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Ergonomics and Manual Material Handling

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REINVENTING
UNIT
LOAD

Overview

As members of ISTA and the packaging community, we are in a unique position to help improve ergonomics as it relates to handling products, packages, and unit loads.

This presentation will help to highlight high risk manual material handling (MMH) work tasks and choose effective options for reducing their physical demands, increasing general safety and health aspects of work environments, and increasing productivity.

Ergonomics

- Ergonomics is the scientific study of people at work.
- The goal of ergonomics is to reduce stress and eliminate injuries and disorders associated with the overuse of muscles, bad posture, and repeated tasks.
- This is accomplished by designing tasks, work spaces, controls, displays, tools, lighting, and equipment to fit the employee's physical capabilities and limitations.

Ergonomics

- Comprised of three main fields of research:
 - Physical Ergonomics
 - Cognitive Ergonomics
 - Organizational Ergonomics
- Types of ergonomic improvements:
 - Engineering Controls
 - Administrative Controls
 - Personal Protective Equipment (PPE)
- Today's focus is on the *Physical Ergonomics* and *Engineering Controls*

Source: Wikipedia "Ergonomics", Ergonomic Guidelines for Manual Material Handling (NIOSH Pub. 2007-131)

Musculoskeletal Disorders (MSDs)

- MSDs are injuries and disorders of the soft tissues (muscles, tendons, ligaments, joints, and cartilage) and nervous system.
- The High Cost of MSDs
 - MSDs account for 34 percent of all lost-workday injuries and illnesses.
 - Employers report nearly 600,000 MSDs requiring time away from work every year.
 - MSDs account for \$1 of every \$3 spent for workers' compensation.

Source: Ergonomics: The Study of Work Occupational Safety and Health Administration (OSHA 3125)

Musculoskeletal Disorders (MSDs)

- Ergonomic risk factors for MSDs
 - Force
 - Repetition
 - Awkward postures
 - Static postures
 - Quick motions
 - Compression or contact stress
 - Vibration
 - Cold temperatures
 - Recovery time
- Force, repetition, and awkward postures, especially when occurring at high levels or in combination, are most often associated with the occurrence of MSDs

Source: Ergonomics: The Study of Work (OSHA 3125)

Musculoskeletal Disorders (MSDs)

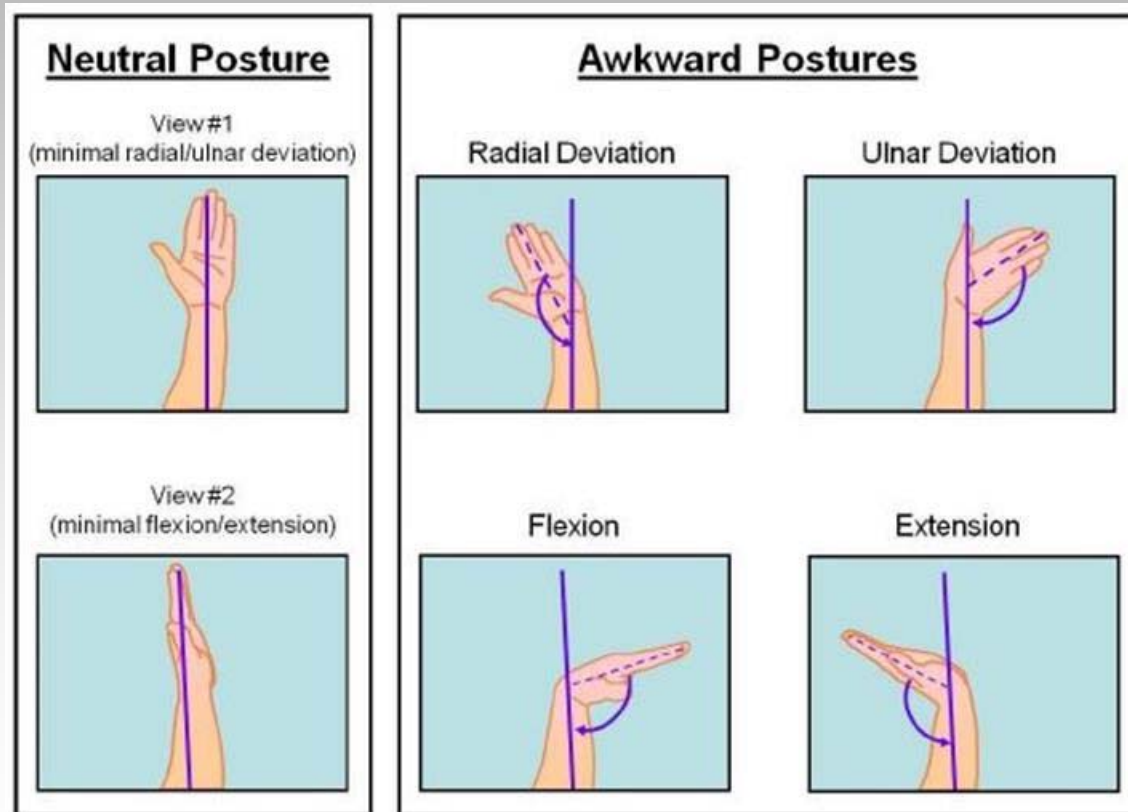
- Manual materials handling (MMH) risks
 - Lifting / Lowering
 - Pushing / Pulling
 - Carrying / Holding
 - Bending / Reaching
- MSDs most frequently involve the arms and back.



Source: Ergonomics: The Study of Work (OSHA 3125), google images

Injuries linked to MMH jobs

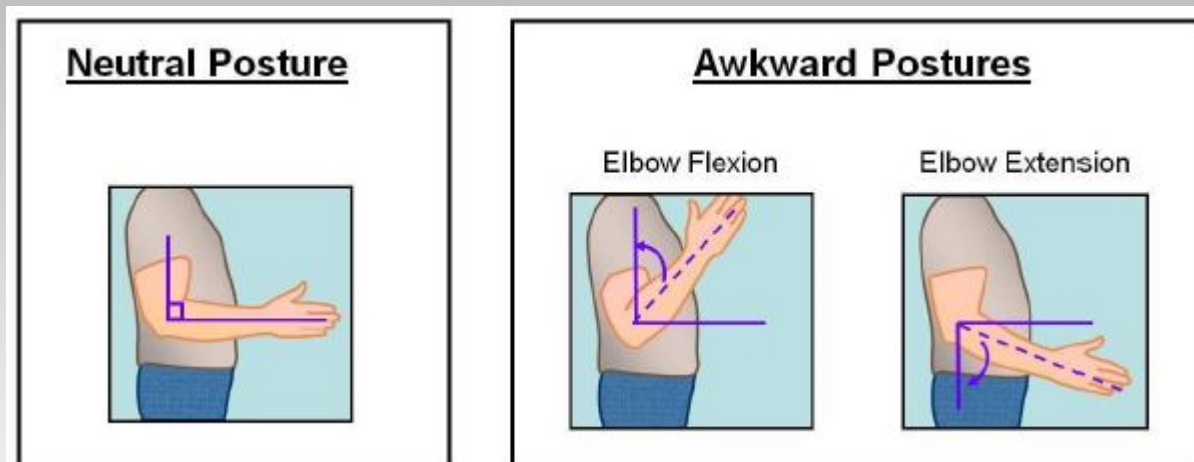
- Hand/Wrist 9 %



Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)

Injuries linked to MMH jobs

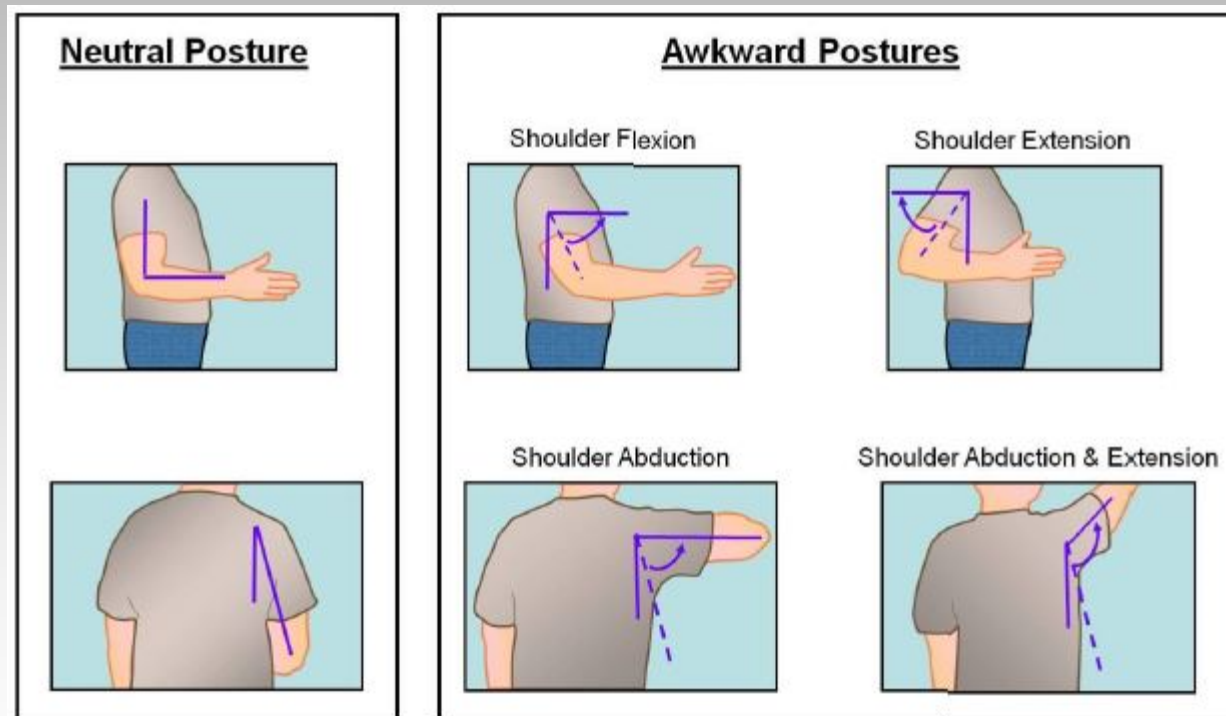
- Elbows 18%



Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)

Injuries linked to MMH jobs

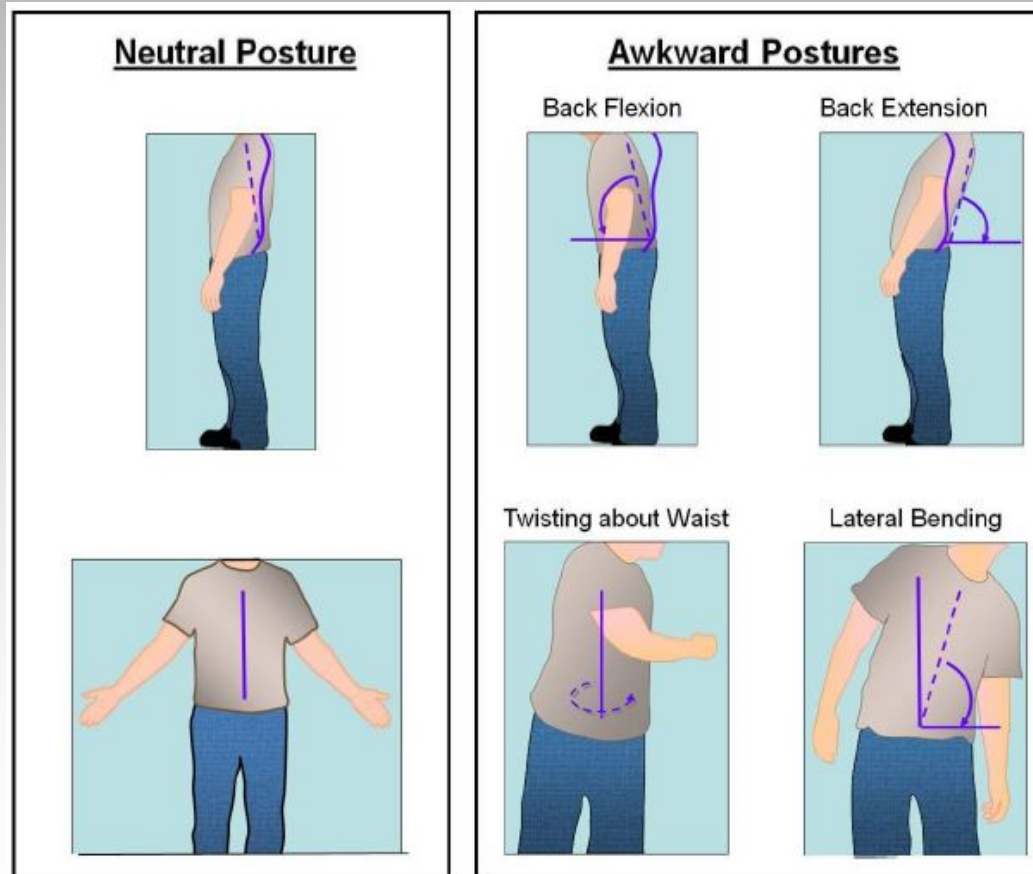
- Shoulders 30%



Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)

Injuries linked to MMH jobs

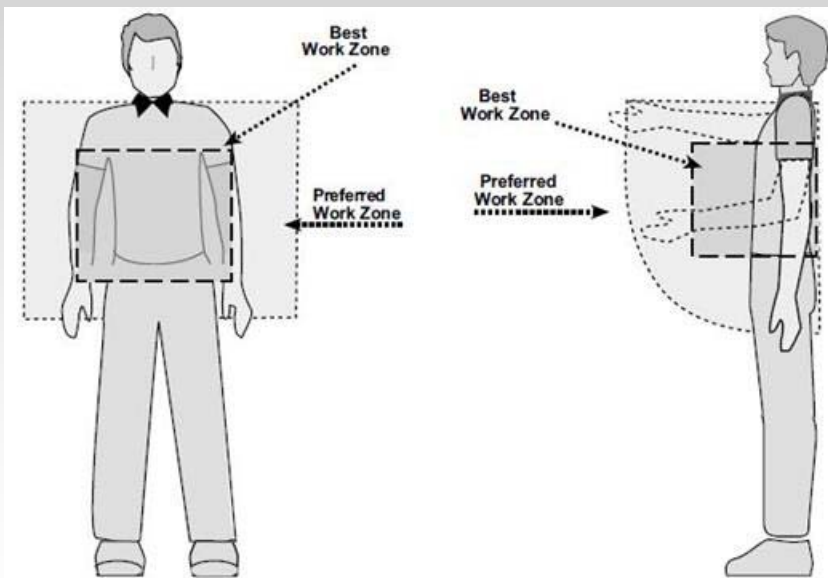
- Back 43%



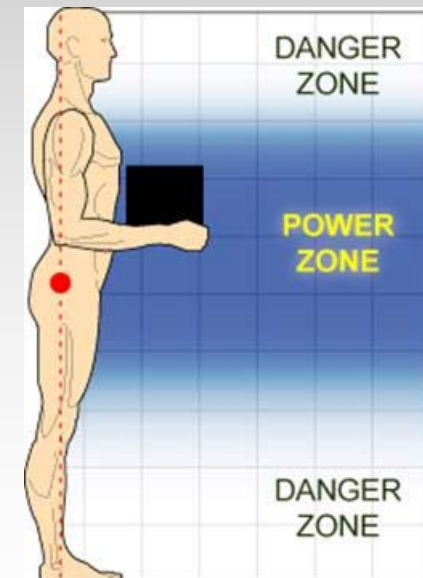
Source: Practical Demonstrations of Ergonomic Principles (NIOSH RI 9684)

Best and Preferred Work Zones

- Work is safest when lifting and reaching is performed in these zones. Working outside these work zones results in non-neutral postures that may increase the risk of injury.



“Power Zone”
shake hands
with your work



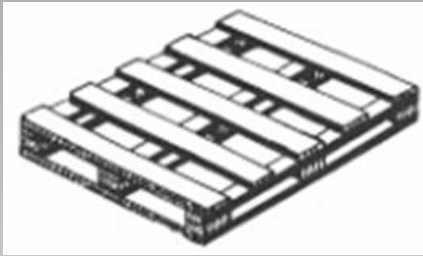
Source: Occupational Safety and Health Administration Guidelines for Retail Grocery Stores (OSHA 3192-05N 2004), OSHA Supplemental Info: Ergonomic Principles Index

Examples of MMH and Ergonomic Solutions

Source: MHI EASE Council

Pallets

Approximately 475 M new pallets produced each year in the USA. 1.4 B (est.) pallets are in use at any given time.



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





Here is a very typical problem

In this retail paint store 65 to 80 lb. pails need to be moved from the pallet to mixer and shaker - then back to the pallet





Positioners allow the worker to stand erect, dramatically reducing the back bending

The solution not only solves the lower back problem, it substantially enhances productivity.





Workers carrying
heavy loads....

DOH! My
aching back

...then picking or placing
those loads on pallets
which are on the floor.



Positioners hold pallet loads to a proper height



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!



Lifts fitted with
turntables eliminate
wasted motion which
enhances
productivity....



....and put the load at
the right elevation to
reduce the possibility
of back injury



Notice the bi-directional workstation crane

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

these trays of parts become virtually "weightless"

Articulated Jib Crane

This balancer has a vacuum end-effector to quickly grab the heavy cheese wheels. The balancer speeds the lifting and maneuvering of this palletizing operation





Vacuum lifters are efficient and very useful in handling unusual shapes and sizes in pick and place tasks



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



Articulated
booms require
substantially
less force to
move them
.....reducing
the stress on
the operator.





Another solution to manually handling loads is using powered stackers.

They are highly maneuverable in tight quarters





These lightweight aluminum stackers are highly maneuverable...

....they provide easy access to loads



...and increase productivity!



even load/unload
directly from the stacker



Inexpensive stackers to
transport pallet loads in and
around work stations

Pallet inverters make quick work exchanging pallets...



...and they eliminate the human interface

Lift tables and gravity conveyor provide efficiency gains as well as ergonomic improvements





Lumber to be processed that is on the floor or a pallet is slow, back breaking work

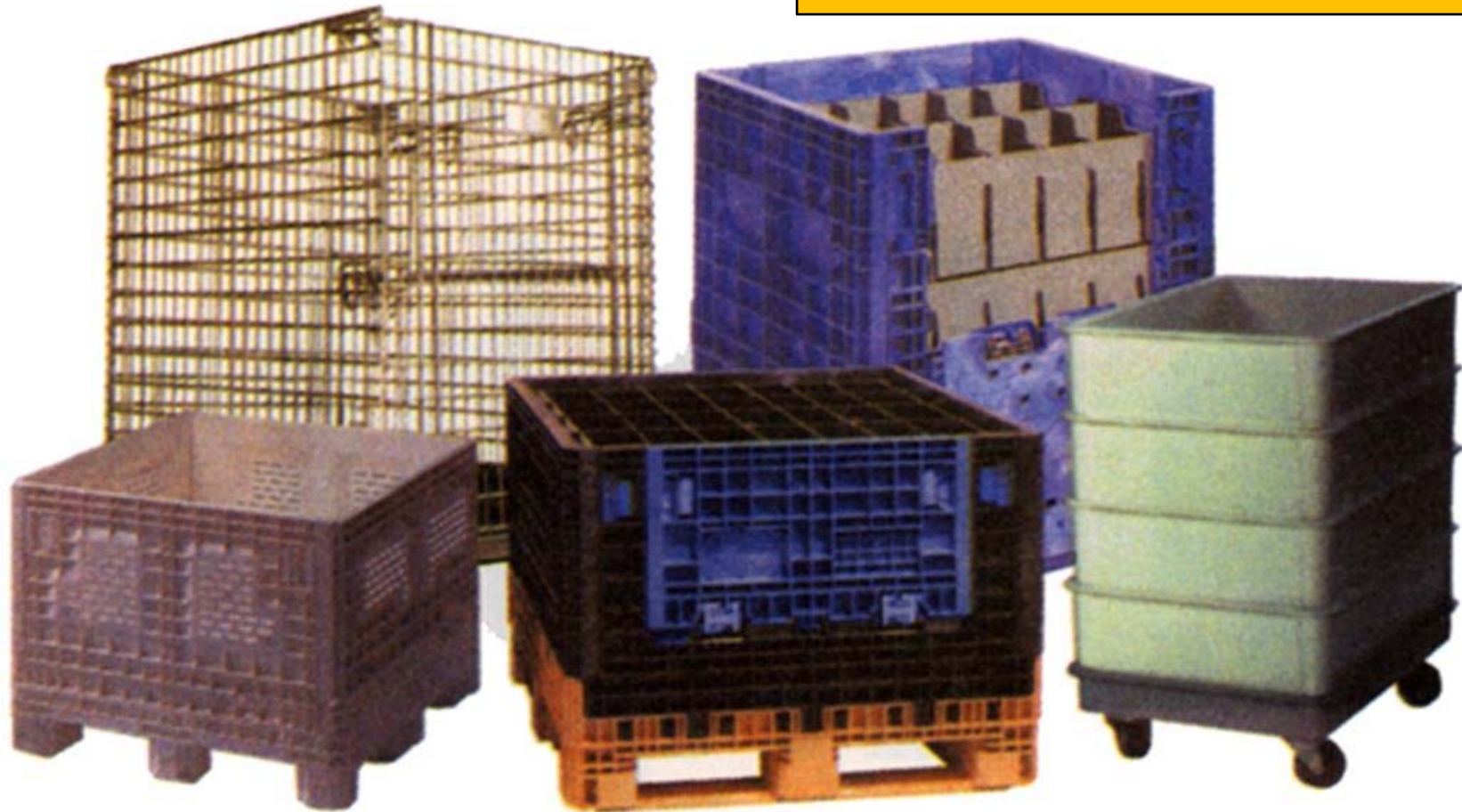


With a lift table to level the stack, the lumber can be fed in as fast as the machine can process it – no wasted motion here.



Containers

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





Production Bottleneck:
Back bending, back
extension, over reaching
and fatigue

Portable
filters also
provide for
getting to all
the material
in the
container



Problem



A Solution



Proper positioning maximizes production
& minimizes ergonomic issues

They can work like this....



....or like this.



Picking 1,000's of small parts made easy by using tilters



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

This spring loaded positioner elevates the goods in the container to speed picking the parts and eliminates the bending and extension issues



Good examples of how industrial tilters foster good ergonomics and help get the job done efficiently



Lift & Tilt to position electrical panels in this work cell



Tilt Table

Lift Table

Positioning large assemblies



Turntable

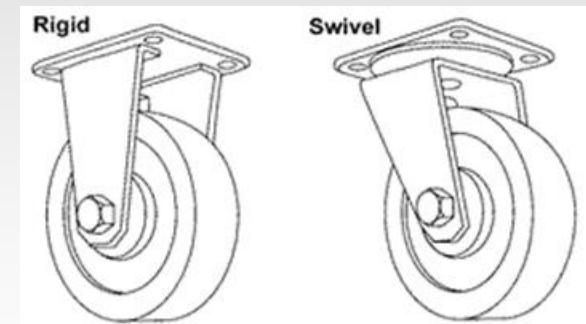
Lift Table

Casters and Wheels



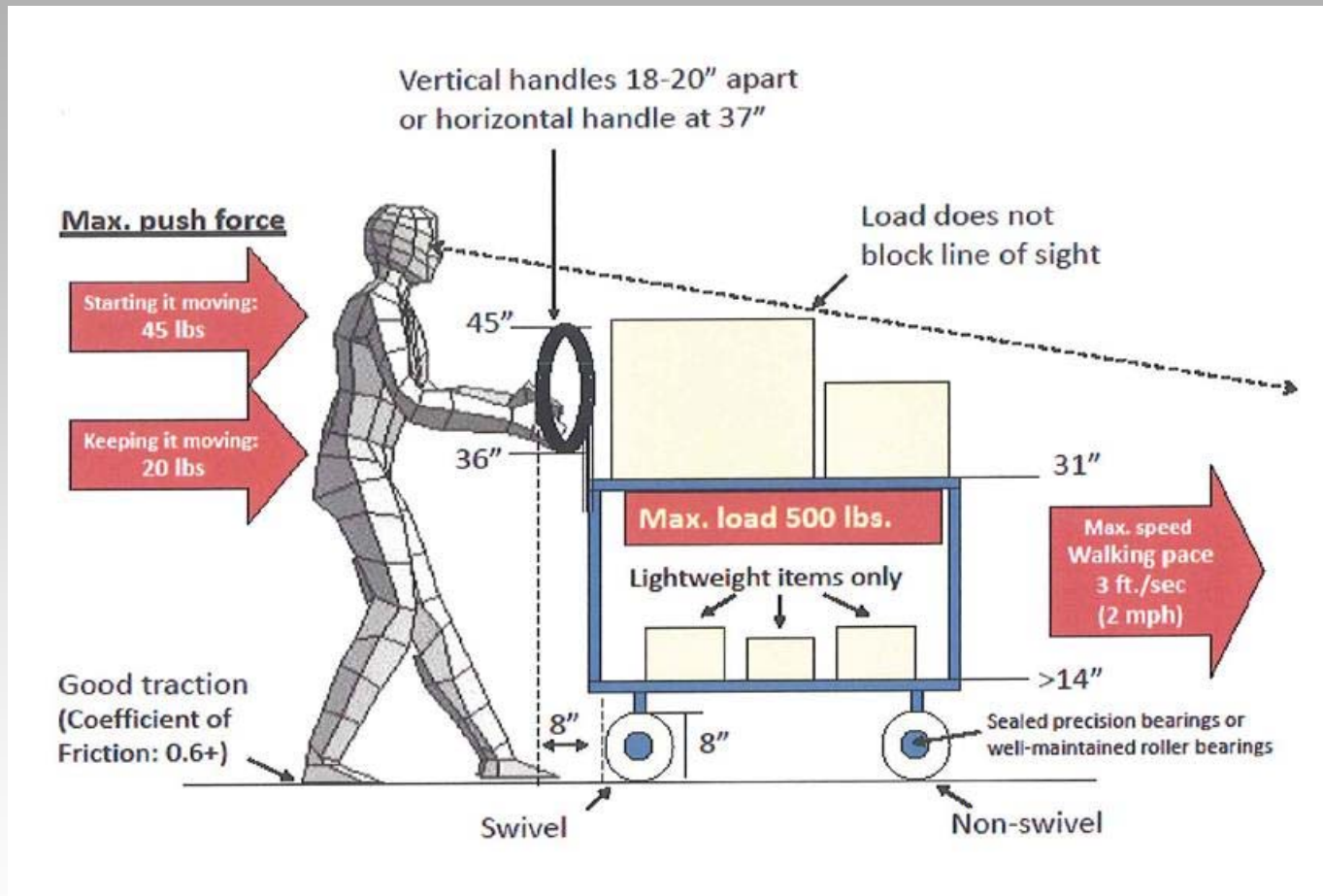
MMH wheel examples

A caster is a complete wheel and horn assembly which, when attached to a piece of equipment, allows that item to move. There are two basic types of casters:

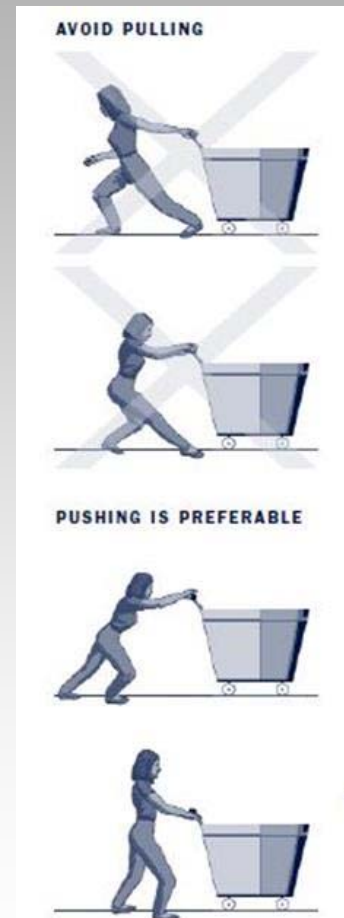


Source: MHI EASE, Hamilton Caster & Mfg. Co., MHI Institute of Caster and Wheel Manufacturers (ICWM)

Caster and Wheel Ergonomics



Pushing is preferable
to pulling



Source: MHI EASE, Hamilton Caster & Mfg. Co., MHI Inst. of Caster and Wheel Mfrs (ICWM)

Ergonomic Do's and Don't's

Doing it Right!



Platform elevated



Correct push bar height



Larger wheels

Harder



Platform too low



No push bar



Wheels too small

Source: MHI EASE, Hamilton Caster & Mfg. Co.

IAD - Intelligent Assist Devices



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.

IAD's for
handling
heavy castings





Hydraulic tilt table
for large window
assembly



Two wheel hand truck with powered lift



Source: www.liftnbuddy.com



In this retail paint store 40 to 50 lb. cartons (4 gals.) need to be moved to shelving.



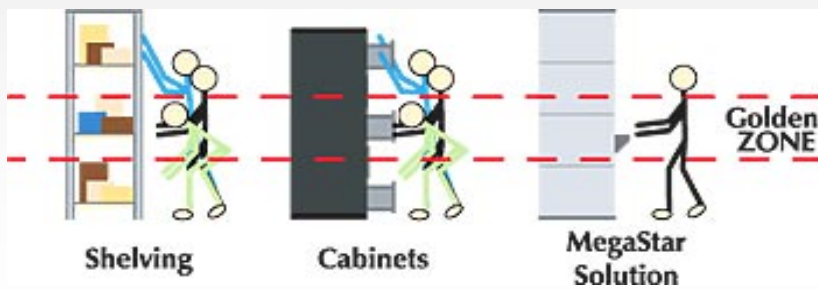
This lifting device permits a greater number of employees to get the same job donea job previously assigned to people which had the upper body strength.

Battery powered scissors lift





High density vertical storage systems speed order picking and put each item at the correct height



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



Special Acknowledgements



14 Member Companies

40 Industries Covered

Ergonomic Resources and Tools

Safety and Ergo News

Case Studies

Technical Support

White Papers

Ergo Checklists

Speakers and Presentation Materials

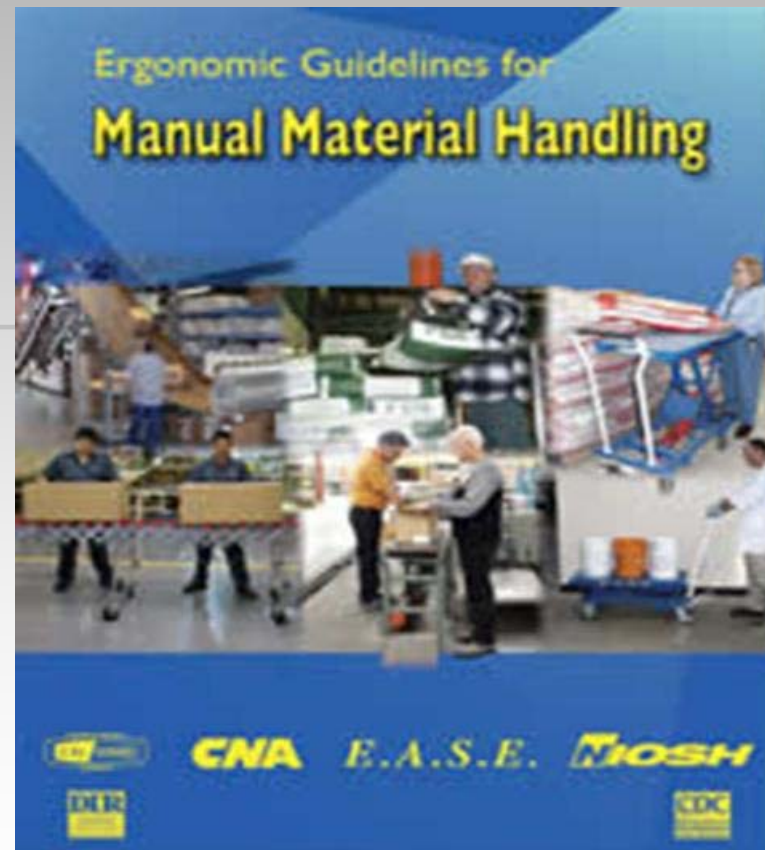
www.MHI.org/EASE



To broadly promote the benefits of ergonomic assist systems and equipment together with the advantages derived from the use of this equipment in the workplace and to promote the safety and health of the work environments.

Ergonomic Guidelines for Manual Material Handling (NIOSH Pub. 2007-131)

free resource
www.MHI.org/EASE



Source: National Institute for Occupational Safety and Health (NIOSH)
Ergonomic Guidelines for Manual Material Handling (NIOSH Pub. No. 2007-131)

What is wrong with this picture?



Thank You



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