A User's Guide to Lean Safety

By SafeBuild Alliance

&

The SafeBuild Alliance Lean Safety Subcommittee

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Contents:

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Introduction:

In this user's guide we will be providing you with many tools to use on any construction project. The tools will be focused primarily on delivering concepts relative to enabling efficient practices with safety in mind.

This user's guide was developed by a collaboration with local general contractors, trade contractors, owners and members of SafeBuild Alliance.

The vision was from design to delivery, to create a partnered work environment that fosters collaboration, relationships and diverse ideas that provide the most efficient, effective and safest work environment for our people

The mission was to develop a continuous improvement movement leveraging SafeBuild Alliance and the lean construction community using a unified understanding, means and methods and best known construction practices to achieve our vision.

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The Lean Foundation on a Construction Project

LEAN has limitless applications on construction projects.

Continuous improvements to processes, decision making, requirements and procedures reduce wasted time and effort and allow project team members to be more productive.

Continuous improvements to the way the work is sequenced and schedule can save considerable time by empowering the workers who actually are responsible for the installation to be an integral part of the planning and delivery of the project.

Continuous improvements to building products, installation and delivery methods reduce jobsite labor and results in a more efficient and safe project.

For LEAN to be a foundation of the project, LEAN must be applied at all levels, from the top down. Without full buy-in from the project executive team, there is little flexibility allowed for project teams to look for ways to improve. The executive leadership team also play a critical support role to insure project teams have the necessary resources and latitude to "change" in order to seek out and affect the improvements.

Project Teams must understand it is their responsibility to embrace and affect change. And by change, we mean to continually improve. Without change, there can be no improvement.

WHY LEAN?

End product:

- Design and construction of a project is only the start of a project. If you look at the design / construction phase of a project, it is literally the tip of an ice-burg in the life of a project. Owners and operators will live with what is created for 30-50x the amount of time it takes to design and build.
- Decisions made during design significantly affect how the project is constructed. Decisions made during construction significantly affect how the project is delivered and operated.
- Having an integrated approach to the design and construction can offer a much improved delivery and end product.

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Process:

Applying LEAN to the process of a project can eliminate wasted time and effort. It should be no surprise that significant effort during design and construction is wasted, either duplicating tasks or "guessing" what is the right direction only to learn there was an more efficient means. The project team must look at ways to make the best decisions early. And this applies to both design and construction.

LEAN should apply to design to help reduce rework and provide clear direction at the earliest possible moment. By including the construction teams with the owner and design team up front, the design-estimate-value engineer-redraft cycle can be streamlined. In addition, construction teams can provide valuable constructability input during design to capture efficiencies for the trade contractors. The result is a less cost project that can be provided quicker and with less effort.

During the construction phase, LEAN can be applied to many areas to reduce waste and streamline the installation of the work. While LEAN is typically thought of as a production tool, other benefits include a cleaner, safer jobsite as well as increasing quality control.

WHAT IS LEAN?

Very simply put, LEAN seeks to eliminate waste through constant improvement. There has been much written on the "8-wastes" but here they are:

- Defects
- Overproduction
- Waiting
- Non Value Added Processing
- Transportation
- Inventory
- Motion
- Unused Employee Creativity

You are not going to eliminate these. The key is to pull together as a project team to constantly improve on these wastes. You may also be thinking that these primarily relate to manufacturing and delivery products being provided and installed on a project. But, these directly apply to the design and construction phase. For instance, overproduction could relate to the detailing provided by the design team that will then be re-done by sub trades as part of their shop-drawing process. Not to say some level of detail isn't required, you just want to produce the minimal amount.

Overproduction can also be seen as a construction issue. Who hasn't seen the pallet of embedded steel that got shipped to the job site prior to the first pour but

also contained enough embeds to do all 10 floors? The pallet then gets opened, picked over, spread out and then items are either lost or damaged and then you have to create more. This is also becomes wasted effort to continually relocate the pallet and the tripping hazard presented by the excess material being on site.

Each project team should be introduced to LEAN with some training and knowledge of what it is and what it means to the design and construction teams. Without some base knowledge and how it applies and can make each individual on the team better, LEAN becomes a useless buzzword that people get tired of hearing.

WHEN IS LEAN APPLICABLE?

It is never too early or late to apply LEAN. The earlier the better, however.

One thing to consider is that LEAN is a process, a journey. It is not a set of tasks that can be started or completed. That may be one of the hardest ideas to understand in the design and construction industry. We are governed by start dates, deadlines, milestones and activities. LEAN is an ongoing effort, to constantly improve the processes that affect the final product.

HOW DO YOU DO LEAN?

Well, there are some tools out there, some work better than others.

The first key to success is to get buy-in from the top. As noted earlier, if the top is not completely committed, the project teams have little opportunity for success.

Pull Scheduling:

Sometimes referred to as LAST PLANNER (a trademarked "system" developed by the LEAN CONSTRUCTION INSTITUTE), pull planning shifts the planning effort from the office to the trades. It utilizes key milestones as the guideline schedule but leaves the day to day and weekly schedule in the hands of the jobsite foreman or design leads (the "LAST PLANNERs"). The main goal of pull planning is to get to reliable commitments.

Kaizen:

Kaizen simply means "change for the better". Kaizen, as it is typically applied to design and construction, focuses heavily on repetitive tasks. Kaizen groups look at particular task or activity and work to simplify the steps, tools or movements necessary to produce a piece of work. These may be large or small changes. Design may use Kaizen for setting up file saving / sharing to reduce lost time looking or waiting for drawing updates. Construction may use Kaizen for streamlining the effort when new trade workers are brought onto the project (orientation) or how they

plan to pre-assemble parts to save time and waste. Kaizen could be applied to just about every aspect of everything design and construction does. Kaizen does take time and resources so choosing the right activities to design a Kaizen event around should be looked at closely. A good place to start are the really annoying things or the items showing the most obvious forms of the 8-wastes.

Value Stream Mapping:

Process mapping visually displays Value-Added and Non-Value Added steps using only a few clear symbols and lines. This will require a fairly deep dive into how the design and construction process will work. Each step can be mapped and all stakeholders given an opportunity to weigh in if there is value added or not.

Value Stream Mapping is used to illustrate the flow and relationship between work processes. A key component of VSM is differentiating value adding activities from non-value adding activities.

Reducing or eliminating non-value adding activities is critical and a principle goal of Lean Manufacturing. Upon examination of your processes through VSM, it soon becomes obvious where improvement opportunities lie.

GOALS OF LEAN

When project teams can be more efficient, the work they perform is at a higher level and with greater accuracy.

These efficiencies can be seen at the owner / design level as well as the trade contractor and trade worker level. The goal for implementing LEAN is to reduce waste and improve the delivery of the project. Of course improved delivery may mean different things to different entities or people involved in the project. The power of LEAN is amplified, however, when EVERYONE associated with the project is interested in the improved delivery at EVERY level.

Building a LEAN team is not easy. It is not conventional. There has to be an intrinsic desire to want to do things better. For example, the owner must desire to improve their trade partner's efficiencies. Trade partners must desire to produce a better and quicker project that improves the owner's pro-forma. This takes trust, mutual respect and mutual benefit.

What is Lean Safety?

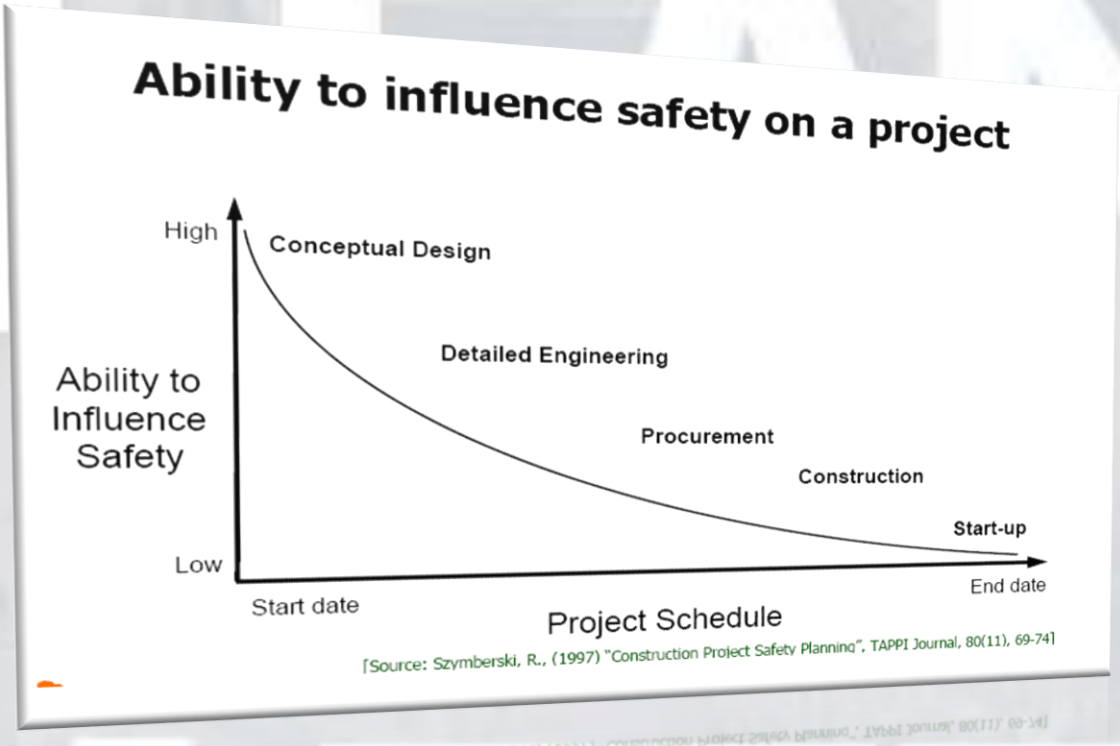
- Eliminating wasteful steps
    - Using an ergonomic evaluation to reduce movements and strain to the worker.
        - Motion – Overexertion, poor ergonomic design
    - Defects – Increased maintenance activities, hazardous material exposure, machine exposure
    - Overproduction – Overexertion, extra handling, unnecessary machine interaction
    - Waiting – Setups/Changeovers – hazardous energy exposure
    - Not Using Employee Ideas – The company misses out on potential safety improvements
    - Transportation – Extra handling, slip, trip and fall hazards, exposure to fork lift traffic
    - Inventory – Falling loads, traffic congestion, trip hazards, extra handling
    - Extra Processing – Unnecessary machine interaction

- Work Planning/Coordination
    - Focusing on the activities and how each trade fits in with each other – forward looking – this creates a safer environment for all
    - Better planning to avoid variance and change
    - Through worker involved planning, Using lean tools that promote a safer environment

- Creating a culture of all people involved to drive lean principles
    - Respecting the knowledge of everyone involved to achieve a common goal.
    - Empowering collaboration and creativity by listening to everyone
- Safety by Design
    - Develop a design that leads to improved construction efficiency and productivity while preserving workers' long-term mobility, and quality of life
    - Incorporate elements that lead to a safely sustainable factory
    - Look at the design through the eyes of the workers

- Eliminate "What were they thinking" statements and rework
- Evaluate the challenges each trade will be faced with during the construction of the design and the owner will be faced with during operation of the facility

The below Time/Safety influence curve indicates that that the ability to influence safety is highest during the design process



Lean Safety Metrics

We believe there are 3 main metrics to measure the effectiveness of Lean Safety. The 3 metrics are as follows:

- % of Project Tasks Reviewed
- Integration of Safety into the Lean Planning Process
- % Adherence to the Lean Safety User's Guide.

1. <u>% of Project Tasks Reviewed</u>

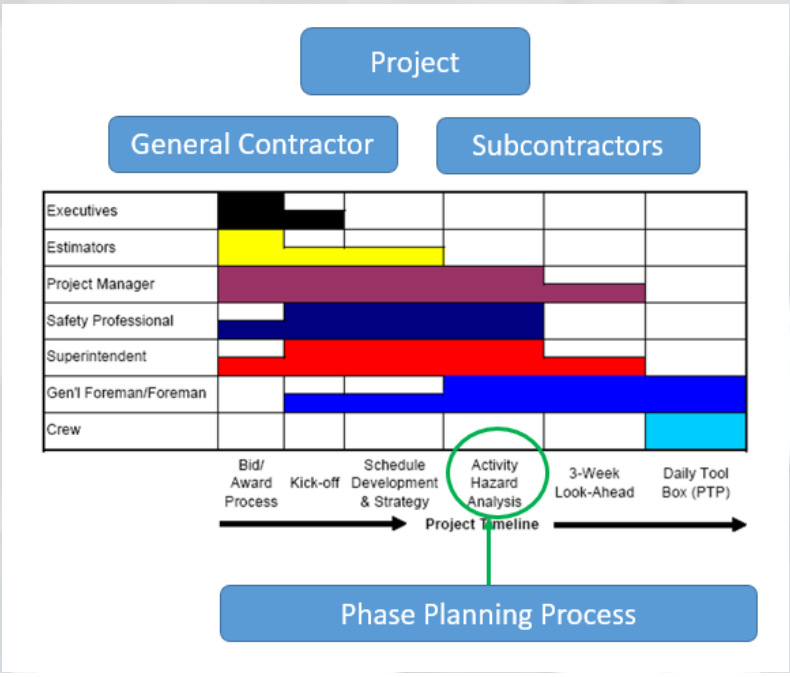
   We know that Lean Safety reduces risk to workers by reducing the frequency of exposure and even reducing the exposure itself. The only way to force this to happen is to have a process to ensure all tasks that are performed on a project have been looked and analyzed to see where these efficiency and risk reduction gains can be obtained. Thus, we believe we should have a metric that measures how many tasks are reviewed. If the goal is to review 100% of the tasks, the metric monitors performance to this goal. If only 50% of the tasks are reviewed, then there will be 50% of the tasks that potentially will not be "leaned out" from a safety perspective.

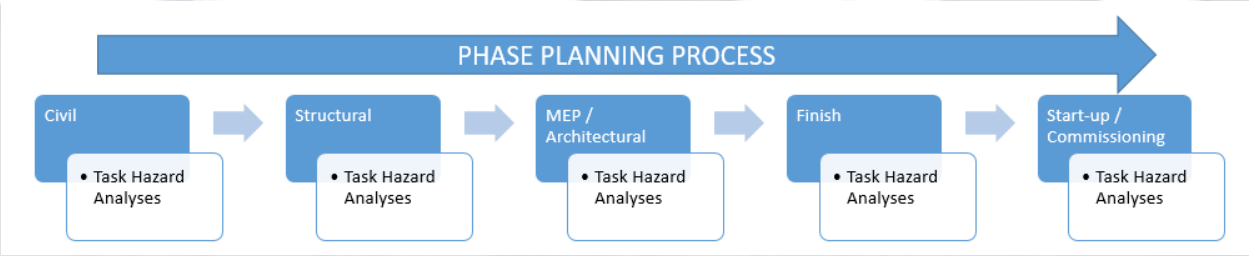
2. <u>Integration of Safety into the Lean Planning Process</u>

   To measure lean safety, we must integrate safety into a lean planning process using the following components:

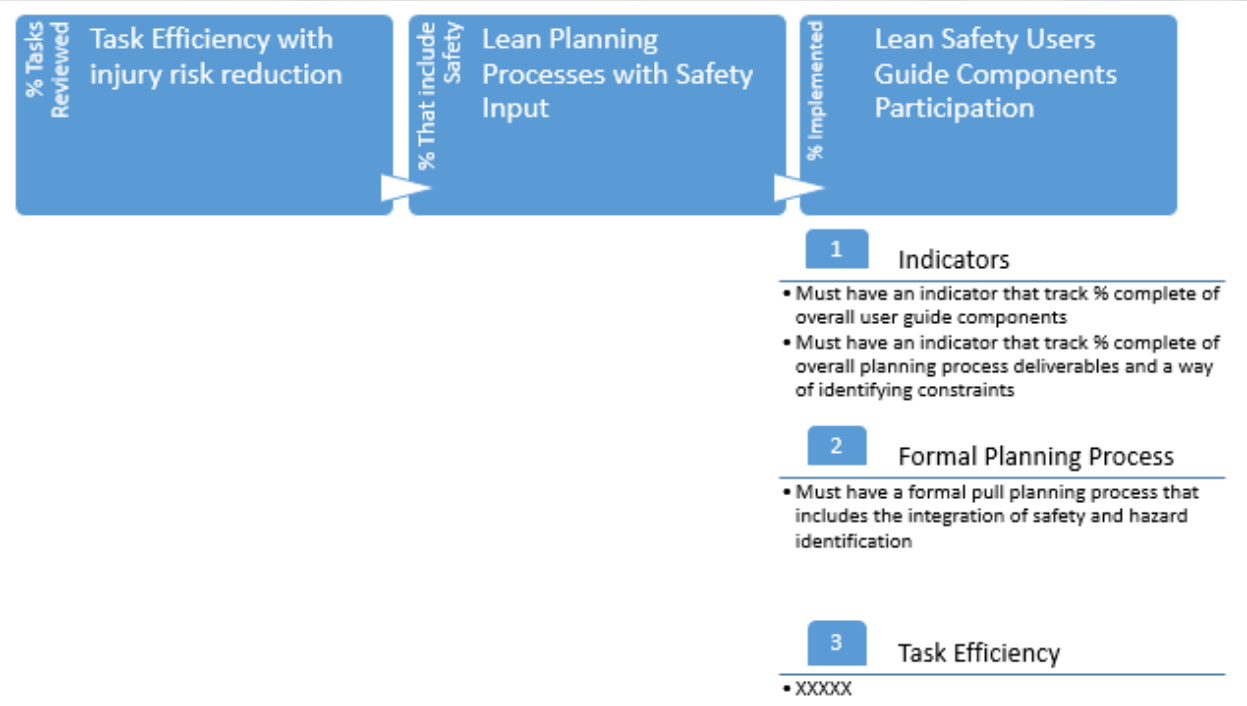
   - A pull planning process (ie. Last Planner)
   - Requirement from the General Contractor for Trade Contractors to perform task hazard analysis during each phase of the project (see figure on next page) as part of the lean planning process
   - Each task hazard analysis will be focused on lean and risk reduction
   - General Contractor to require all task hazard analysis' to be reviewed with all affected trade contractors in that phase of the project

   Measuring the above items will ensure they are being done – this is the basic principal for the metrics – what gets measured gets done.


Project
General Contractor
Subcontractors
Executives
Estimators
Project Manager
Safety Professional
Superintendent
Gen'l Foreman/Foreman
Crew
Bid/ Award Process
Kick-off
Schedule Development & Strategy
Activity Hazard Analysis
3-Week Look-Ahead
Daily Tool Box (PTP)
Project Timeline
Phase Planning Process


PHASE PLANNING PROCESS
Civil
• Task Hazard Analyses
Structural
• Task Hazard Analyses
MEP / Architectural
• Task Hazard Analyses
Finish
• Task Hazard Analyses
Start-up / Commissioning
• Task Hazard Analyses

3. % Adherence to the Lean Safety User's Guide



Lean Safety Training for Professional Contractors

A practical guide to working smarter, not harder, for professional construction workers.

April 2017

Why does this matter?

- Work-related injuries due to manual material handling (lifting, carrying, pushing, pulling) are *considerably higher* in the construction industry than most other occupations (i.e. strain injuries)
- A 2012 study found that *40% of construction workers* over age 50 had chronic back pain.
- Injuries due to overexerting the body required a median of **13 days** away from work
- Often, we can't physically "see" strain-type injuries, so many go unreported, and workers continue to work through the pain, causing the injury to become worse



What is in this for you?

By utilizing the tools presented in this course, you can:

- Improve the way that you feel physically and mentally at the end of a workday
- Make your work easier to do
- Help improve safety within our industry

Exercise

1-Share at your table an example of the last time you woke up and felt "sore" from something you did at home.

2- What contributed to this feeling?

3- What could you have done differently?

4- What obstacles were in place to prevent you from doing this differently?

Example:
1- I woke up feeling sore after I moved a piece of furniture this weekend
2-Lifting and carrying the piece of furniture
3-Gotten someone to help or planned how I was going to pick it up and the path I used to carry it- or used the dolly in my basement
4-I was in a hurry and thought by just picking it up I could get this done quicker than taking the time to plan

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What risk factors cause strain injuries?

- Overexerting yourself
- Awkward Posture
- Repetition
- Vibration

Your level of risk depends on the DURATION and the INTENSITY of the exposure

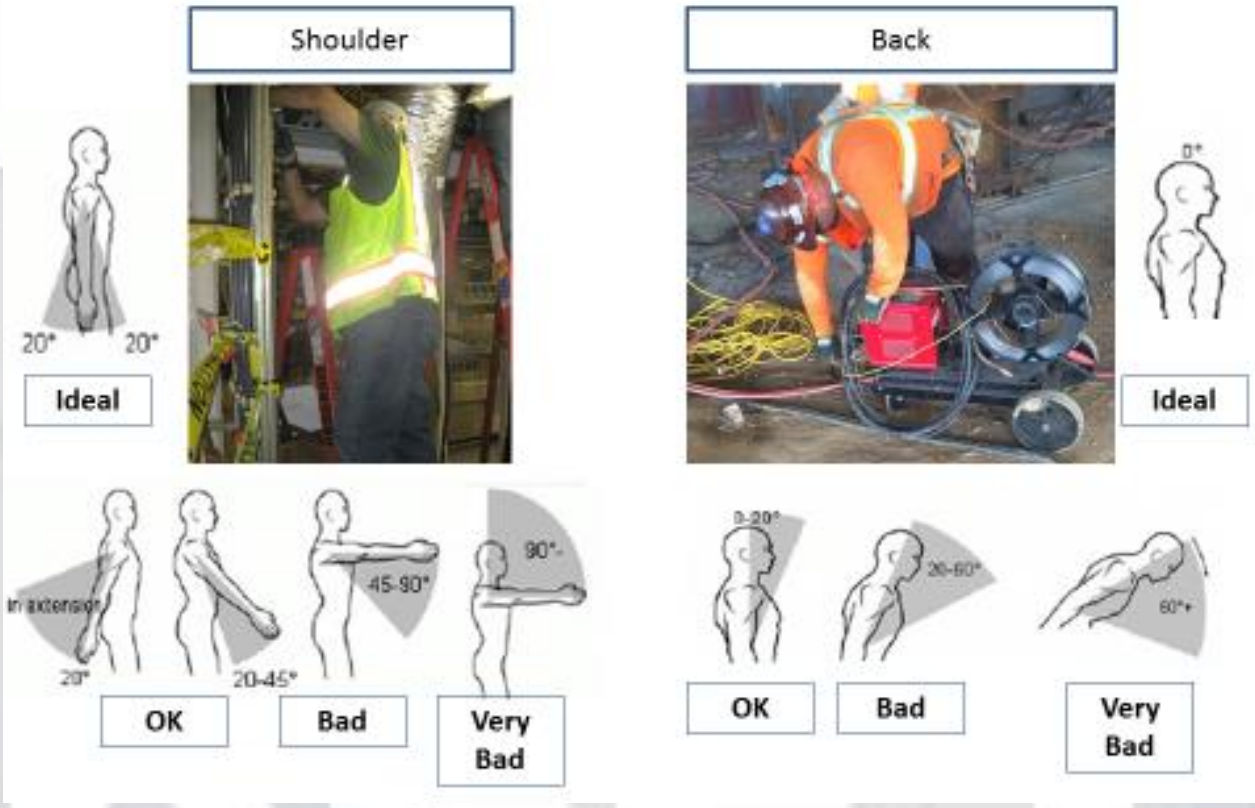
What do overexertion, repetition and vibration look like?

Pushing, pulling, lifting, prying material, swinging a tool, over-reaching

Performing the same movement repeatedly for a long duration of time

Using a tool which vibrates over a long duration of time

What are Awkward Postures?



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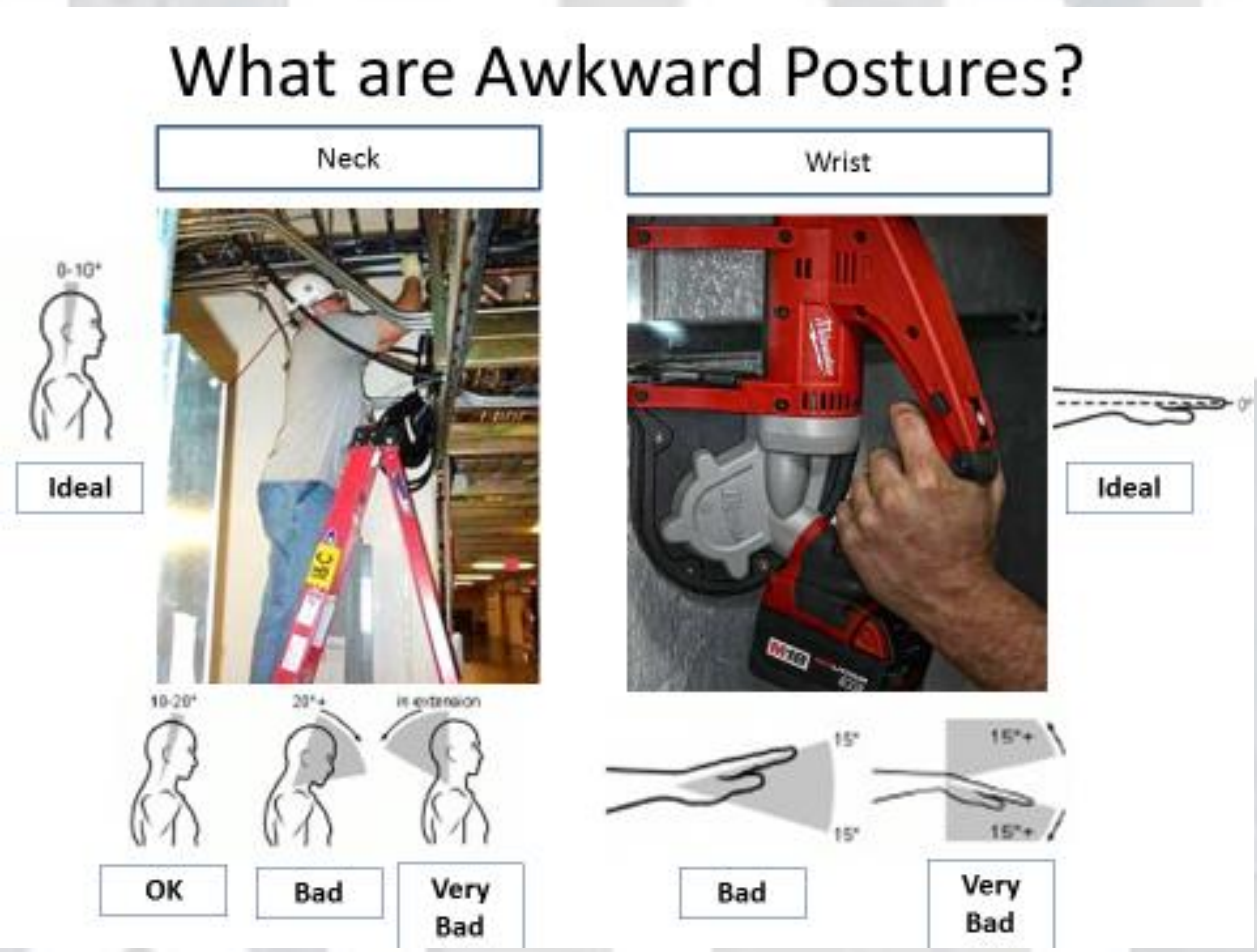
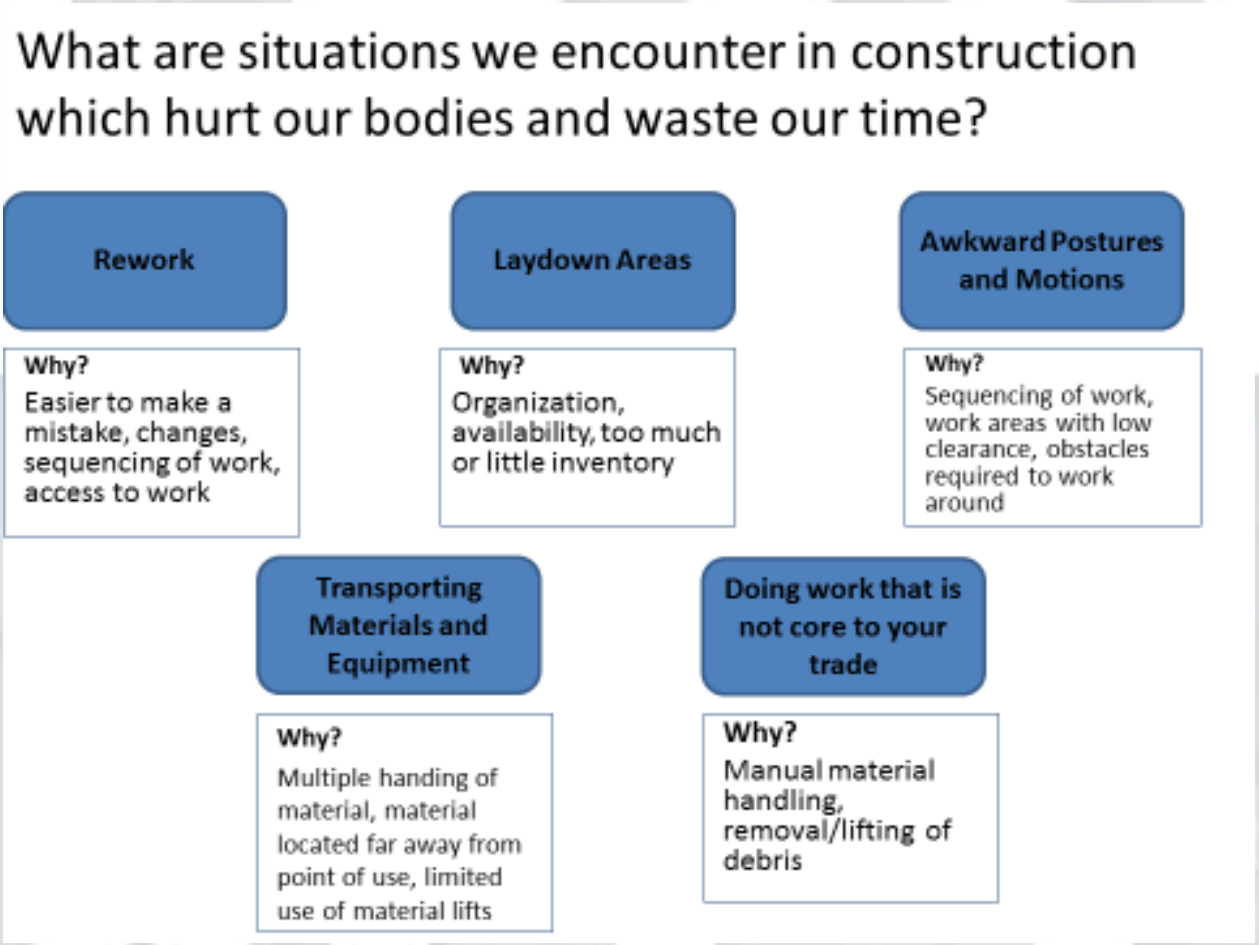
What are Awkward Postures?




What are situations we encounter in construction which hurt our bodies and waste our time?
Rework
Why?
Easier to make a mistake, changes, sequencing of work, access to work
Laydown Areas
Why?
Organization, availability, too much or little inventory
Awkward Postures and Motions
Why?
Sequencing of work, work areas with low clearance, obstacles required to work around
Transporting Materials and Equipment
Why?
Multiple handing of material, material located far away from point of use, limited use of material lifts
Doing work that is not core to your trade
Why?
Manual material handling, removal/lifting of debris

When we encounter these situations in our environment, what can we do about it?

- Plan the work to include minimizing the amount of time you spend working in an awkward posture (example: when doing rework)
- Plan the material handling to maximize the use of carts or attempt to have material delivered to point of use by fork truck (example: reduce manual handling/transportation from laydown)
- Plan material delivery and laydown to minimize travel
- Question if performing the work in a different sequence could make the job easier to do
- Plan the access path to your work area each day and discuss where carts will be located
- Plan housekeeping each day, based on your work activities (example: minimize activity not core to your trade)
- If it seems like it might be easy to make a mistake while doing your task, try to remove that likelihood during the work plan. If you cannot, implement what you can (example: wear hardhat task lights in dark areas)

Group Exercise




Your task is to weld angle braces to an existing overhead beam for seismic upgrade. The braces weigh 20 pounds each, are 4 feet long, and you are to install 20 to the beam. You are working inside of a large warehouse which is partially co-occupied with warehouse technicians.

Break up in crews of 3-4 and discuss the following:

- What steps would we take to perform this task, and what tools, material and equipment would we use?
- What might be difficult about this task, using our plan?
- What part of the task would wear you out at the end of the day, using our plan?
- Is this the only way to do this task? If not, how else could it be done to make it easier?
- What tools or equipment could make it easier?
- Did we improve the process through this discussion? If so, what did we improve?

Insert examples and photos of safety + ergonomics with Lean metrics

- Show before/after photos of operation
- Show efficiency gains- translate to $
- Show quality gains
- Show risk profile changes
- Show potential for injury rate reductions

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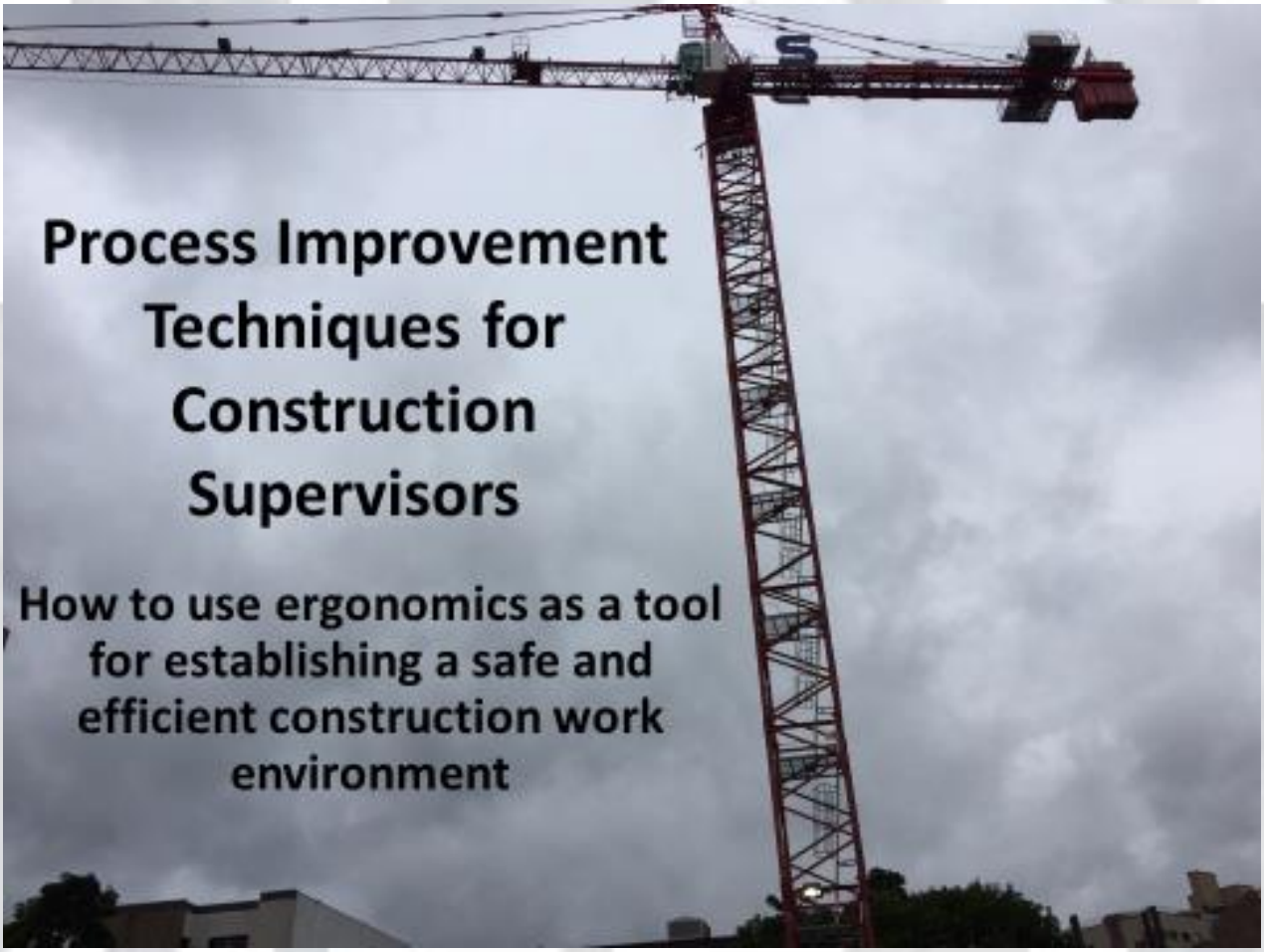
Lean Safety Training for Supervisors of Professional Contractors



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Intent of this course

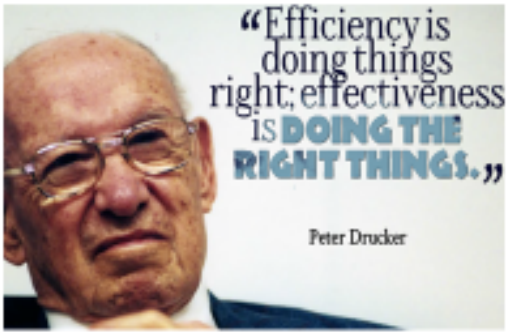
- To provide attendees with a working knowledge of process improvement techniques that will enable them to:
  - Maximize human performance on the job
  - Minimize physical exhaustion and fatigue
  - Work Safely
- To leave attendees with a developed awareness of:
  - The effects of motion and body mechanics on productivity
  - How to avoid wasted time and energy by implementing ergonomics improvements on the job
  - How to improve process efficiency using ergonomics methods
- To leave attendees with a working knowledge regarding how Lean, Ergonomics, and Safety are intertwined

What's in this for ME?

- Why continue to do things the hard way when there are easier and better ways?
- Why not make the job more comfortable so that we go home feeling less tired and exhausted?
- Why not learn new techniques to keep you and your crews safer on the job?
- Why not learn something new that you can apply to tasks at both work and at home?

Why is this topic important?

- A Lean work environment is an efficient, quality driven work environment, which requires innovation to thrive
- Safety indicators tend to correlate directly with efficiency, quality and profit indicators
- The science of Ergonomics makes the work easier to perform for the human, thus reducing
  - Chance of injury
  - Opportunity for mistake
  - Time required to execute work



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Part 1: Definitions and examples of Lean and Ergonomics concepts

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Definition of Lean

:a systematic method for the elimination of waste within a system.

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Lean: The Eight Wastes

• Defects	Make it right the 1st time
• Over Production	Covers other problems
• Processing	Unnecessary processing
• Transportation	Double handling
• Inventory	Covers other problems
• Motion	Work motion not moving
• Waiting	Delay time
• Underuse of People	

Breakdown of typical employee work time

Waste	40%	Waiting, double handling
Non-Value Added Work	50%	Loading/Unloading parts, rework
Value-Added Work	10%	Welding, forming, assembly

Examples of Waste in Construction Operations

- Travel distance (time) to retrieve material
- Multiple handling of parts/material
- Unorganized laydown areas
- Working in awkward postures for long periods of time
- Inadequate tools in the gang box
- Poor lighting
- Inefficient trash removal systems
- Poor material fit-up (leads to increase in in-field cuts)
- Poor sequencing of the work activity (trade stacking, clearance issues)
- Others?

Definition of Ergonomics?

It is not a product

Definition of Ergonomics?

It is not an injury

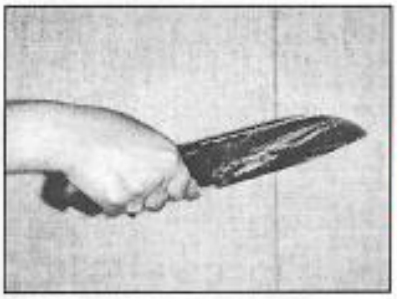
Definition of Ergonomics

ERG	A Unit of Work
NOMOS	The Law or Study of

:an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely

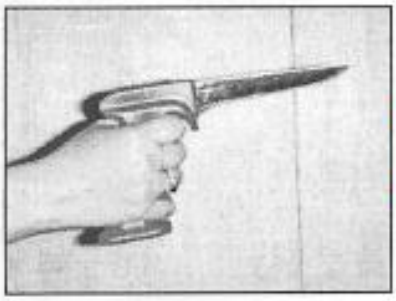
(Merriam-Webster)

Example of Ergonomics in Manufacturing Industry



De-boning knife, before.

Before: High incident of carpal tunnel syndrome and tendonitis in poultry plant



De-boning knife, after.

After: New ergonomic design eliminated employee pain and discomfort

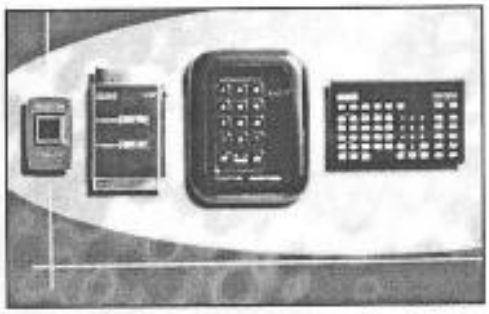
Adapted from Hal Hendrick at 1996 Proceedings of the Human Factors and Ergonomics Society 40th Annual Meeting. Copyright 1996, HFES.

Example of Ergonomics in Construction Industry

SkyTray for tool storage on scissor lifts.

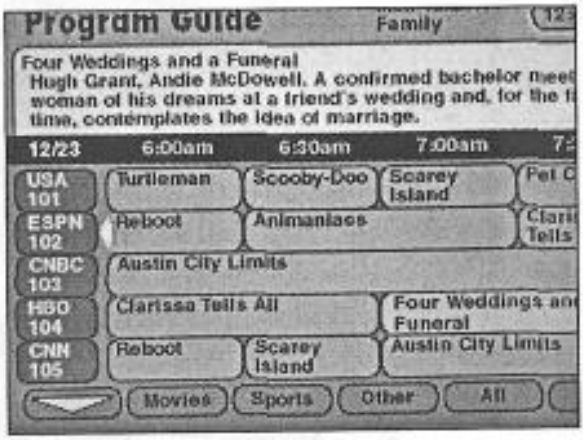
- **Eliminates searching/reaching for tools**
- **Minimizes risk of tools being displaced from lift**
- **Eliminates workers tripping on tools/materials in lift**
- **Provides easy access for removal of trash in lift (trip hazards), access to work plans, and forces planning which tools to use prior to entering lift**

And at Home....



TV and VCR remote controls, before.

Left: Redesigned System Link remote control; right: DSS system remote control.



DSS system, on-screen display.

In our Cars...

How do you turn the wipers off ?

Adopted from www.baddesigns.com

Which button?

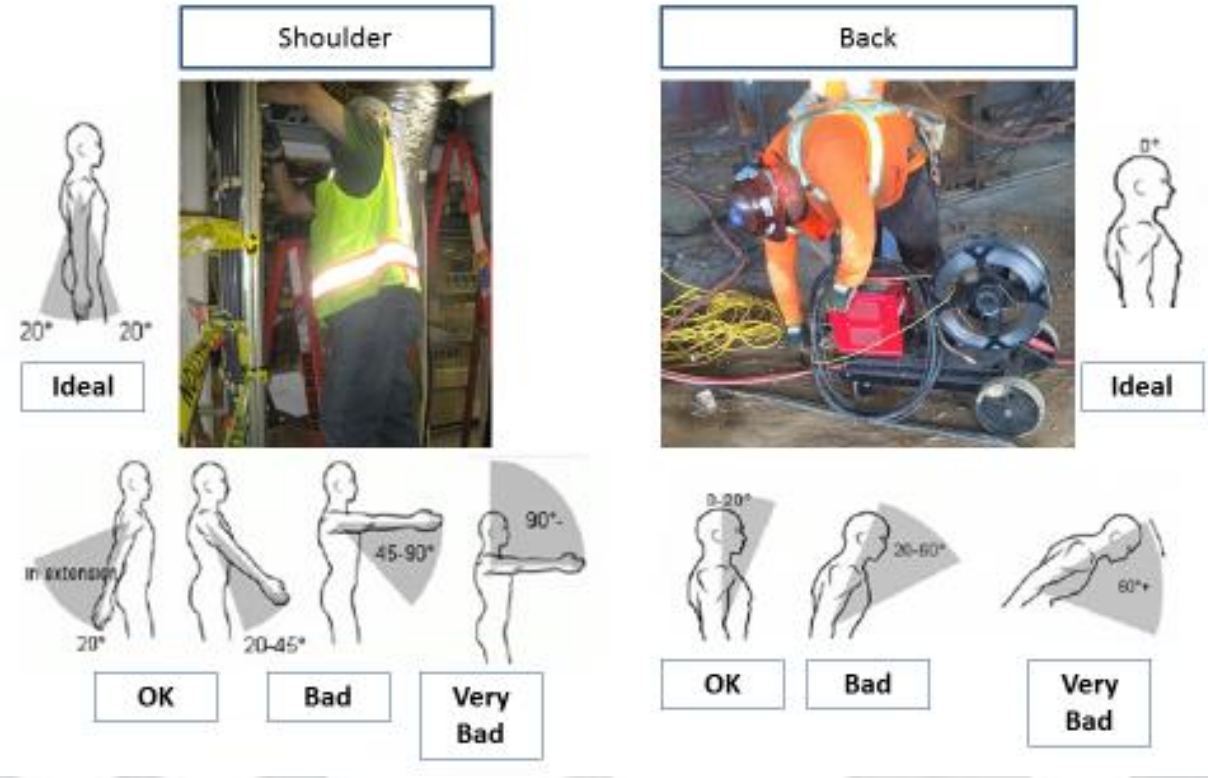
Chernobyl : Human error due to inadvertent operation of controls was a major factor

Does these appear to be "natural" body positions?

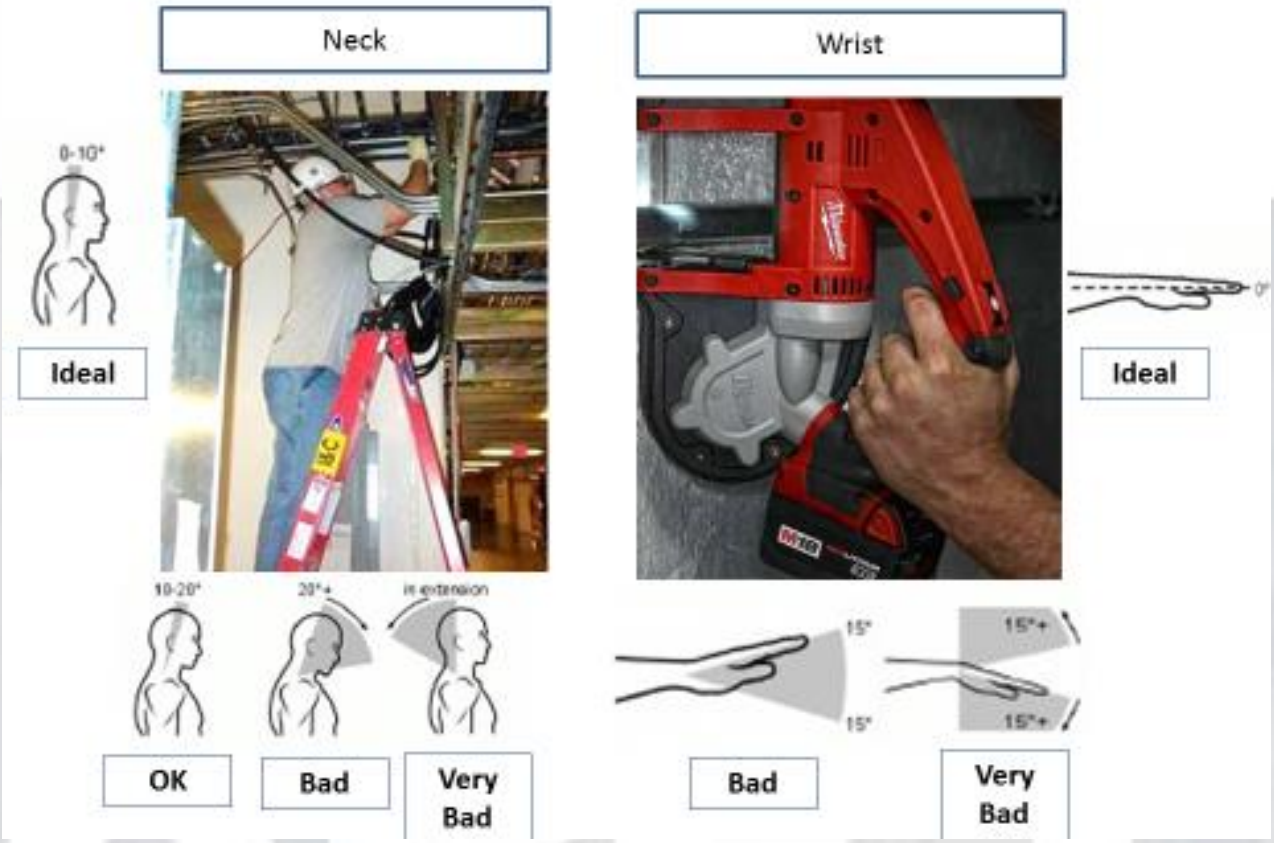
Assembly of instrument panel inside operator cab

Placing locator into chassis welding fixture

What are “Awkward” Postures?



What are Awkward Postures?



Grip Comparisons

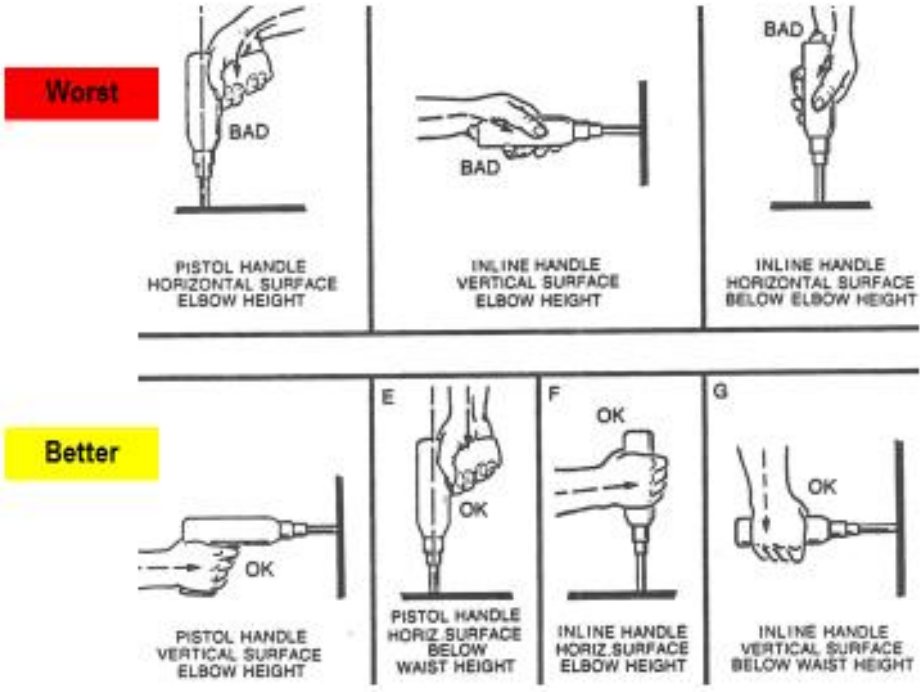
Pencil Proof:
Awkward posture effects grip strength

*Try gripping your pencil with a power grip, and then gripping your pencil with a flexed and extended (bent) wrist using the same power grip.



*Next, try gripping the pencil with your hand pronated(palm down) and then supinated (palm up)


Wrist Posture Examples- Tool Use



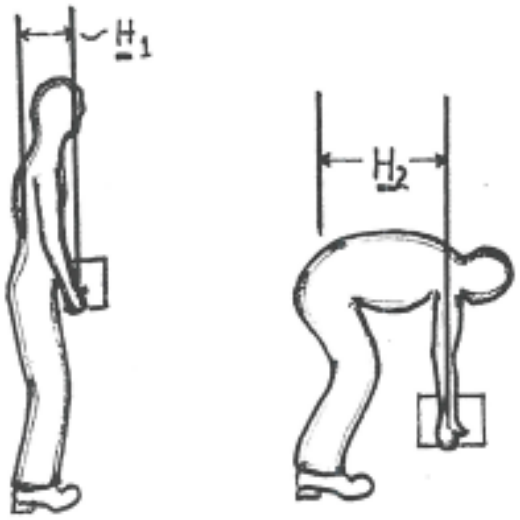
Standing Lift vs Stoop Lift

- 2/3rds average person's weight is in upper body !
- The more the upper body is bent, the more the influence of the upper body weight

Example: 25 Lb Load Lifted

150 Lb Employee

25 Lb + 100 Lb =125 Lb Lift



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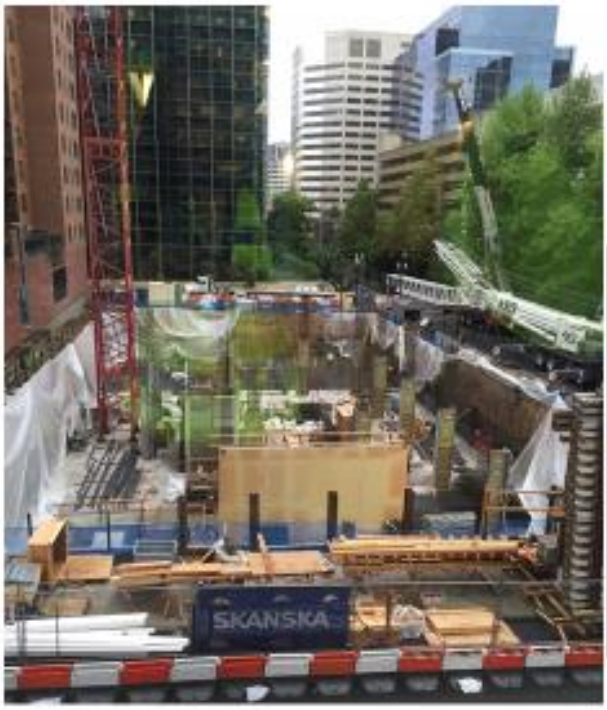

Part 2:
Ergonomics and Lean: Where do they intersect?

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What are examples of frustrating situations which we encounter in construction? How can these be improved through ergonomics?

Rework

Why does this occur?
It's easier to make a mistake if the job is difficult to perform, changes to design, sequencing of work, access to work

Laydown Areas

Why?
Disorganized, availability of space, too much or little inventory

Awkward Postures and Motions

Why?
Sequencing of work, work areas with low clearance, obstacles required to work around

Transporting Materials and Equipment

Why?
Multiple handling of material, material located far away from point of use, limited use of material lifts

Doing work that is not core to your trade

Why?
Manual material handling, removal of garbage

Where do Lean and Ergonomics intersect?

• **Defects**	Make it right the 1st time
• Over Production	Covers other problems
• Processing	Unnecessary processing
• **Transportation**	Double handling
• Inventory	Covers other problems
• **Motion**	Non-productive motion
• **Waiting**	Delay time
• **Underuse of People**	Unbalanced work load

Can be affected using ergonomics

Key Performance Indicators (KPIs)

Ergo Metrics

- Reduction of process bottlenecks (Waiting)
- Reduction of overtime
- Reduction of manpower
- Reduced travel
- Less rework and scrap
- Faster machine set-ups
- Machine maintenance improvements

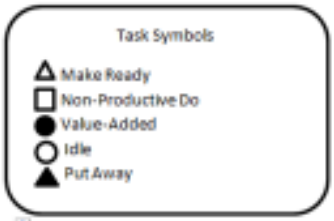
Lean Metrics

- Lead time reduction
- Productivity increase
- Work in process reduction
- Floor space reduction
- Quality improvements
- Customer satisfaction improvement

Part 3: Task Analysis and Planning Tools

April 2017

Step 1:
Process Analysis Worksheet



Job Evaluated:

Task Analyzer/Date:

Comments:

Description of task element	Task Symbol	Distance (ft)	Time (mins)	Why?

- Used to breakdown a job into pieces (elements) to analyze areas of improvement
- Jobs should be broken down as detailed as possible
- Can follow either a person or material
- Each task element should be described in 5 words or less (Verb/Noun)

Challenge Every Element of the task!

- What is the purpose, Why??
- Where should this be done, Why??
- When should this be done, Why??
- Who should do this, Why??
- How should this be done, Why??

Eliminate

Combine Location

Combine Processes

Combine Persons

Simplify Operation

Explanation of Symbols

- **Productive-Do:** Work that **adds value. Work which involves actual processing of a finished component or system.** Examples: welding, inserting duct, connecting wires in a panel, coring concrete, hammering a stake/nail, drilling into a J-box

  Questions to consider:

  - **Combine**, can we combine with another operation
  - **Simplify**, could the element be eliminated or combined with other elements?
  - **Multiples**, can we handle the parts or tasks elements in multiples?
  - **Whom**, could this element be done more effectively by someone else?
  - **Methods or procedures**, could they be changed effectively?
  - **Equipment**, does the operation justify better equipment?

Explanation of Symbols (cont'd)

- **Non-Productive Do:** Actual work performed but **adds no value.** Examples: Loading parts into fixture/assemblies, retrieving materials

Questions to consider to remove the waste:

- **Eliminate**, is this necessary?
- **Combine**, can we combine with another operation
- **Simplify**, could the element be eliminated or combined with other elements?
- **Whom**, could this element be done more effectively by someone else?
- **Methods or procedures**, could they be changed to be more effective?
- **Equipment**, does the operation justify better equipment?

Explanation of Symbols (cont'd)

Δ **Make Ready:** Setting up machine, preparing work area, filling out paperwork

These elements should be studied very closely as they often consume large amounts of time and energy

- Questions to consider to remove this waste:
  - **Eliminate**, is this necessary?
  - **Combine**, can we share work area with another operation?
  - **Distance**, can we shorten the travel distances?
  - **Reach**, can we minimize the reach required for frequently used materials?

Explanation of Symbols (cont'd)

- **Idle:** Operator or machine is inactive. Examples: waiting on another operation to complete in order to perform the task, waiting on materials to be delivered, waiting on the machine to complete a cycle

Explanation of Symbols (cont'd)

Put Away: Clean up workstation or put away material, remove waste to dumpster

Questions to consider to remove this waste:

- **Eliminate**, is this necessary?
- **Combine**, can we combine with another operation
- **Distance**, can we shorten the travel distances?
- **Reach**, can we shorten the reach for tools and parts?
- **Multiples**, can we handle the parts or tasks elements in multiples?
- **Timing**, could this be done while the machine is doing work?

Pencil Sharpening Exercise

- The task is to sharpen 5 pencils

- Work Instructions:
  - Set up pencil sharpener on hard surface 15-20 ft from operator
  - Picking up one at a time from the container,
    - Walk to pencil sharpener
    - Sharpen pencil
    - Walk back to container
    - Put pencil in container
    - Pick up second pencil and repeat this process for all 5 pencils

- Need one volunteer to run through exercise 3 separate times
- Everyone will observe the activity and fill out the worksheet
- We will discuss findings afterwards and share ideas for improvement

PROCESS ANALYSIS CHART

Task Symbols

- △ Make Ready
- □ Non-Value Added
- ● Value Added
- ○ Idle
- ▽ Put Away

Product/Task/Job Evaluated: Pencil Sharpening Exercise
Analysis by & Date: David Looper
Comments: TRAINING MASTER

Sequence #	Task Elements	Task Symbol	Distance (Ft)	Time (Sec)	Why?	Action Taken
1	Setup pencil sharpener on table top	△			Place on desk 10 to 15 ft away	
2	Pick up single pencil from container	□			Mix previous sharpened & unsharpened	
3	Walk to pencil sharpener	□				
4	Insert pencil in pencil sharpener	□				
5	Sharpen pencil	●			How many revolutions for each pencil?	
6	Remove pencil from sharpener	□				
7	Clean pencil ???	□			Do they blow on it?	
8	Inspect pencil ???	□			Do they hold the pencil close to eyes?	
9	Walk back to container	□				
10	Insert sharpened pencil into container	□				
11	Pick up single pencil from container	□				
12	Repeat process 4 more times				Does the vacuum break on sharpener?	
13	Remove pencil sharpener & put in storage	▽				

How to compute Return on Investment (ROI)

Old Method

Time to sharpen 5 pencils = _____min x 2 sharpens/day = _____ min

x 252 workdays/year =____min or ____hours/year x $10.00/hour labor = $_____/year

New Method

Time to sharpen 5 pencils = _____min x 2 sharpens/day = _____ min

x 252 workdays/year =____min or ____hours/year x $10.00/hour labor = $_____/year

ROI

Annual cost savings/avoidance (total): $Old Method - $New Method

Cost of equipment or resources:$10.00

ROI (1-Year) = ACS- 10

10

ROI = ___ or ____% return on investment in 1 year

Step 2: Plan the Work to Improve Ergonomics and Minimize Waste

Construction
Work Plan Tool

Use what we have learned in our task analysis to adequately plan the work in a manner which minimizes waste and improves ergonomics for the crew.

April 2017

Intent- Revisited

- To provide attendees with a working knowledge of process improvement techniques that will enable them to:
  - Maximize human performance on the job
  - Minimize physical exhaustion and fatigue
  - Work Safely
- To leave attendees with a developed awareness of:
  - The effects of motion and body mechanics on productivity
  - How to avoid wasted time and energy by implementing ergonomics improvements on the job
  - How to improve process efficiency using ergonomics methods
- To leave attendees with a working knowledge regarding how Lean, Ergonomics, and Safety are intertwined

Lean Safety BKMs

The SafeBuild Alliance Lean Safety Subcommittee has a vision to create a partnered work environment that fosters collaboration, relationships and diverse ideas that provide the most efficient, effective and safest work environment for our people...

The committee has been working to develop a continuous improvement movement leveraging SafeBuild Alliance and the lean construction community using a unified understanding, means and methods and best known construction practices to achieve our vision.

One of the committee objectives is to create "A User's Guide to a Lean Safety Culture" to help contractors implement key lean safety items that will ultimately lead their projects to be safer and more efficient. A component of the user guides includes Best Known Methods (BKMs) for tasks that we believe will help projects achieve this level of safety and efficiency.

SafeBuild Alliance was awarded an OSHA grant in December of 2016 that will help us to seek out and document these BKMs. These BKM's will be posted on our website to share with the construction community. One BKM will be posted each month starting February 2017.

We will continue publishing and communicating to you our BKM efforts monthly. Please let us know if you have any questions, or if you know of BKMs today that we can share.

BKMs can be found at this URL.

http://SafeBuildalliance.com/interact/lean-safety

Resources:

Web Article: How Will Combining Safety and Lean in Process Improvement Efforts Save Money? *By Tom Sammon, Project Manager, Georgia Manufacturing Extension Partnership (GaMEP) at Georgia Tech*

April 2017

SAFEBUILD ALLIANCE

LEAN + SAFETY

April 2017