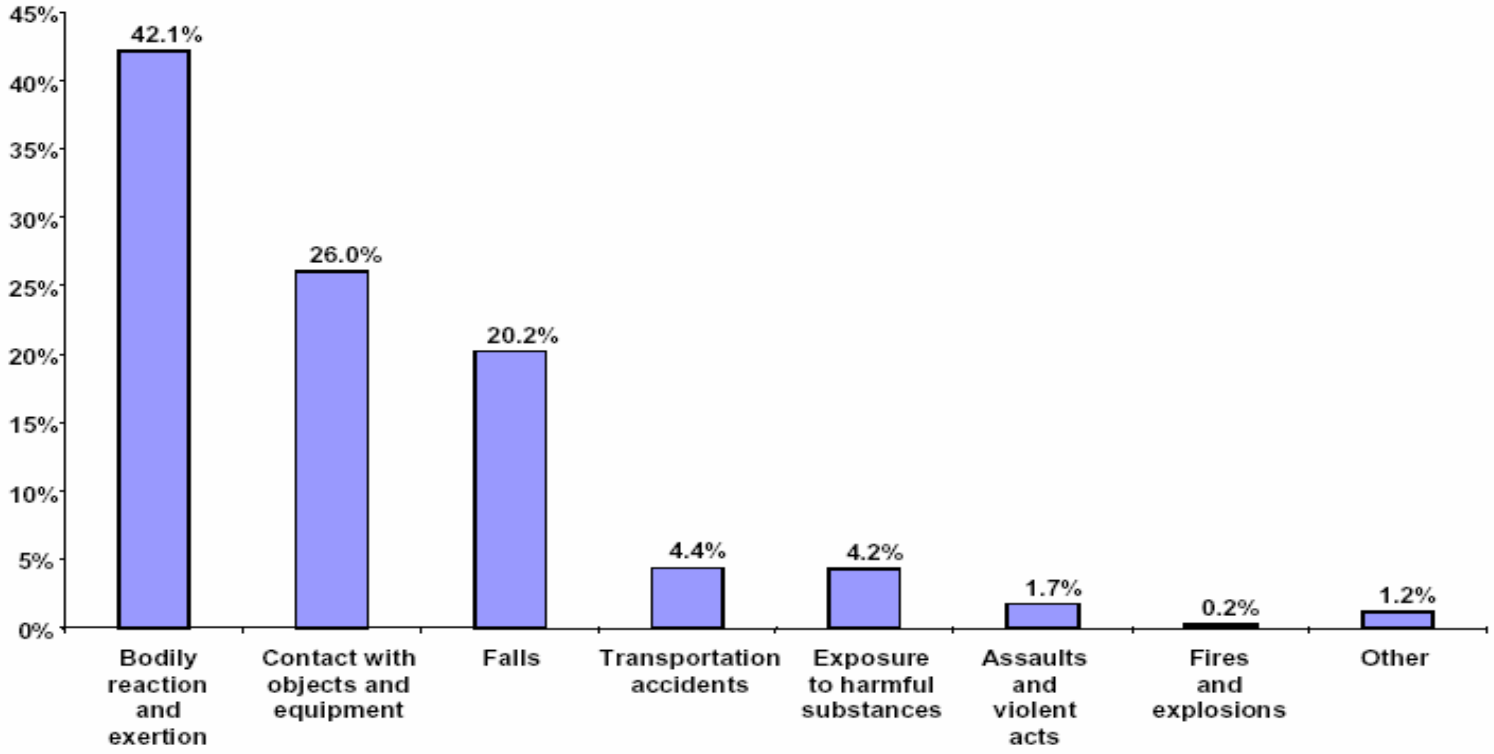


The Back & Upper Extremities Were Involved In Almost 1/2 of All Lost Time Injuries & Illnesses

SOURCE: Bureau of Labor Statistics, U.S. Department of Labor, Survey of Occupational Injuries and Illnesses.

Why Address Manual Material Handling ?

The Manner in Which the Disabling Condition Occurred,
Occupational Injuries and Illnesses with Days Away from Work, 2003



Bodily Reaction & Exertion Accounted For Over 40% of All Lost Time Injuries & Illnesses

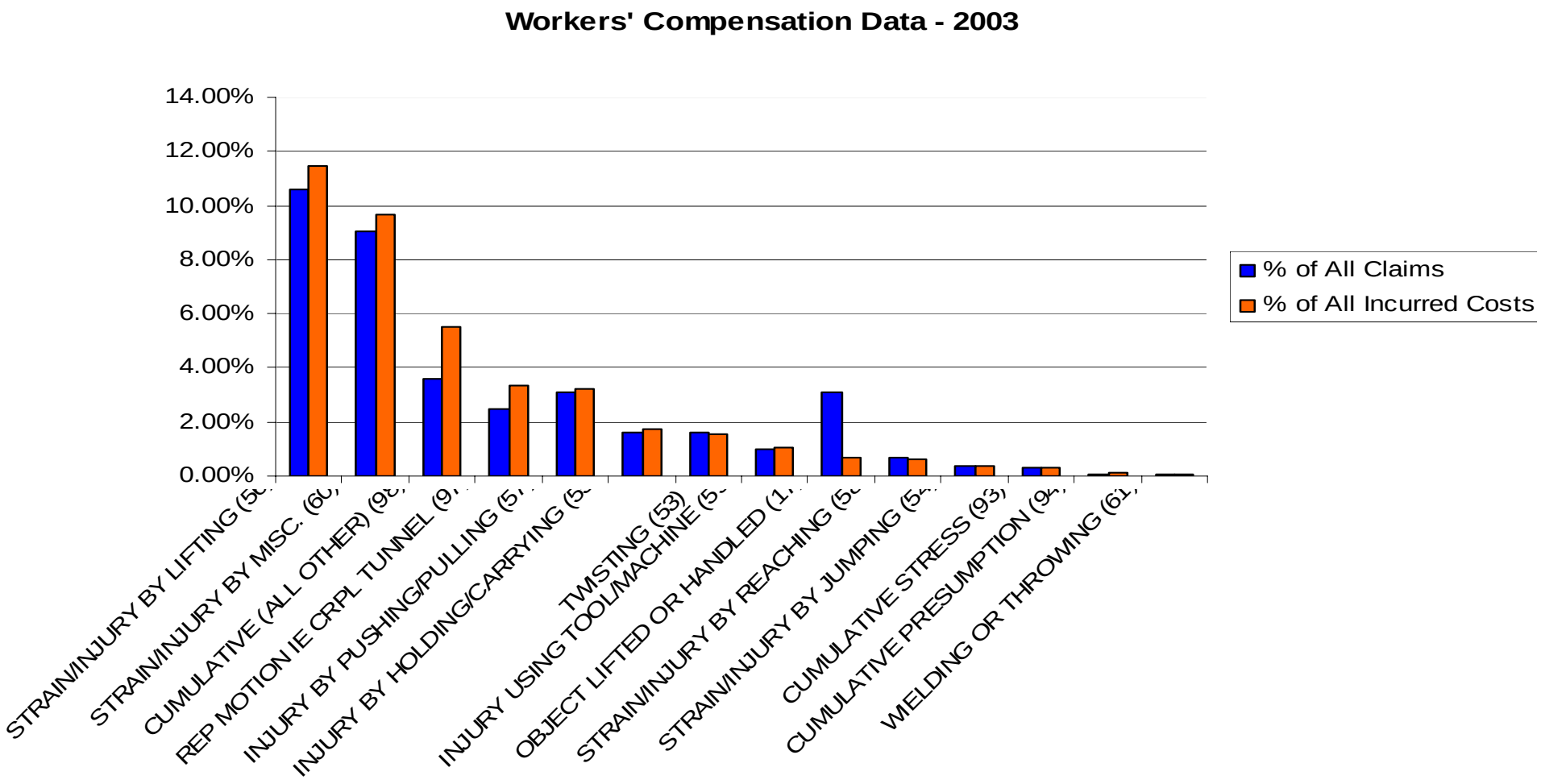
SOURCE: Bureau of Labor Statistics, U.S. Department of Labor, Survey of Occupational Injuries and Illnesses.

Why Address Manual Material Handling ?

Costs

- DIRECT
  - W.C. (Medical, Indemnity, Loss exposure)
  - Lost Productivity
  - Errors & Defects
- INDIRECT (Up to 4X Direct Costs)
  - Turnover,
  - Absenteeism,
  - Re - Training

Why Address Manual Material Handling ?



Pattern of High Losses

Strains, Rep. Motion, Pushing, Pulling, Holding, Twisting, Using Tools/Machines, Carrying, Objects Lifted/Handled

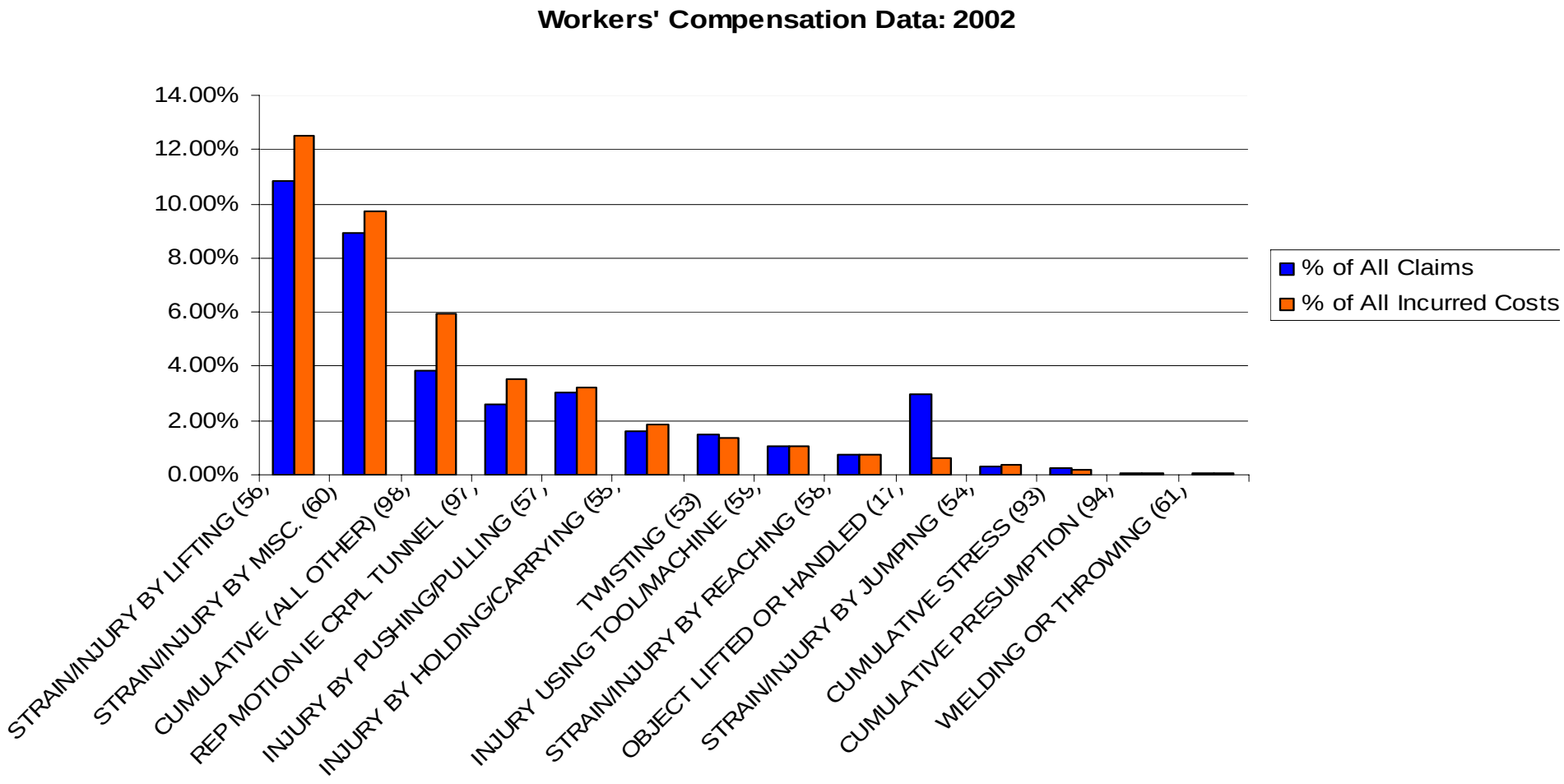
Why Address Manual Material Handling ?

California W.C. Data - 2003

53% of Insurance Market

	% All Claims	% All Costs	Total Incurred Costs ($)
Strain/Injury Lifting	11	12	314,484,353
Strain/Injury Misc.	9	10	264,614,044
Rep Motion (CRPL Tunnel)	2.5	3.5	91,683,456
Injury Pushing/Pulling	3	3.5	87,505,943
Injury Holding Carrying	2	2	48,248,929
Twisting	2	2	42,645,706
Object Lifting/Handled	3	1	17,821,835
Strain/Injury by Reaching	1	1	16,859,056
Totals	34	36	883,863,322

Why Address Manual Material Handling ?



Pattern of High Losses

Strains, Rep. Motion, Pushing, Pulling, Holding, Twisting, Using Tools/Machines, Carrying, Objects Lifted/Handled

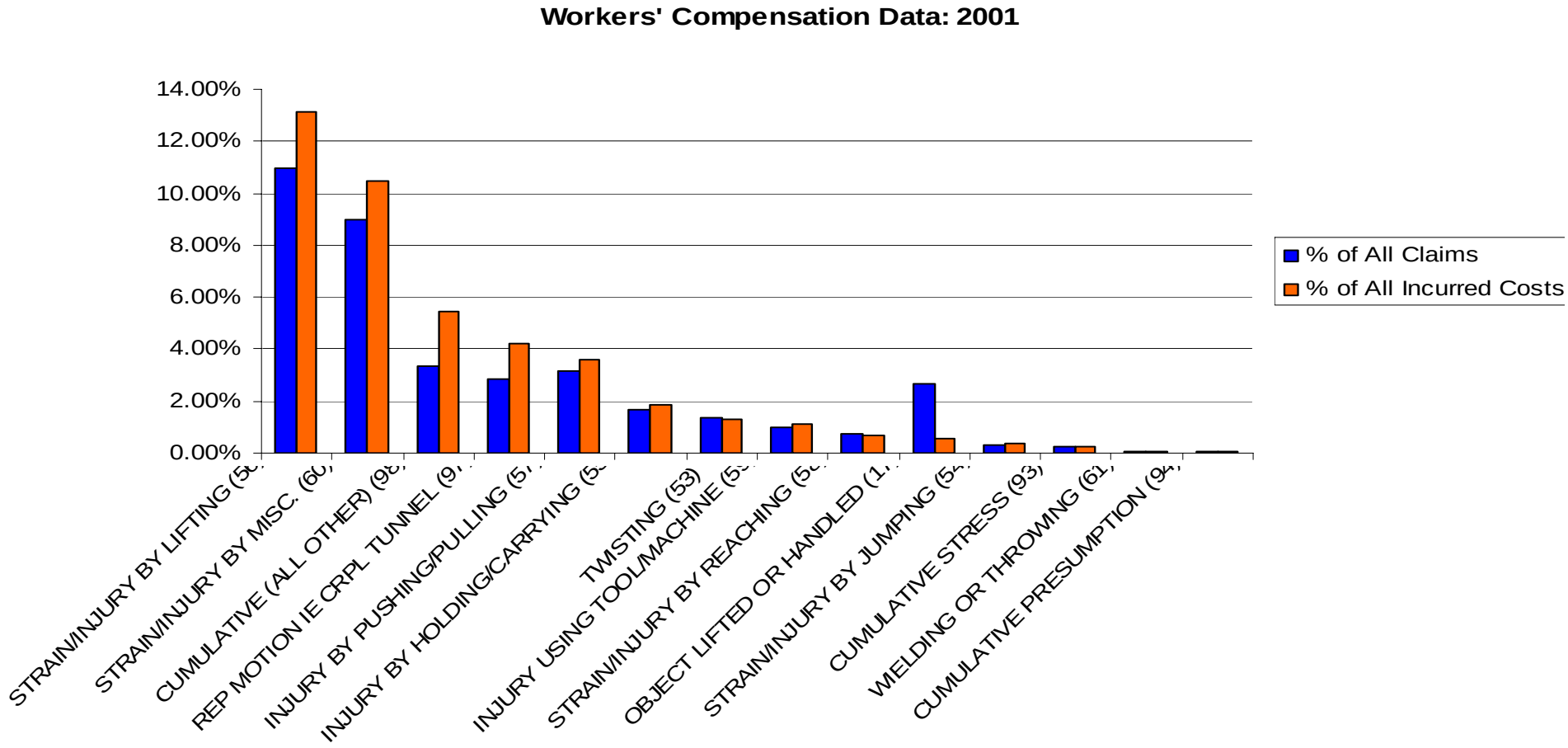
Why Address Manual Material Handling ?

California W.C. Data - 2002

50% of Insurance Market

	% All Claims	% All Costs	Total Incurred Costs ($)
Strain/Injury Lifting	11	12.5	499,551,388
Strain/Injury Misc.	9	10	387,349,560
Rep Motion (CRPL Tunnel)	2.6	3.5	140,047,697
Injury Pushing/Pulling	3	3	128,910,435
Injury Holding Carrying	2	2	74,213,592
Twisting	1.5	1. 5	54,538,089
Object Lifting/Handled	3	1	23,574,020
Strain/Injury by Reaching	1	1	29,392,193
Totals	33	35	1,337,576,974

Why Address Manual Material Handling ?



Pattern of High Losses

Strains, Rep. Motion, Pushing, Pulling, Holding, Twisting, Using Tools/Machines, Carrying, Objects Lifted/Handled

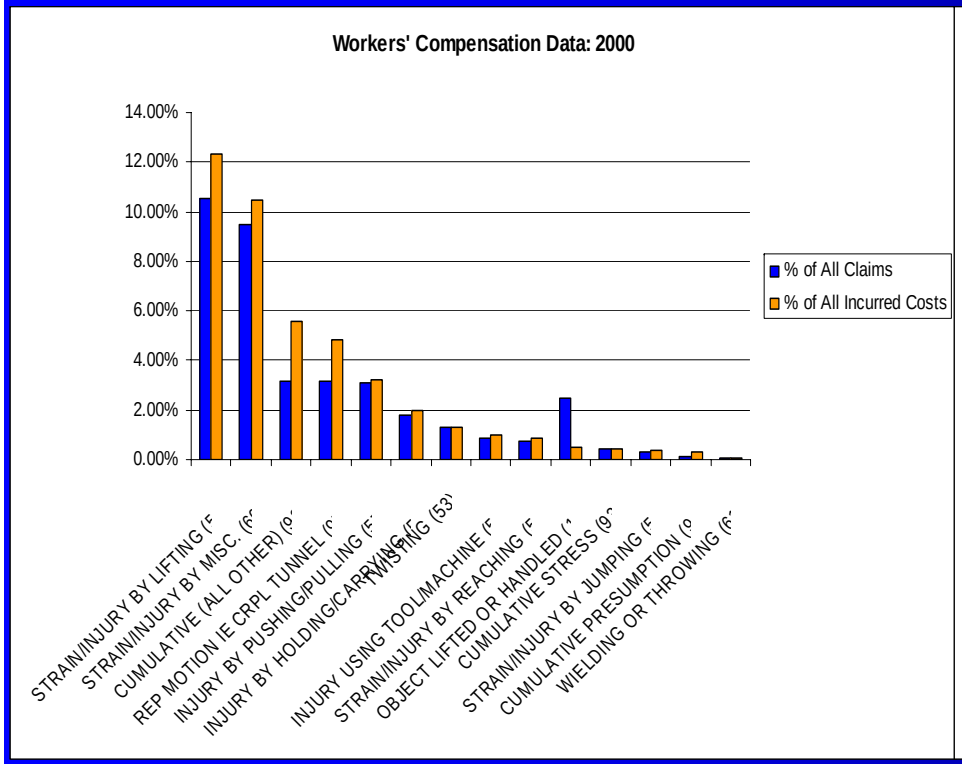
Why Address Manual Material Handling ?

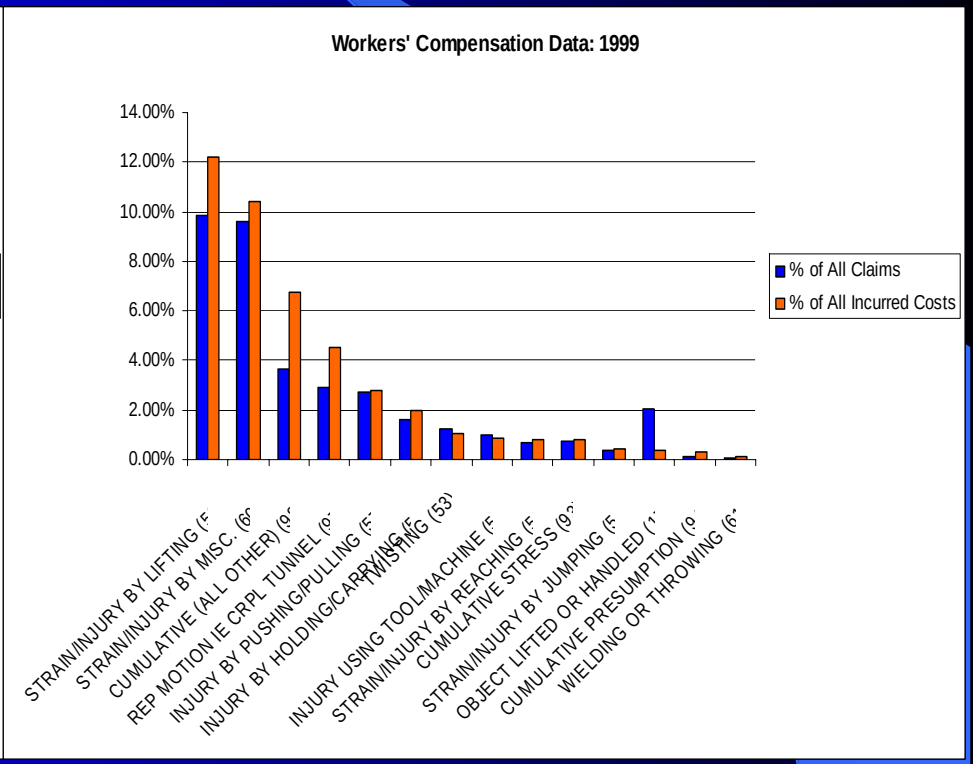
California W.C. Data - 2001

43% of Insurance Market

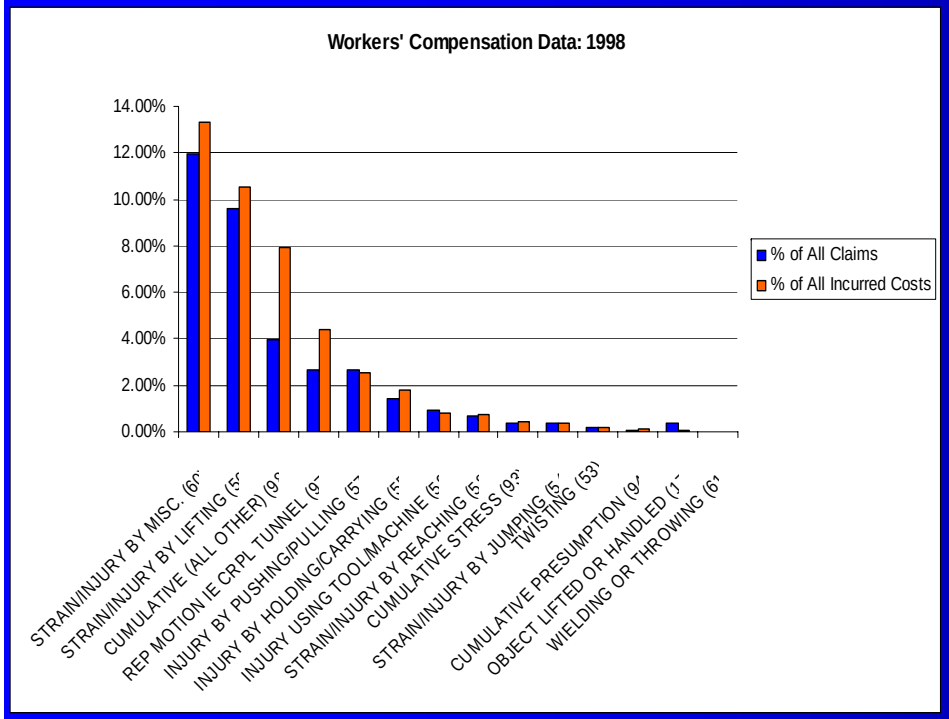
	% All Claims	% All Costs	Total Incurred Costs ($)
Strain/Injury Lifting	11	13	558,864,656
Strain/Injury Misc.	9	11	445,435,822
Rep Motion (CRPL Tunnel)	3	4.2	180,254,890
Injury Pushing/Pulling	3	3.5	152,023,340
Injury Holding Carrying	2	2	78,185,860
Twisting	1.3	1. 3	55,317,938
Object Lifting/Handled	3	1	23,018,957
Strain/Injury by Reaching	1	1	29,898,408
Totals	34	36	1,522,999,871

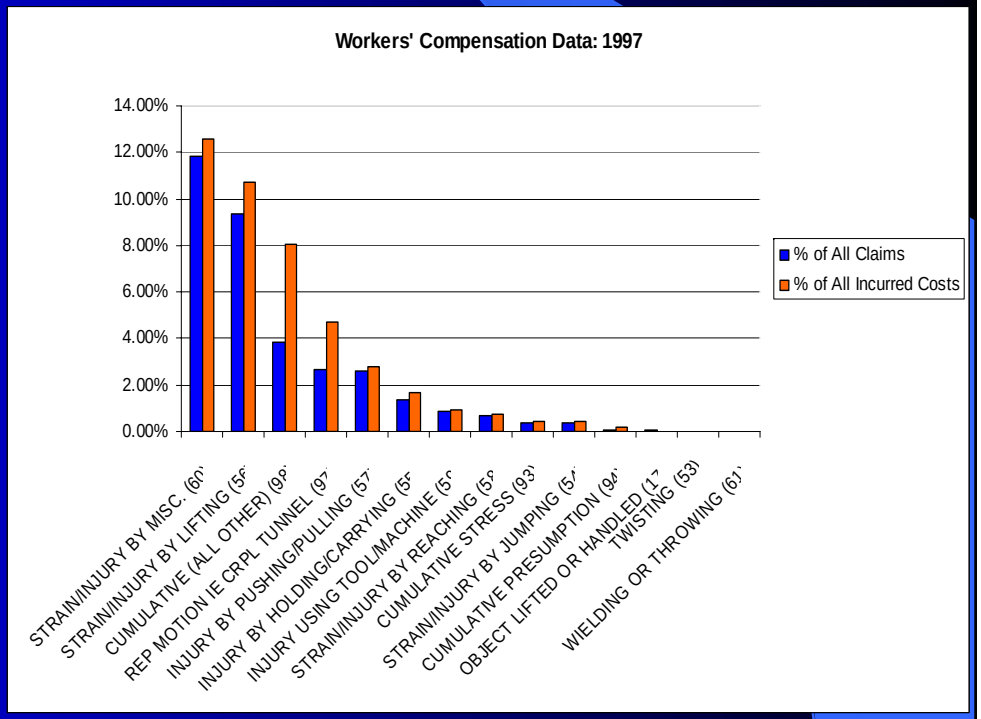
Why Address Manual Material Handling ?





Why Address Manual Material Handling ?





Why Address Manual Material Handling ?

California W.C. Patterns 1997 – 2003

	% All Claims	% All Costs	Total Incurred Costs($)
Strain/Injury Lifting	11 - 13	11 - 13	1,372,900,397
Strain/Injury Misc.	9	10 – 11	1,097,399,426
Rep Motion (CRPL Tunnel)	2 - 3	3 - 5	411,986,043
Injury Pushing/Pulling	3	3 - 4	368,439,718
Injury Holding Carrying	1 - 2	2	200,648,381
Object Lifting/Handled	0.1 – 3	0 - 1	64,414,812
Strain/Injury by Reaching	1	1	76,078,657
Totals	**27 - 34**	**30 – 37**	**3,591,867,434**

Ergonomic Guidelines for Manual Material Handling

Why Develop Guidelines ?

- What About Ergonomic Regulations ?
  - Federal OSHA
  - Cal/OSHA

Ergonomic Guidelines for Manual Material Handling

- Federal OSHA Ergonomic Standard
  - Promulgated November, 2000
  - Congress repealed standard March, 2001 as part of Contract with America, the Congressional Review Act (1995),
- For the Future
  - Same law (i.e. Congressional Review Act) if OSHA promulgates another standard, the new standard can not be similar to the one that congress nullified in 2001

Ergonomic Guidelines for Manual Material Handling

- Federal OSHA's Current Strategy - 4 parts
  - Develop Industry / Task Specific Voluntary Guidelines
  - Enforcement - General Duty Clause (Section 5(a)(1) of OSHA Act
  - National Advisory Committee (convened 2002-3)
  - Outreach & Assistance

Ergonomic Guidelines for Manual Material Handling

- Industry / Task Specific Voluntary
- Based On
  - Current incidence rates - injuries & illness
  - Information on effective / feasible solutions

Ergonomic Guidelines for Manual Material Handling

- Industry / Task Specific Voluntary Guidelines
  - Lots of Help - Three Part Recommendations
    - Management Practices
    - Worksite Analysis
    - Hazard Control
  - Meatpacking, Nursing Homes, Grocery, Poultry & Shipyards

Ergonomic Guidelines for Manual Material Handling

Industry / Task Specific Voluntary Guidelines

- Lots of Help - Three Part Recommendations
  - Management Practices
    - Providing Management Support, Involving Employees
    - Providing Training
    - Evaluating Ergonomics Efforts
  - Worksite Analysis
    - Identifying Problems
    - Checklists
    - Addressing Reports of Injuries

Ergonomic Guidelines for Manual Material Handling

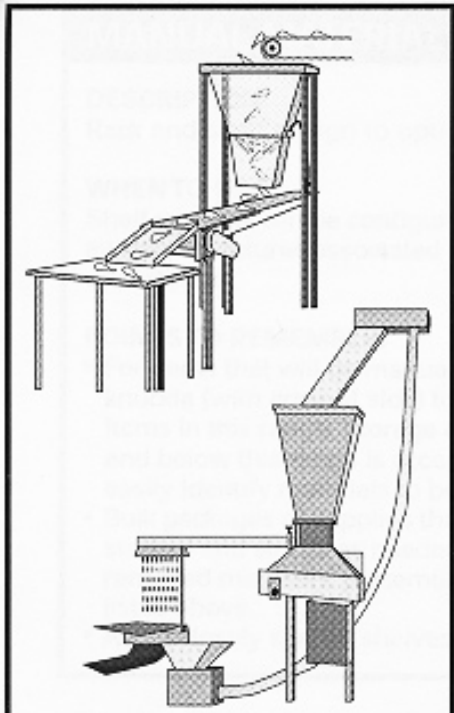
Industry / Task Specific Voluntary Guidelines

- Lots of Help - Three Part Recommendations
  - Hazard Control
    - Implementing Solutions
    - Lots of Pictures & Examples of Solutions (Tools, Workstations, MMH, PPE)

Ergonomic Guidelines for Manual Material Handling

Industry / Task Specific Voluntary Guidelines

- Hazard Control



MANUAL MATERIALS HANDLING - Hoppers and Augers

DESCRIPTION:
Container used to hold and dispense contents into a machine, a new container, or onto a workstation through an open gate or using a screw-type mechanism.

WHEN TO USE:
When storage of product or other items is required at a workstation.

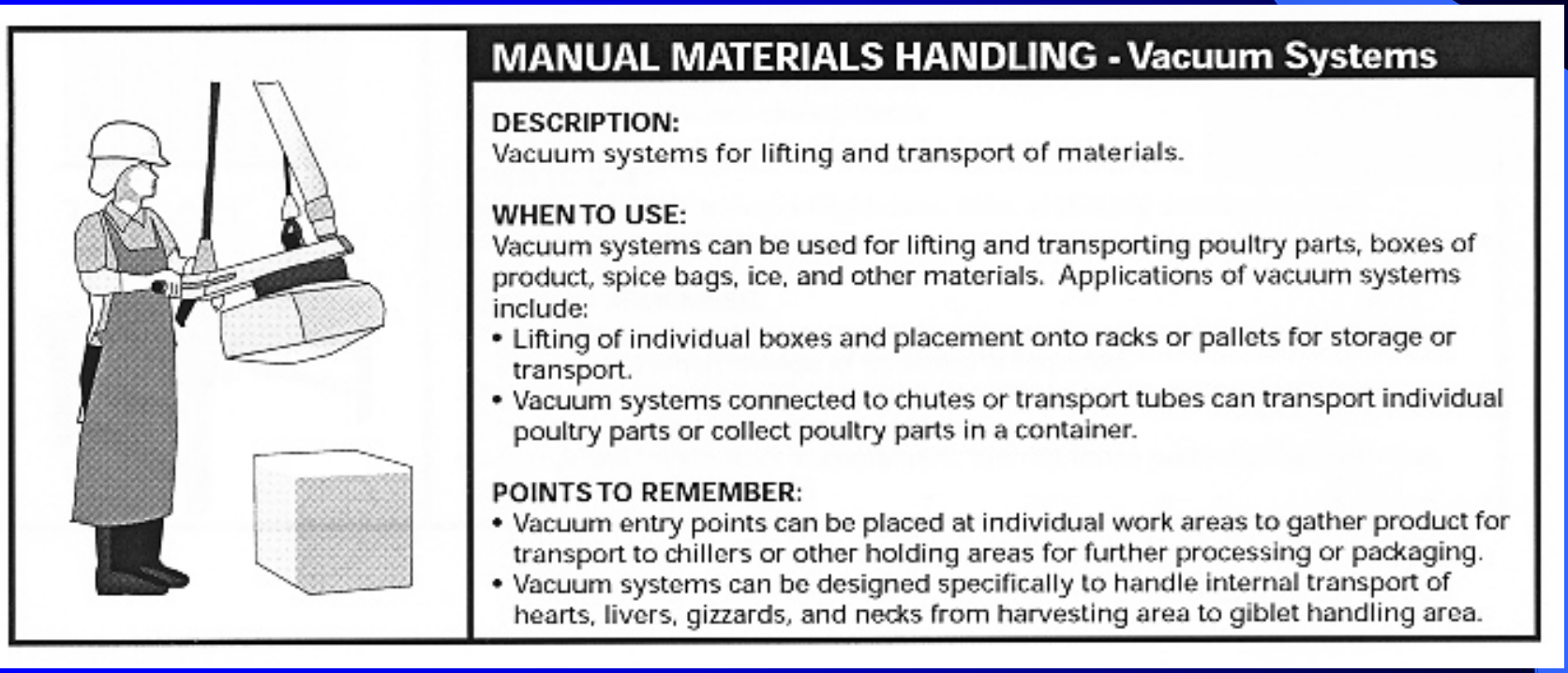
POINTS TO REMEMBER:

- Hoppers are generally preferred for dispensing larger objects such as poultry parts, whereas augers are generally preferred for smaller product such as ice, spices, and tenderizers in predetermined quantity to match recipe or packaging units.
- Hoppers are loaded from the top of the unit and have a gate to drop contents in bulk or pre-measured quantities, whereas augers have screw-type mechanisms that lift smaller particles from a transport container and dispense in pre-measured quantities.
- Operation can be automatic or employee initiated with activation controls located to avoid reaching and bending.
- May replace the need for shoveling, especially for ice.
- To load hoppers and avoid additional lifting, consider devices such as mechanical lifters, dumpers, augers, and conveyors.

Ergonomic Guidelines for Manual Material Handling

Industry / Task Specific Voluntary Guidelines

- Hazard Control



MANUAL MATERIALS HANDLING - Vacuum Systems

DESCRIPTION:
Vacuum systems for lifting and transport of materials.

WHEN TO USE:
Vacuum systems can be used for lifting and transporting poultry parts, boxes of product, spice bags, ice, and other materials. Applications of vacuum systems include:

- Lifting of individual boxes and placement onto racks or pallets for storage or transport.
- Vacuum systems connected to chutes or transport tubes can transport individual poultry parts or collect poultry parts in a container.

POINTS TO REMEMBER:

- Vacuum entry points can be placed at individual work areas to gather product for transport to chillers or other holding areas for further processing or packaging.
- Vacuum systems can be designed specifically to handle internal transport of hearts, livers, gizzards, and necks from harvesting area to giblet handling area.

Ergonomic Guidelines for Manual Material Handling

- Enforcement
  - Focus - industries/employers with know high injury & illness rates related to ergonomics by:
    - National Emphasis Programs
    - Local Emphasis Programs
    - Enforcement
  - Addresses Ergonomic by Issuing:
    - Citation under General Duty Clause 5(a)(1)
    - Ergonomic Hazard Alert Letters

Ergonomic Guidelines for Manual Material Handling

- Enforcement
  - National Emphasis Programs
    - Nursing Homes – 2002-3 (1225 Inspections / 157 EHA Letters)
  - Local Emphasis Programs
    - 8 Area Offices (240 EHA Letters)
    - Meat processing, Warehousing, Hospitals
    - Auto Parts Manufacturing

Ergonomic Guidelines for Manual Material Handling

- Enforcement
  - Ergonomic Hazard Alert (EHA) Letters
    - Issued When Not Enough Documentation to Write Citation
    - 397 Issued (240 to various industries / rest to Nursing Homes)
    - Alerts Employers to the Hazards / Suggests Improvements
    - Follow-up Case – by -Case

Ergonomic Guidelines for Manual Material Handling

- Enforcement – General Duty Clause 5(a)(1)
  - 5(a)(1) - Employer must "furnish to each employee employment and place of employment free from recognized hazards that cause or are likely to cause death or serious physical harm to employee"
  - OSHA Must Show
    - Employer Did Not Keep Workplace Free of Hazards Employees Were Exposed To
    - Hazard caused or likely to cause death / serious physical harm
    - Hazard was recognized
    - Feasible abatement exists

Ergonomic Guidelines for Manual Material Handling

- Enforcement – General Duty Clause 5(a)(1)
- OSHA Citations 2000 – 2005
- Total of 17
  - 2005 - 0
  - 2004 - 4
  - 2003 - 12
  - 2002 - 1

Ergonomic Guidelines for Manual Material Handling

- National Advisory Committee (2002-4)
- Advised On:
  - Ergonomic Guidelines
  - Research - Gaps, Future Needs
  - Methods to Provide Outreach / Assistance

Ergonomic Guidelines for Manual Material Handling

- Outreach and Assistance
  - eTools
  - Success Stories
  - Case Studies
  - Cooperative Programs
  - Training & Education
  - Speeches
  - Industry Developed Guidelines
  - Additional Information

Ergonomic Guidelines for Manual Material Handling

California

- **1993 WC REFORMS - AB 110**

  - CAL /OSHA Must Focus Resources

  - Establishments with Highest Incidences of Preventable Injuries / illness and W.C. Losses

Ergonomic Guidelines for Manual Material Handling

California Ergonomics Standard

- T8CCR 5110
- Long History – 1986
- Enforced / addressed on a “case by case” basis
  - Answer complaints / requests for consultation
- If facts indicate hazards may be present then:
  - inspection /consultation conducted
  - information gathered
  - standard applied if facts support the case

Ergonomic Guidelines for Manual Material Handling

California Ergonomics Standard

- Scope / Application
- Program to Minimize RMIs
  - Worksite Evaluation
  - Control of Exposures
  - Training
- Satisfaction of Employer's Obligation

Ergonomic Guidelines for Manual Material Handling

California Ergonomics Standard

- (a) Scope & Application

- RMI to More Than One Employee and
  - (1) Work related causation - predominantly caused (50% or more by repetitive work)
  - (2) Employees performing job / process / operation of identical work activity
    - same repetitive motion task
    - such as / not limited to word processing / assembly / loading)

Ergonomic Guidelines for Manual Material Handling

California Ergonomics Standard

- (a) Scope & Application

- RMI to More Than One Employee and
  - (3) Were Musculoskeletal injuries
  - (3) Licensed physician objectively identified / diagnosed
  - (4) Reported in last 12 months/not before July 3, 1997

Ergonomic Guidelines for Manual Material Handling

California Ergonomics Standard

- (c) Satisfaction of Employer's Obligation
- Employers Obligation Satisfied Unless It Is Shown
  - measures known but not taken are substantially certain to cause greater reduction in RMIs
  - no additional unreasonable costs from alternative measures

Ergonomic Guidelines for Manual Material Handling

California Ergonomics Standard

- History- T8CCR 5110 Since Adoption
- Inspections Conducted / Citations Issued
  - 2003 - 6 / 19
  - 2002 - 10 / 24
  - 2001 - 14 / 34
  - 2000 - 16 / 38
  - 1999 - 18 / 24
  - 1998 - 6 /5
- Totals - 70 Inspections / 144 Citations Issued

Why Develop Guidelines For Manual Material Handling ?

Summary

- Common Type of Operation Worldwide
- Reduce Injuries
- Reduce Costs
  - Direct
    - W.C. (Medical, Indemnity, Loss exposure)
    - Lost Productivity
    - Errors & Defects
  - INDIRECT (Up to 4X Direct Costs)
    - Turnover
    - Absenteeism
    - Re - Training

Why Develop Guidelines For Manual Material Handling ?

Summary

- Provide Competitive Edge by Improving
  - Productivity / Efficiency
  - Product / Service Quality
  - Customer Appeal
  - Management Tools

Why Develop Guidelines For Manual Material Handling ?

Summary

- Ergonomic Regulations ?
  - Federal Regulation
    - Repealed
    - No Current Regulation
    - Future – Can Not Adopt Similar Regulation
    - 20 Total OSHA Citations 2000 – 2005
    - OSHA Now - Outreach / Guidelines

Why Develop Guidelines For Manual Material Handling ?

Summary

- Ergonomic Regulations ?
  - California Regulation
    - 70 Inspections / 144 Citations 1998 – 2003
    - States Programmatic Requirements
    - Many Enforcement Issues

Ergonomic Guidelines for Manual Material Handling

Summary

California Ergonomics Standard

- Enforcement Issues - (a) Scope & Application
  - Standard says “repetitive motion injuries”
    - what about “static posture” or other types of injuries ?
  - RMI to More Than One Employee & work related / predominantly caused (50% or more by repetitive work)
    - off the job activities ? Ultimately the doctors opinion / judges decision

Ergonomic Guidelines for Manual Material Handling

Summary

California Ergonomics Standard

- Enforcement Issues - (a) Scope & Application

  - "identical work activity" ? means the same:
    - "task category" (assembly / loading/ etc.) / risk factors / body parts used

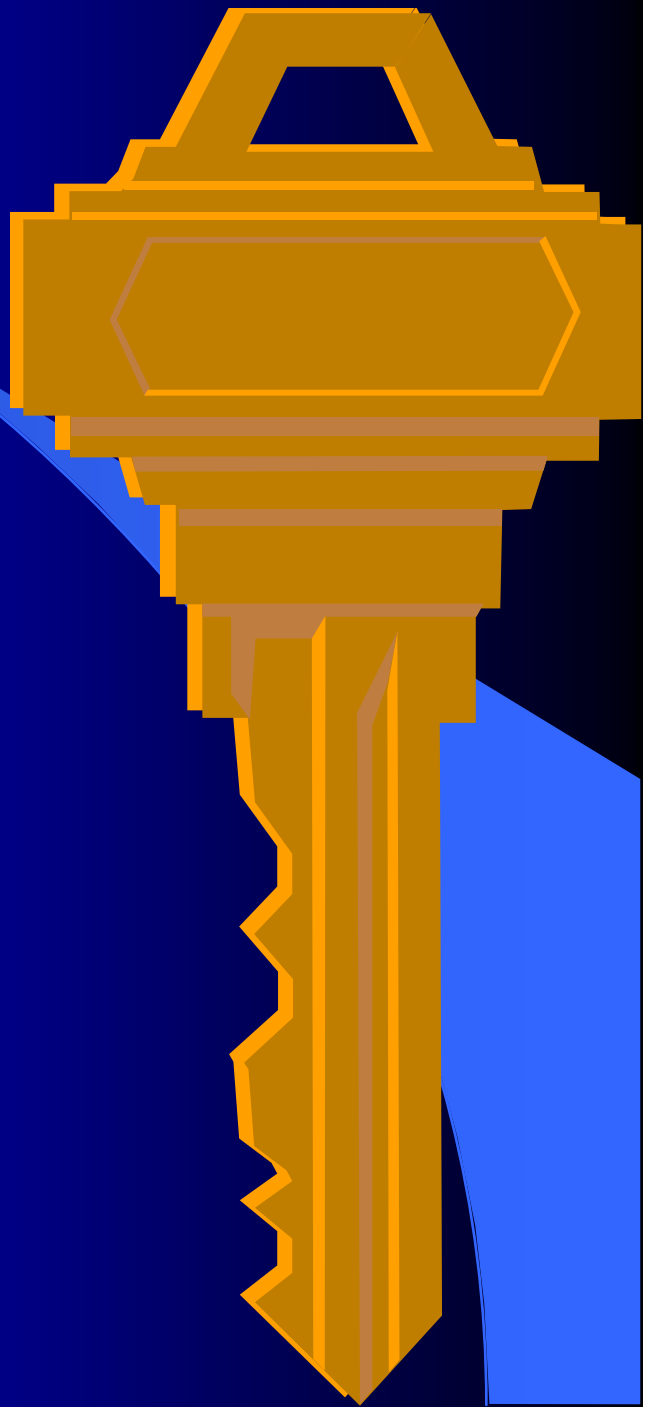
  - "objectively identified and diagnosed"
    - measurable and observable signs & symptoms
    - "customary protocol" (symptoms / labs / physical exam / work history)
    - info taken as a whole supports RMI diagnosis

Why Develop Guidelines For Manual Material Handling ?

Summary

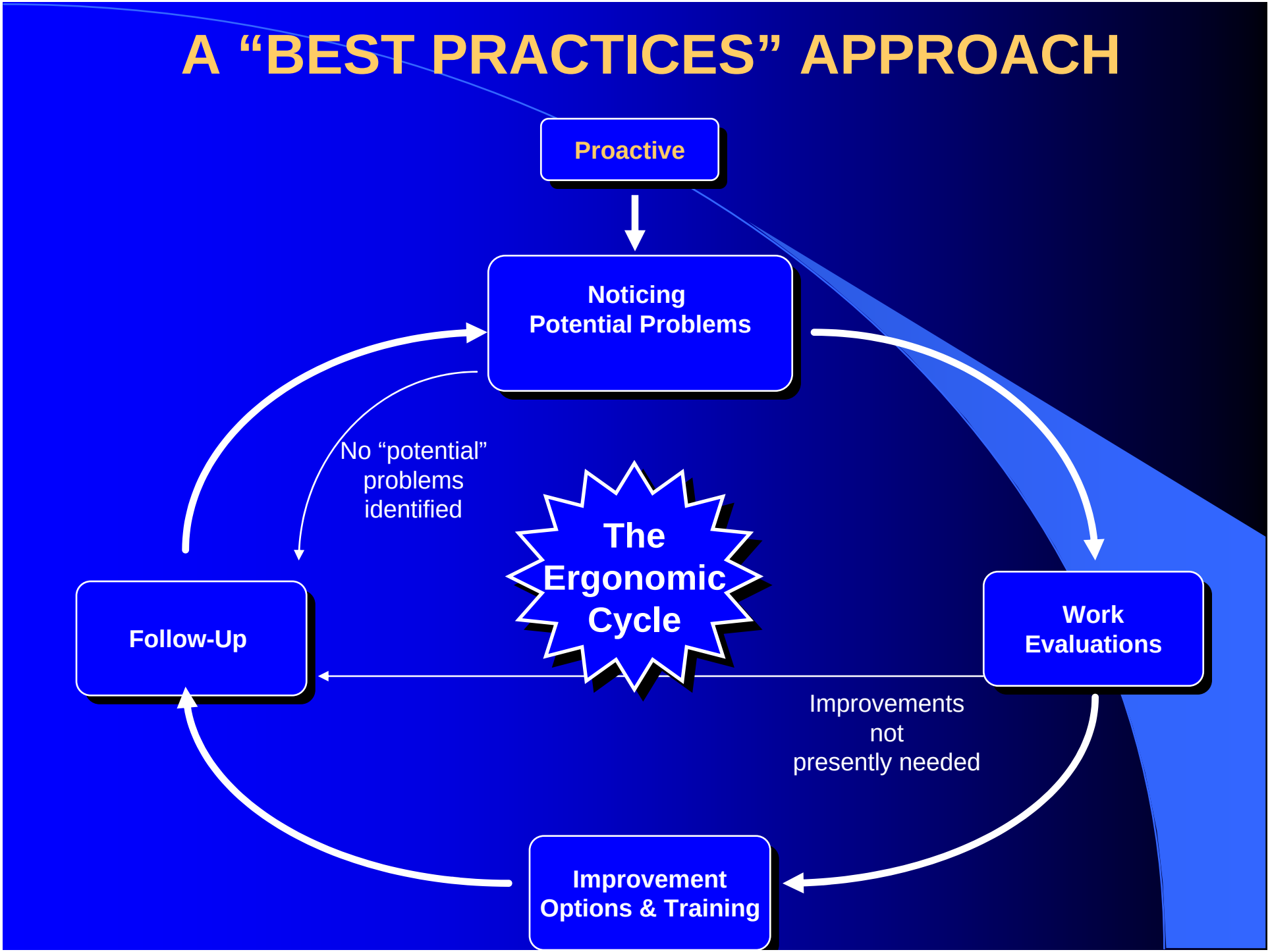
- Guidelines - Practical, Specific Information on:
  - Effective Management Practices
    - Involving Employees
  - "Best Practices" Approach - How To
    - Evaluate Worksites
    - Train Employees
    - Select & Implement Improvement Options
    - Ongoing Problem Solving & Follow-up
  - Resources & More Help

“BEST PRACTICES” APPROACH IMPROVEMENT OPTIONS



IMPROVE THE “FIT” BETWEEN THE WORK & EMPLOYEES

A "BEST PRACTICES" APPROACH



Ergonomic Guidelines for Manual Material Handling

What Can These Guidelines Do For You ?

Why Improve Your Workplace ?

How to Improve Your Workplace

- **What to Look For**
- **What Are Ergonomic Improvements ?**
- **How to Make Changes - "Proactive Problem Solving"**

Ergonomic Guidelines for Manual Material Handling

What Can These Guidelines Do For You ?

"A Best Practices Approach"

- Looking for Clues
- Prioritizing Jobs for Improvements
- Choosing "Effective Improvements"
- Following - Up

The Matrix – Improvement Options for Common Manual Material Handling Tasks

The Ergonomic Guidelines for Manual Material Handling

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EASE Council

Material Handling Industry of America

Charlotte, North Carolina

MATERIAL HANDLING INDUSTRY OF AMERICA®

- Non Profit Trade Association
- Established 1945
- Members include 750+ Manufacturers

E.A.S.E. Ergonomic Assist Systems and Equipment

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EASE Council

Material Handling Industry of America

Charlotte, North Carolina

INTRODUCING …

"The Ergonomic Guidelines for Manual Material Handling"

What Will the Guidelines Look Like ?

The Layout

I. Introduction – Process Piece

II. Matrix: a. W*hat is the worker doing?*

b. What is the worker handling?

III. Templates with Photos & Examples

Equipment Improvement Options & Simple,

Less Expensive Improvement Options

IV. Resources / Index / Appendices

What Will the Guidelines Look Like ?

			WHAT IS THE WORKER HANDLING?								
			A	B	C	D	E	F	G	H	I
			Boxes, Trays, Totes, Crates	Buckets, bottles, cans	Drums	Empty Pallets, Skids, Large Containers, Wire Baskets	Parts	Rolls, Coils	Sacks/ Bags	Sheets, Boards	Tools, Fixtures, etc
WHAT IS THE WORKER DOING?	1	**Lifting / Lowering, Palletizing / De-Palletizing:** *Material ON									
	2	**Filling / Emptying Containers:** manually scooping, pouring or packing/unpacking *Material IN									
	3	**Carrying**: manually moving the objects									
	4	**Assembling & Positioning:** pushing, pulling, turning, tilting or holding									

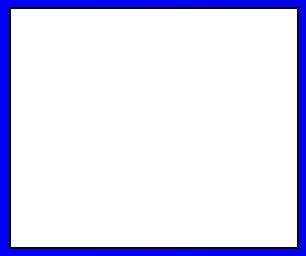
What Will the Guidelines Look Like ?

What is the worker doing? Lifting/lowering, palletizing/de-palletizing

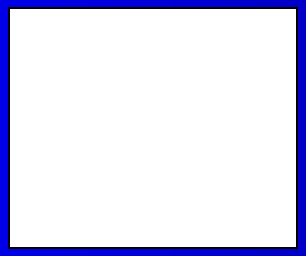
What is worker handling? Boxes, totes, trays crates

Limitations:

Possible Risk Factors:

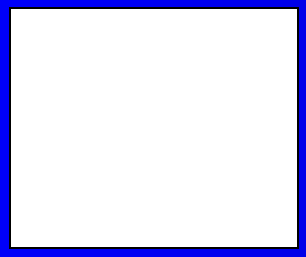


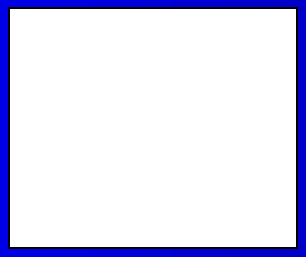
Awkward Posture



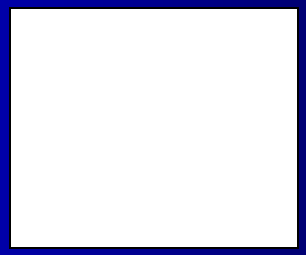
Force on back

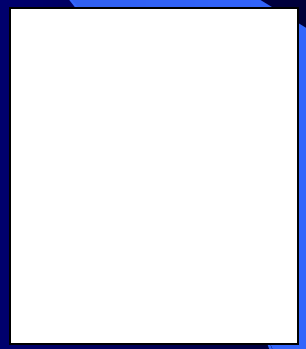
Simple, Less Expensive Options:

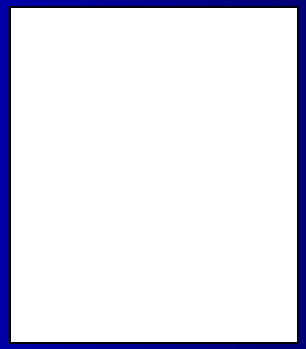




Equipment Improvement Options:







What Will the Guidelines Look Like ?

MANUAL MATERIAL HANDLING JOB DUTY DESCRIPTION

Job Duty Description: Unloading parts from containers, baskets, gaylords

Main Body Parts Affected:
- Back
- Neck/Shoulders

Possible Risk Factors:

Awkward, static posture

Forceful exertion

Improvement Options:
Alter the workplace
- Provide a clear pathway

Change the objects used in the task
- Xxxx xxxxx xx xxxxxx xxxx
- Xxxxxxxx x xxxxxx xxxxx xx xxxxxx

Change the Job Tasks:
- Rotate this task with other, non-loading, tasks
- Take short, frequent breaks from this task

Improvement Options: Equipment

Use a lift and tilt table

Use a lift and tilt table

Use a mobile bin tilter

Use a mobile bin tilter

DRAFT

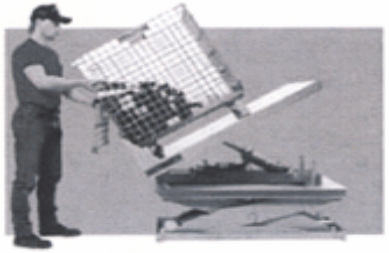
draft 9-30-03

What Will the Guidelines Look Like ?

More Improvement Options

Use a portable stacker

Use a lift and tilt device



Use lift and tilt tables

Use pick and place tilt stands

Use a portable lift and tilt

Use collapsible bins with drop down side

Use a Container Rotator

Use Collapsible bins with drop down sides

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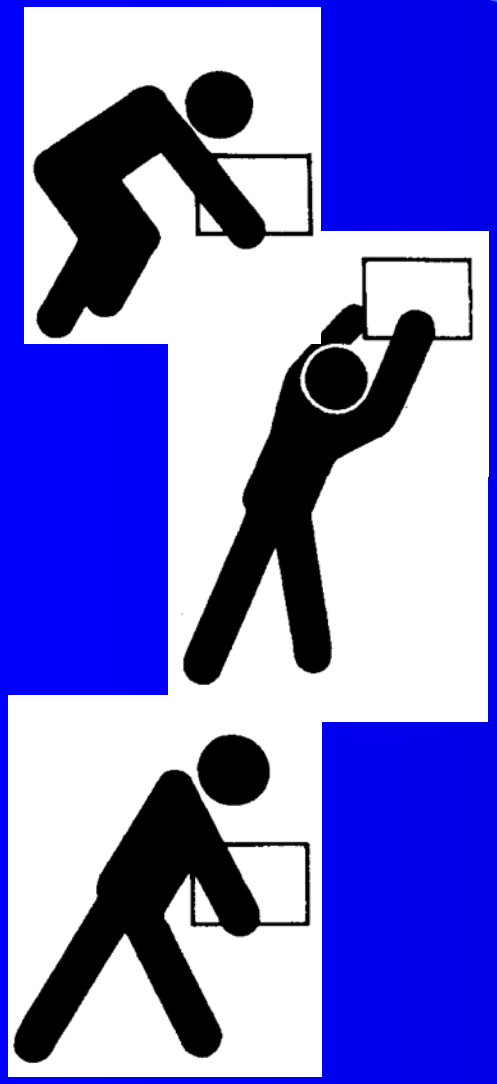
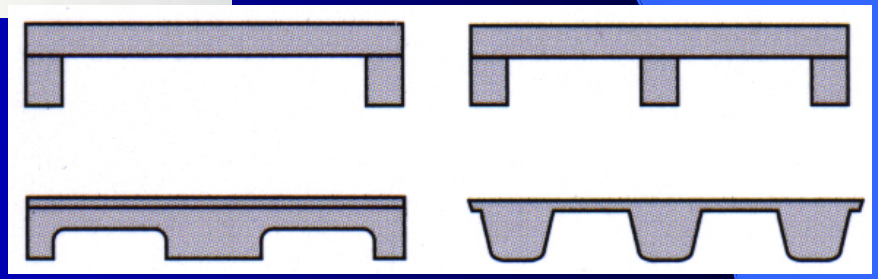


LIFTING
STRETCHING
REACHING
BENDING
STOOPING
and
WALKING

These unnecessary worker activities can result ergonomic problems

Pallets



MANUAL LOADING AND UNLOADING OF PALLETS CONTINUES TO BE ONE OF THE MOST COMMON AND MOST INJURY PRONE TASKS IN INDUSTRY TODAY

These are automatic load leveling devices that maintain the top of the load in the 30 to 38” ergonomic window

Sitting or standing a lift can eliminate the back bending to associated with pallet loading/unloading

Portability allows the operator to bring the machine in close & eliminate walking around

Notice the bi-directional work station crane

Balancers can also be used to unload pallets and make positioning goods at various locations within a machine or work center

these trays of parts become virtually “weightless”

These lightweight lifts are highly maneuverable

Lifts and positioners can also be fitted with turntables for "*near side*" loading

As much as 40% of the time required loading a pallet, can be spent walking around it!

There are inexpensive machines to transport pallet loads in and around work stations - even load positioners

This is a really cheesy job!

This vacuum lifter makes easy lifting and maneuvering of these heavy cheese wheels

Containers

Manual loading and unloading of wire baskets, containers and Gaylord's leads to a high incidence of lower back injuries

Repetitive bending into containers can result in a high incidence of back injuries

Bending eliminated!

Parts picking at a hydraulic press work station

Imagine the back extension, bending and reaching required to get to these parts

Parts picking made productive from fixed height tilters

Notice the high hinge causing the container to elevate as it tilts

Parts picking on assembly line

Manipulators making easy work of handling cylinder heads in a machining center

Electric chain hoist on articulated jib crane

Notice the use of gravity roller conveyor to ease the feeding of parts

Where no loading dock exists

Wrong!

Make that <u>three</u> wrongs!


I love this lift!
Right!

This expandable conveyor is driven right into the truck

The individual boxes and cartons are conveyed right to the worker

Notice how the odd sizes and shapes are handled easily by a single piece of equipment

Portable lift for vertical positioning panels in a finishing operation

Lift & Tilt to position electrical panels in this work cell

lifters

to

manipulate

the

small stuff

IAD - Intelligent Assist

Amplifies operator's power

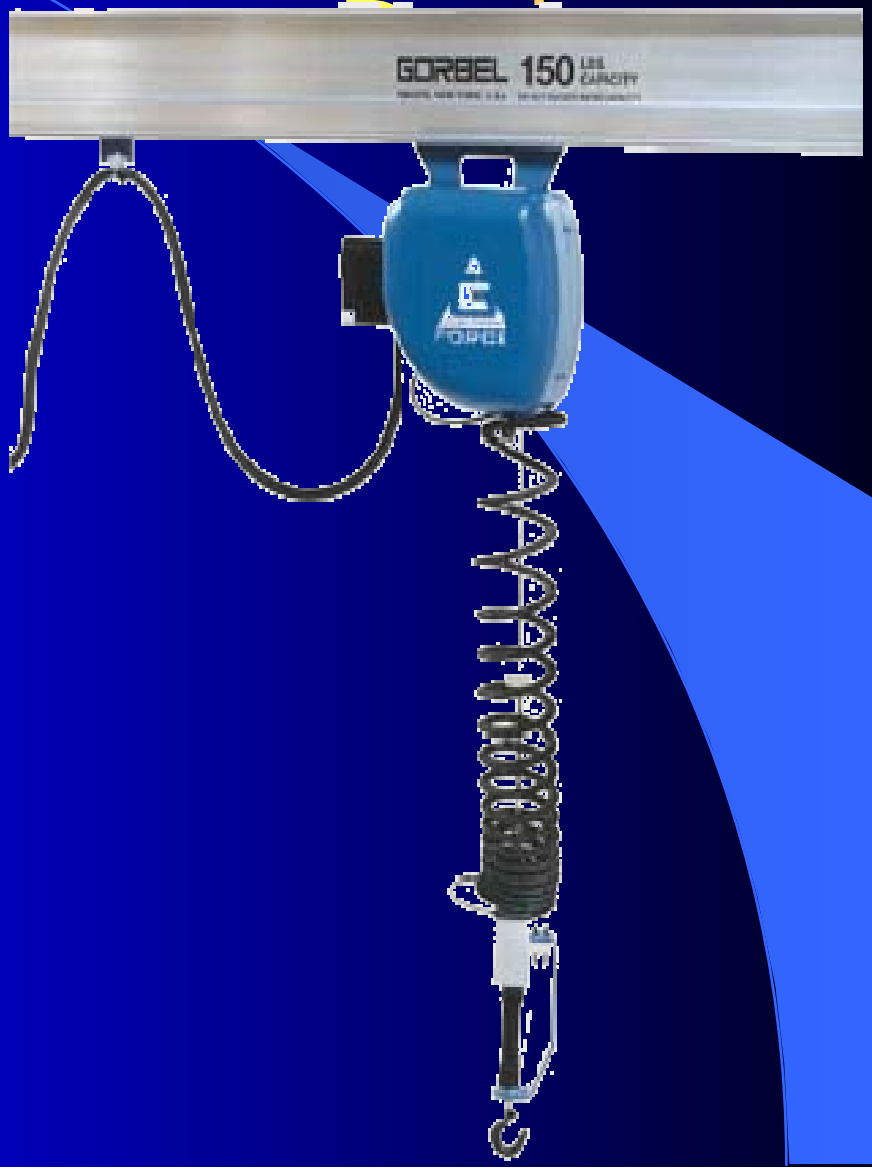
Unit has an intuitive, human-like feel

Intuitive

The operator has a sense of control & feel over the load using normal arm, wrist and hand movements.

Intelligent

Resolver feedback from the servomotor allows for future implementation of programmable human limits.



This lift and gravity conveyor permits one person to do what was a two man job

Use portable lifts to level loads and eliminate bending and reaching

FINIS

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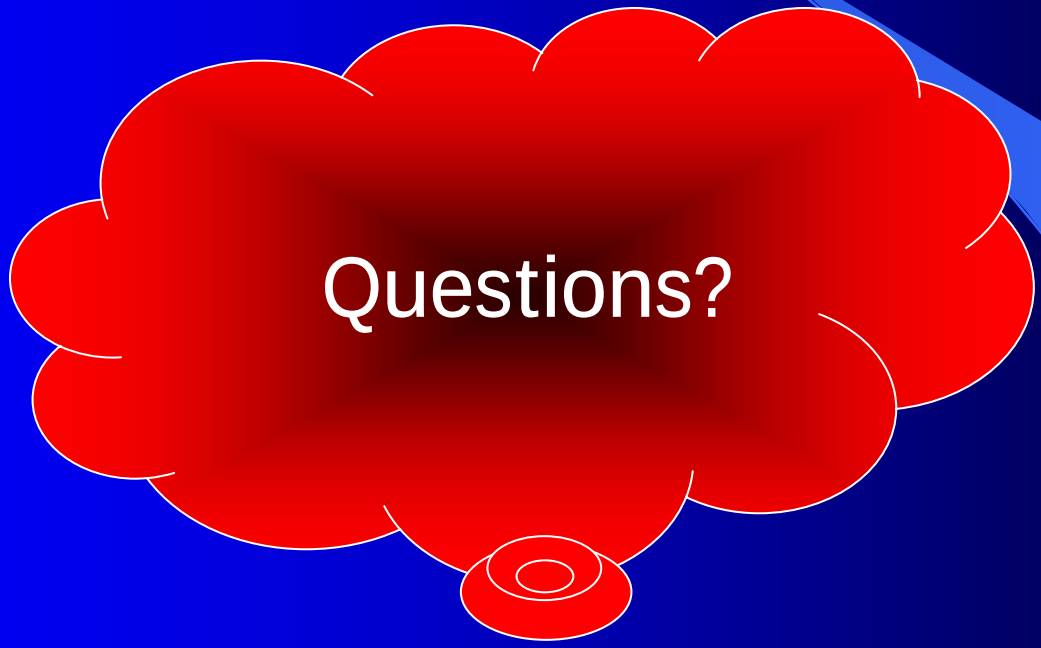

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