Incorporating Ergonomics into a Construction Safety Management System

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Objectives

- Background of the problem
- Model ergonomic program
- Case study: Development of an ergonomic program

Background

- Construction workers suffer from high rates of non-fatal injuries, 16% higher than all industries (BLS 2013)
- Overexertion is the leading cause of all injuries, exceeding $13 billion in 2016 (Liberty Mutual Workplace Safety Index 2017)
- Many construction tasks involve ergonomic risks: forceful exertions, repetitive motions, awkward postures, or hand vibration.

Ergonomic hazards in common tasks

- handling heavy loads
- performing same tasks repeatedly
- working in poor postures.

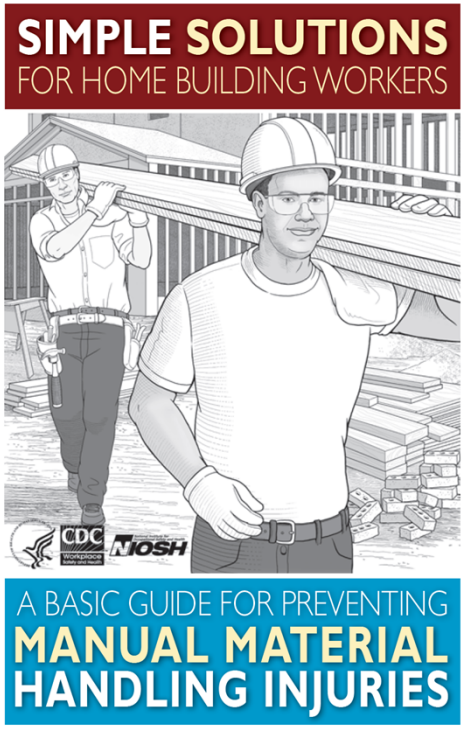
High physical demands leads to injuries

- Musculoskeletal injuries
  - Acute-strains, sprains
  - Chronic-bursitis, tendonitis, carpal tunnel syndrome

- Any body part-low back, neck, wrist, and knee

Many ergonomic solutions exist

- Ergonomics: the science to reduce/eliminate physical exposures to prevent musculoskeletal disorders

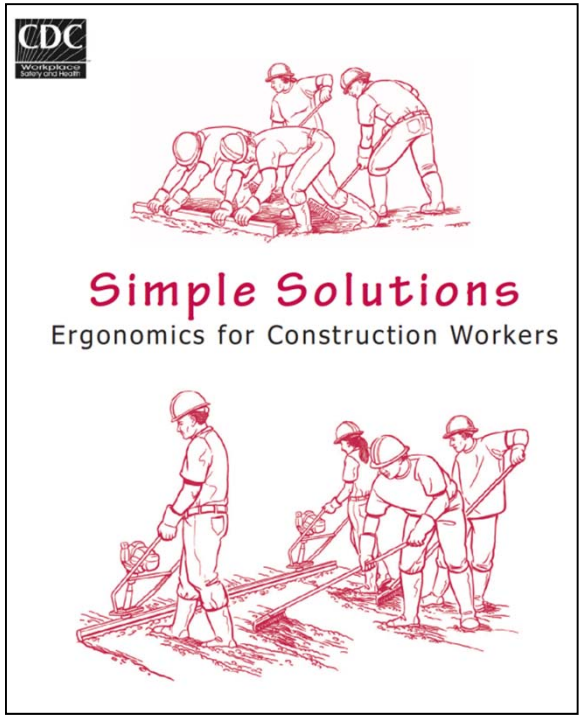


elcosh

Electronic Library of Construction Occupational Safety & Health

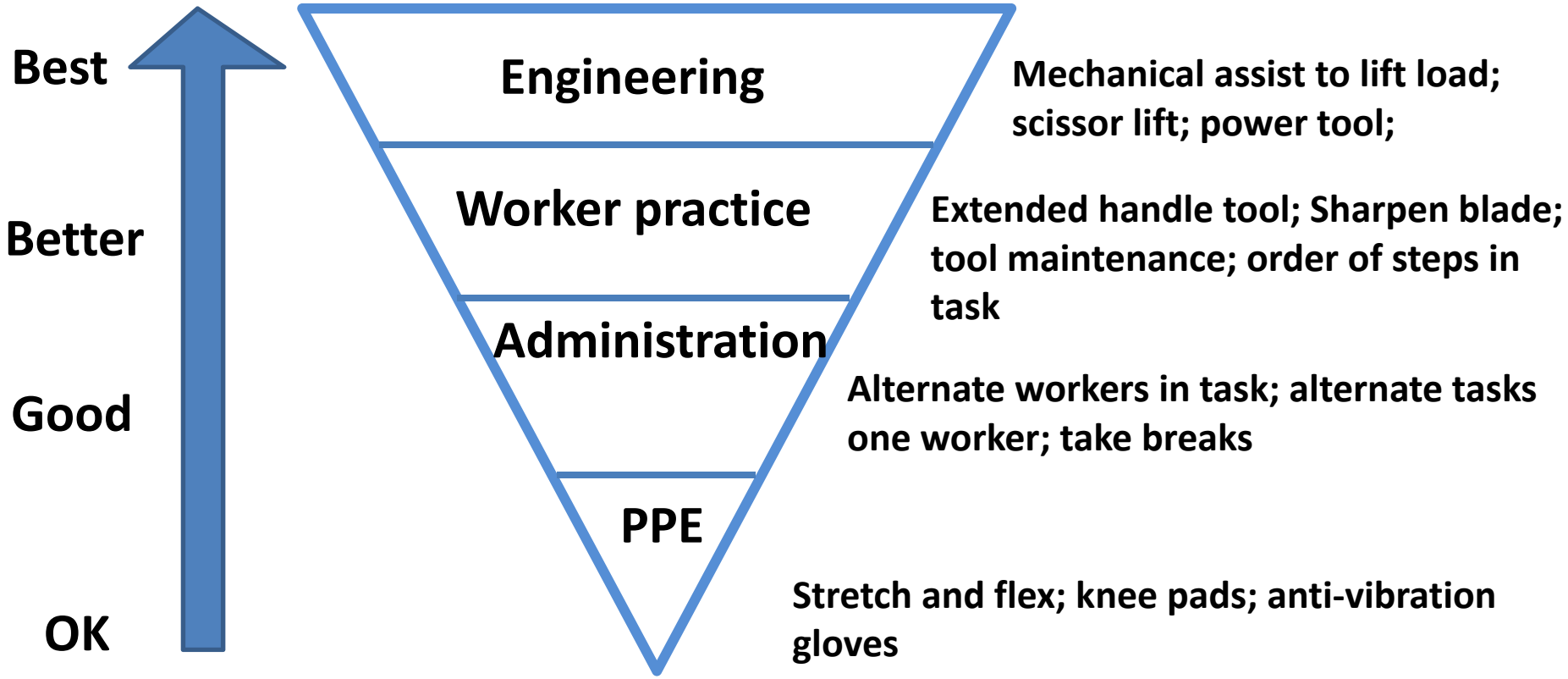
construction solutions

ROI CALCULATOR



Hierarchy of Controls

Ergonomic Examples



Ref: Peterson JE , 1973; DHHS (NIOSH),

Problem: Bent back to spray sealant

Solution: Extended handle sprayer available

Worker identified solution.

Result: Device was not available the day task performed; preplanning and communication issue with warehouse

Problem: Forceful grip to hand pull carpet

Solution: Use automatic carpet puller

Worker identified solution.

Result: Significantly less hand force but requires preplanning and coordination to have device available; not useful in small areas nor with old carpet.

Barriers to use of ergonomic solutions

Construction organization

- Unstable crews; high worker turnover
- Frequently changing tasks

Workers

- Don't have solutions when needed
- Don't use solutions if available

Specialty Contractor

- Solutions are costly
- Rarely plan for equipment/tools needed on jobs

Primary contractor

- Planning and schedule rarely consider impact on worker
- Lack task coordination between specialty employers

Conceptual model to eliminate injuries

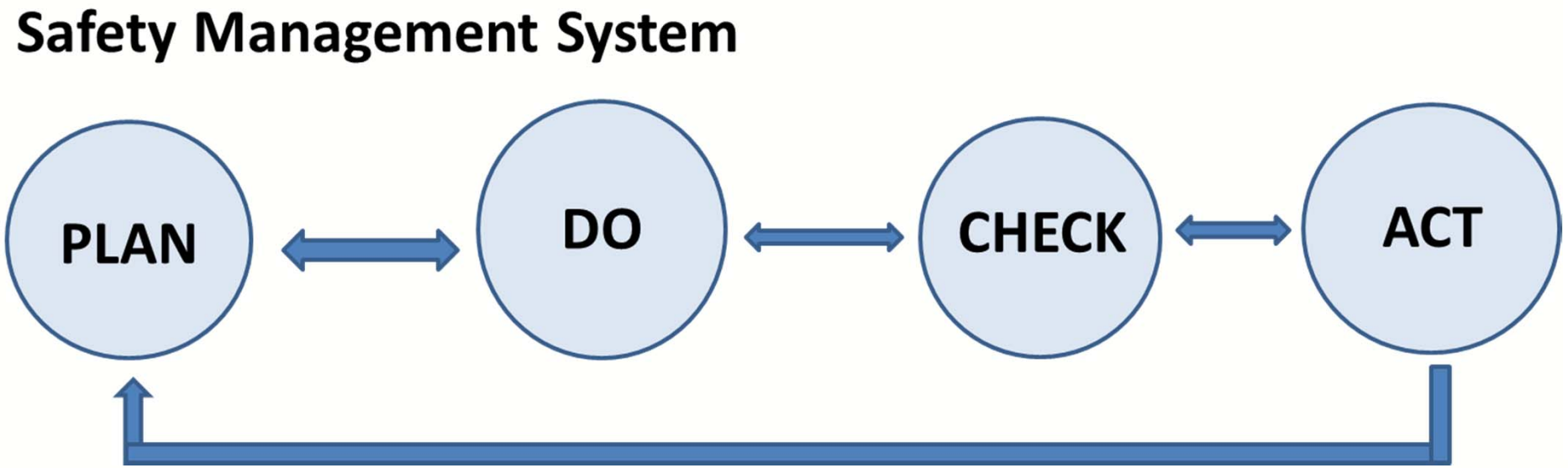
- Collection of safety activities
- How activities are delivered

- Measure safety activities delivered
- # of inspections
- # trained

- Measure of injuries
- OSHA log

Integration of ergonomics into safety

- Most ergonomic activities are “add-ons” to safety programs (Yazdani and Wells 2012)
- Integration requires continuous monitoring in the system



Case study- General Contractor

- Find ergonomic activities and information
- Topic in meetings

- Find measures of ergonomics
- Listed on inspections, daily pretask assessments
- Training/Toolbox talks

- Review ergonomic injuries
- Overexertion
- Sprain/strains

Program Review

- *Safety* is integrated into each construction activity
    - Preconstruction meetings
    - Training
    - Weekly meetings
    - Hazard ID/controls
  - Recognition program
  - Enforcement and accountability
- *Ergonomic gaps*
  - Preconstruction meetings-not listed
  - Weekly meetings- not listed
  - Few activities with reference to ergonomics

Process measures

			Leading Indicators	
Category	Topic		Pretask Forms	Toolbox talks
Safety	Falls	Hazard ID	40%	18%
		Controls	96%	
Ergonomics	Manual Material handling	Hazard ID	45%	3%
		Controls	19%*	

*mechanical assist

Injury Review

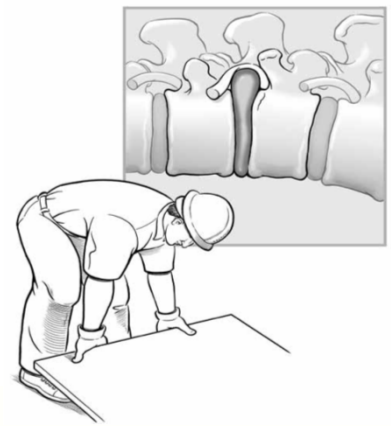
Safety program → Leading Indicators → Lagging indicators

- Sprains and Strains: 25% of all injuries
  - Overexertion involving manual lifting: 47%
  - Location of work below knee: 27%
  - Location of work above shoulder: 17%

Focus of Ergonomics Program:

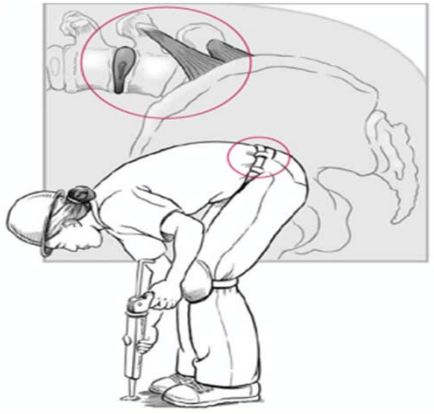
- 3 exposures and "keep it simple"

I. **Manual Material Handling**



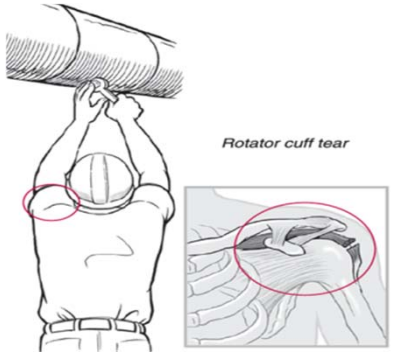
Heavy loads-Lifting

II. **Work with hands below knee**



Awkward Posture
Bent forward

III. **Work with hands above head**



Awkward Posture
Overhead

Discussions with workers/foreman

- Worker focus groups (3):
  - Workers must figure out best method themselves
  - Sometimes the general contractor helped:
    - kept the job clean;
    - built crates to lift equipment to higher floors before buck hoist installed
- Foreman interviews (11):
  - Few references to ergonomics in daily interactions
  - Sometimes general contractor stopped guys from carrying an object that was too heavy

Review of program

- General Contractor has a well developed safety program
- Little reference to ergonomics in documents and in interactions

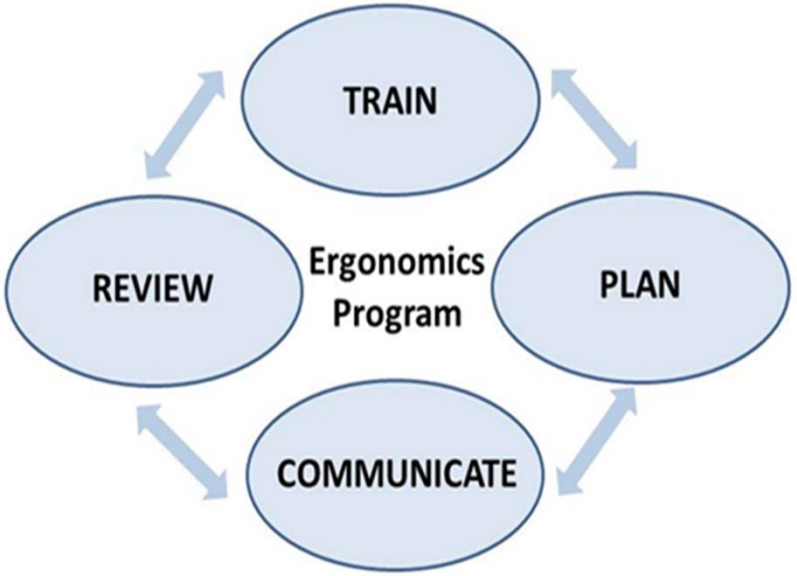
- Workers have difficulty using best ergonomic practices

- Common barriers to ergonomics: lack of equipment, schedule issues, staging, manpower; coordination/planning between general, subs, workers

Develop an ergonomic plan

- Focus on 3 ergonomic exposures
    - Reduce handling heavy objects
    - Work above shoulder
    - Work below knee
- Incorporate information into all written materials and procedures
- Gain approval from Management (safety committee)
- Roll plan out to the organization
    - Educate all employees on ergonomics and the program

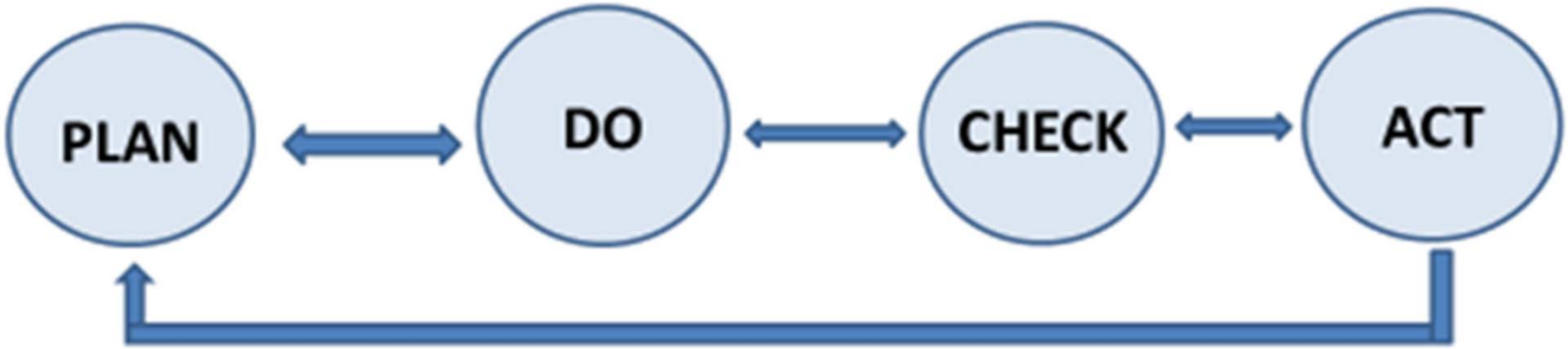
Ergonomic program



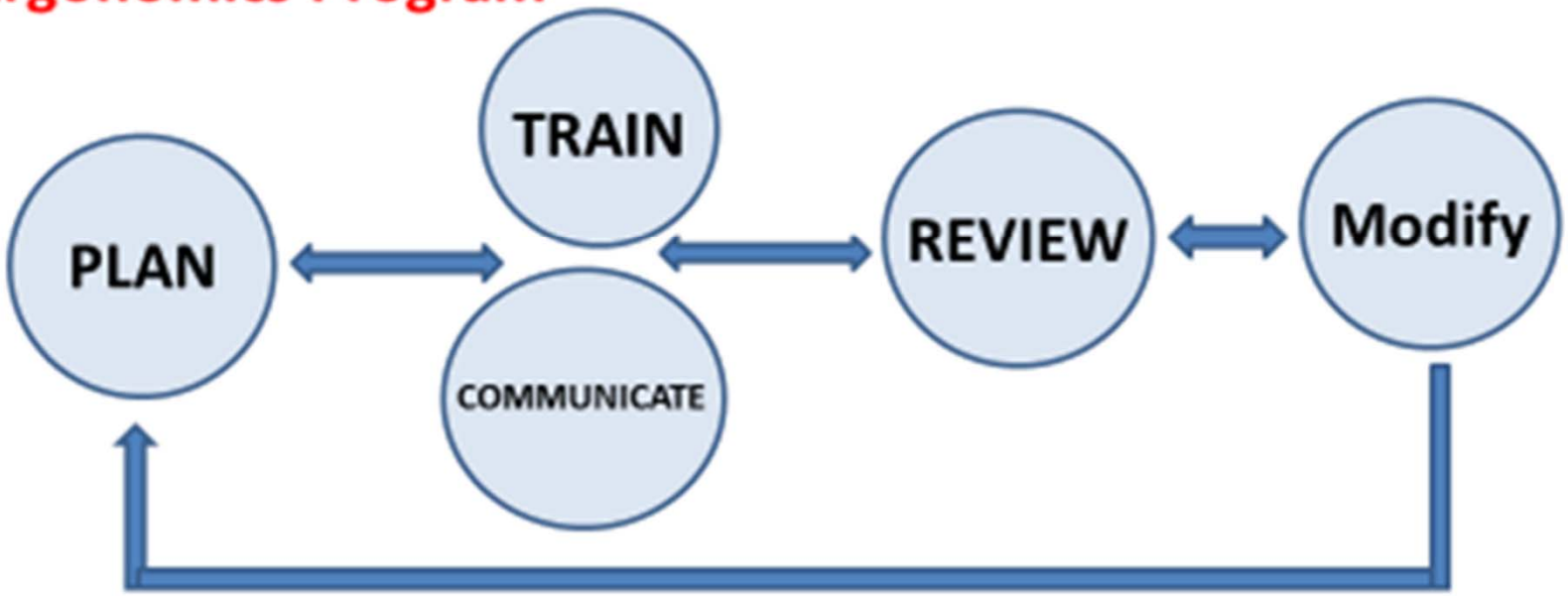
The program includes four main elements:

1) **PLAN:** Primary contractors and subcontractors work together to plan ergonomic controls
2) **TRAIN**: Educate all employees (recognize and control risks)
3) **COMMUNICATE**: Communicate plan to all workers during meetings and by signage
4) **REVIEW**: Process to monitor effectiveness of the plan

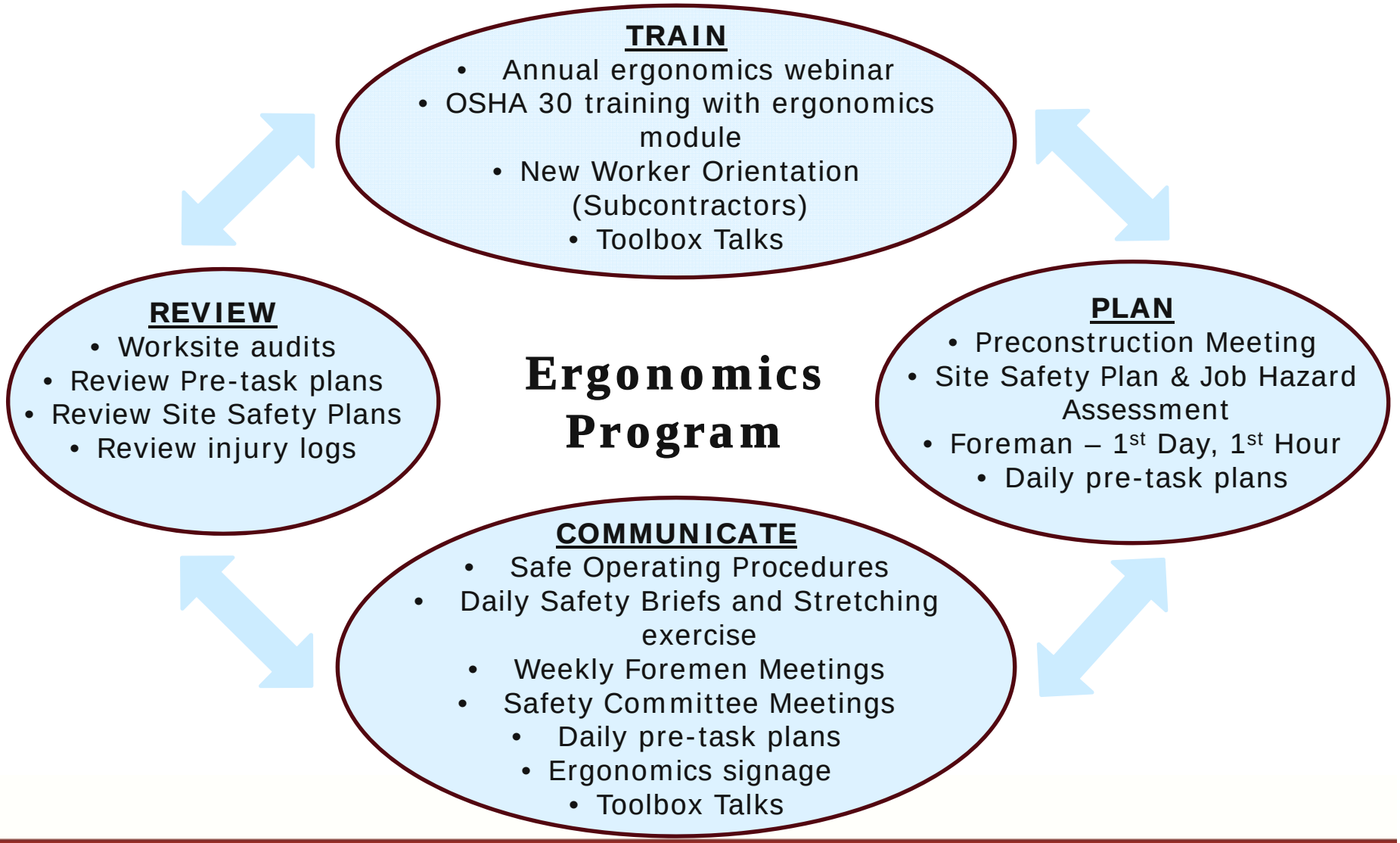
Safety Management System



Ergonomics Program



Program Activities & Documents: Related to Ergonomics



Ergonomics program

- Consider in all stages of construction
  - Before work onsite
    - Ergonomic needs in the bid
    - Subcontractors plan for ergonomics in site specific safety plan
    - Discuss ergonomics in preconstruction meeting
  - Start of work
    - Worker orientation- review ergonomic principles
    - Discuss expectations for ergonomics
  - During project
    - Review of daily PTSA
    - Discuss in weekly foreman meetings and daily interactions

Worker training

ERGONOMICS/SOFT TISSUE INJURY

- Caused by work tasks that are too much for the body, lead to sprains and strains
- Common problem tasks:
  - Manual material handling
  - Work above head
  - Work below knee
- Plan each task to use best practices
  - PTSA form
  - Team communication

Excessive force

Awkward Postures

Worker training

CONTROLS FOR SOFT TISSUE INJURY

Manual handling

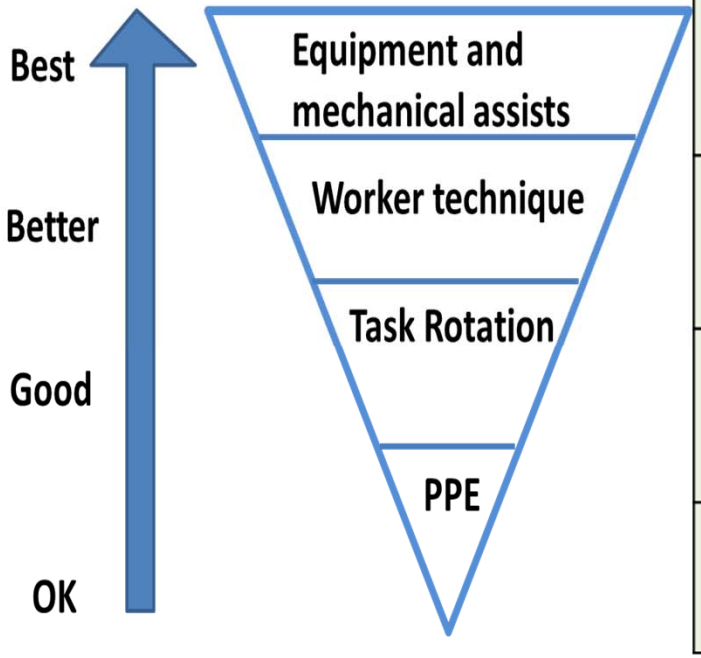
- Stage deliveries near installation
- Use mechanical means

Engineering control is preferred

- Co-worker team lift
- Lift assist tools
- Stretch and Flex (as often as needed)
- Proper lifting technique

- GOOD HOUSEKEEPING

Hierarchy of Controls for Ergonomic Hazards



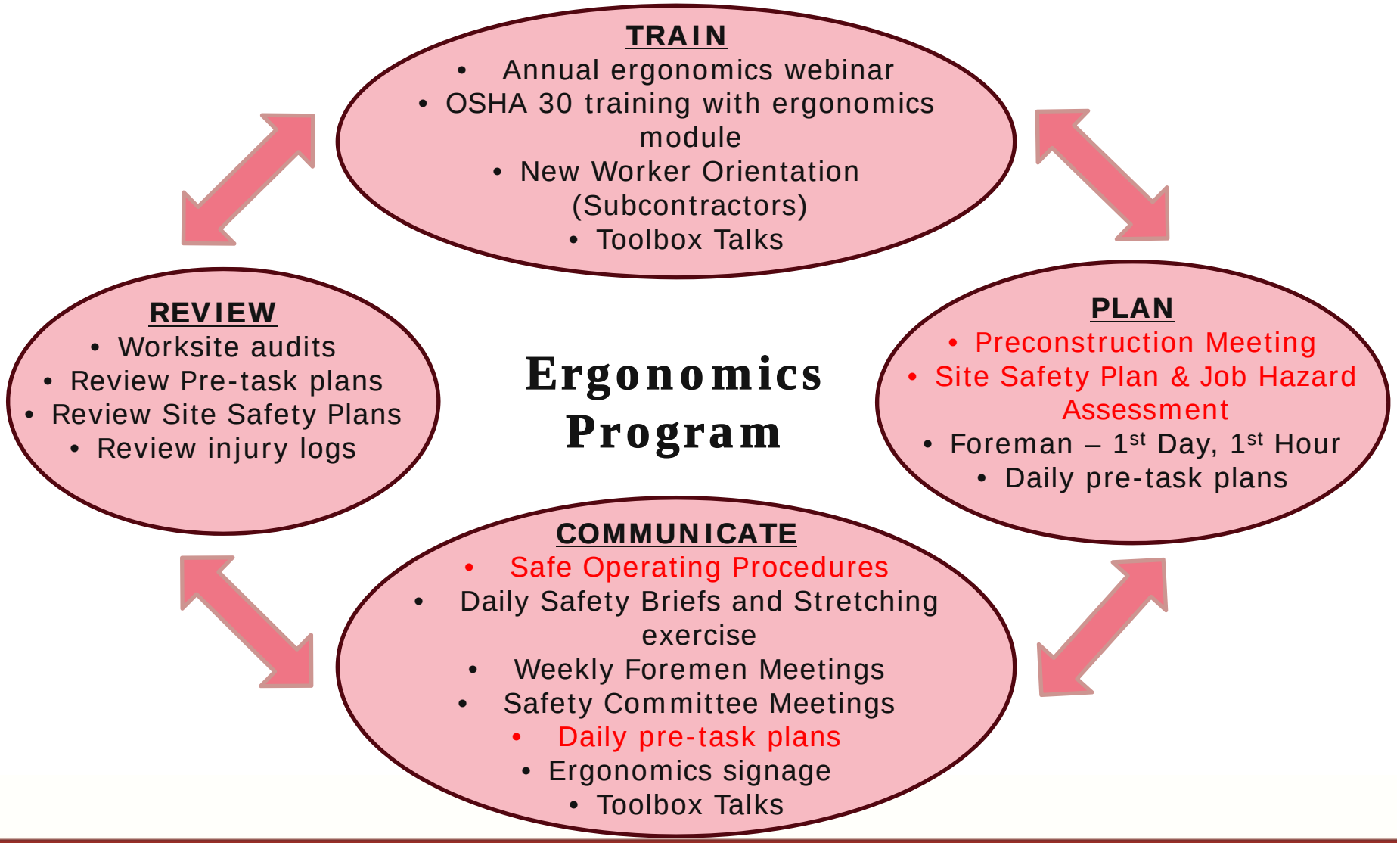
HOC level	Ergonomic Hazards		
	Manual material handling	Work below knee	Arms overhead
Engineering	Use mechanical assist	Preassemble at shop/in field	Mechanical assist: scissor lift, hoist
Work Practices	Position material close	Raise height of work	Assemble at ground level
Admini-strative	Assign more workers	Rotate workers	Rotate workers
PPE	Stretch after task	Knee pads, stretch after task	

Review- 1st

			Control	Intervention
Program	Elements	Data Source	(07/2015-04/2016)	(07/2017-01/2018)
Train	Annual training	% trained	0%	90%
	Toolbox talk topic	Ergo	4%	4%
		Falls	11%	13%
Plan	Preconstruction	Notes	12% (6/50)	0% (0/15)
Communicate	Subcontractor meetings	Worker Survey*	34%	53%
	Safety committee	Worker Survey*	64%	68%
Injury Review	Sprain/strain injuries	Company log	28	26

*research activities

Modify activities as needed



Review-2nd

			Control	Intervention	
Program	Elements	Data Source	(07/2015-04/2016)	(07/2017-01/2018)	(02/2018-07/2018)
Train	Annual training	% trained	0%	90%	n/a
	Toolbox talk topic	Ergo	4%	4%	8%
		Falls	11%	13%	19%
Plan	Preconstruction	Notes	12% (6/50)	0% (0/15)	50% (1/2)
Communicate	Subcontractor meetings	Survey	34%	53%	41%
	Safety committee	Survey	64%	68%	68%
Injury Review	Sprain/strain injuries	Company log	28	26	n/a

Many good practices observed… and shared with others

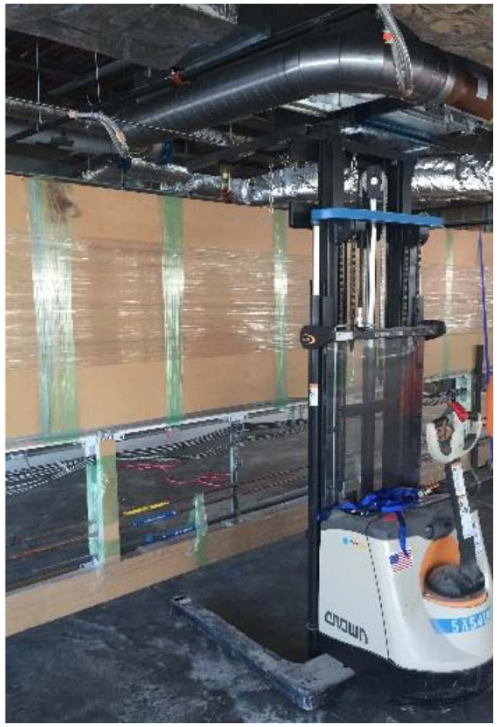
CARTS/WHEELS

Wheels and wheeled carts help to reduce stress on shoulders, backs, arms and legs.

GET CREATIVE

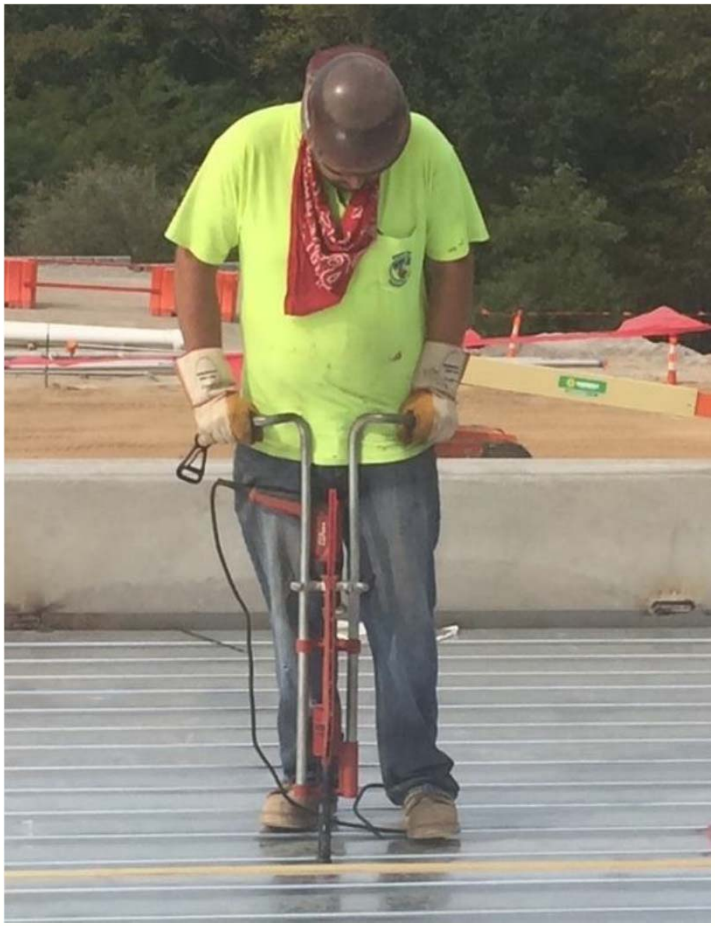
Lots of tools and equipment are available to help reduce stress

Shared information on carts, devices, and equipment for manual handling



Launched an ergonomic “Best Practice Recognition” challenge

"The recent focus on ergonomics has helped us bring **sprain/strain injury rates down by 23%** compared to this time last year."



Conclusions

- Ergonomics is rarely integrated into construction safety programs
- Development and integration of ergonomics into a safety program takes time. Change in injuries don't happen quickly.
- Must get management commitment
- Create a plan and commit it to paper.
- Start small with a few ergonomic activities and add more over time.
- Small contractors can create a simple but effective program.
- Worker involvement is critical to success.
- Build a culture around ergonomics and safety

Recommendations: build an ergonomics program

1. Review current safety program and indicators (leading and lagging) to select an ergonomic hazard to address.
   - Smaller companies may have no recordable injuries.
   - Evaluate ergonomic information in safety activities. Examine productivity or days absent as indicators.
   - Manual material handling is common in most trades so a good place to start.
2. Identify activities to change or add to address ergonomic hazards.
3. Define and monitor leading indicators.
   - Select a simple measure that can be easily counted (number trained, TBT)
   - Create a specific measure that will be routinely collected (ergonomic item on inspections)
4. Train and communicate ergonomic program to all management and workers.
   - Consider a campaign to launch, safety luncheon, other means to announcement
5. Modify program as needed.

Questions?

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