

80/20® Inc.

The Industrial Erector Set®

INCREASING EFFICIENCY AND SAVING COSTS



HOW TO DESIGN LEAN
WORKSTATIONS

Introduction

This white paper explains the benefits of a properly planned workstation and outlines how one that is designed to be safe and eliminate waste supports lean initiatives. Learn how to decrease injuries, increase productivity, and reduce costs by creating a customized workstation that conforms to people and processes.

Workstations can either add to or inhibit a lean manufacturing strategy. If a workstation is built without analysis or preplanning, it risks the probability of unnecessary motion, excessive reaches, uncomfortable configurations for users, and can even become a safety hazard. Preplanning or making small changes within processes can lead to increased efficiencies and cost savings. Research has found up to a 76% improvement in productivity¹ after analysis and redesign of workstations and layouts.

Furthermore, Boyoun and Rui point out in “Environmental Disorder Leads to Self-Regulatory Failure” that “tidiness enhances many other aspects of normal work such as quality, performance, teamwork and absenteeism.”² In essence, an organized, properly designed workstation utilizes lean principles to increase safety and productivity while decreasing waste.



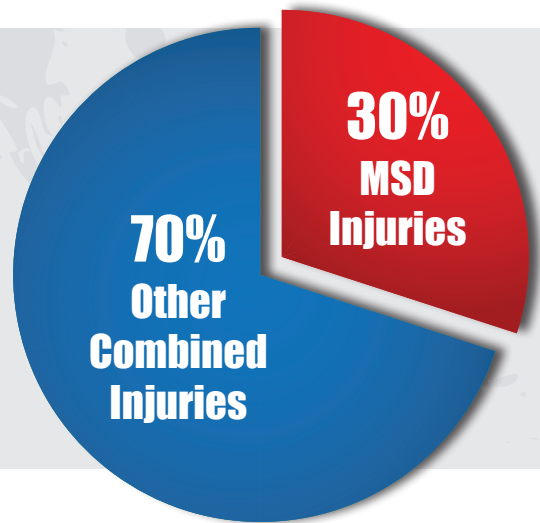
**Don't Become
A Safety Hazard**



¹Yerian, L. M., Seestadt, J. A., Gomez, E. R., & Marchant, K. K. (2012). A collaborative approach to lean laboratory workstation design reduces wasted technologist travel. *American Journal of Clinical Pathology*, 138(2), 273-280. doi:10.1309/AJCPE0PI2ENWYWMU

²Boyoun, C., & Rui, Z. (2014). Environmental Disorder Leads to Self-Regulatory Failure. *Journal of Consumer Research*, 40(6), 1203-1218. doi:10.1086/674547

**Promote a safe and healthy workplace
by implementing better workstations
with an ergonomic design**



Safety Considerations

A top priority for any workstation should focus on an ergonomic design. The station needs to conform to the natural reach and body posture of the operator. Studies from the Bureau of Labor Statistics (BLS) and the Occupational Safety & Health Administration (OSHA) report that musculoskeletal disorders (MSDs) are the largest category of workplace injuries, comprising about 30% of all costs.³

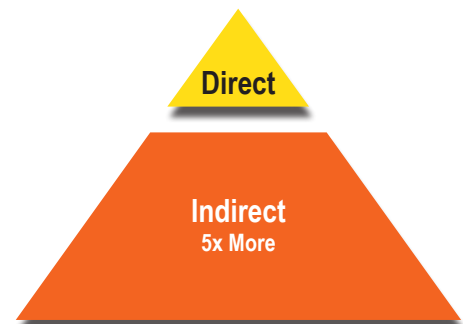
Workplace injuries equate to 50 billion dollars in direct costs to companies while indirect costs can skyrocket. Indirect costs include factors such as increased workers' compensation premiums, a negative public relations image, wages paid to injured workers for absences not covered by workers' compensation, overtime costs paid to other employees to cover the injured worker's responsibilities, administrative time spent on processing the injury, training costs for a replacement worker, and lost productivity. These costs can be up to five times the direct costs of musculoskeletal disorders.

Direct Costs of MSDs

Each  = \$5,000,000,000



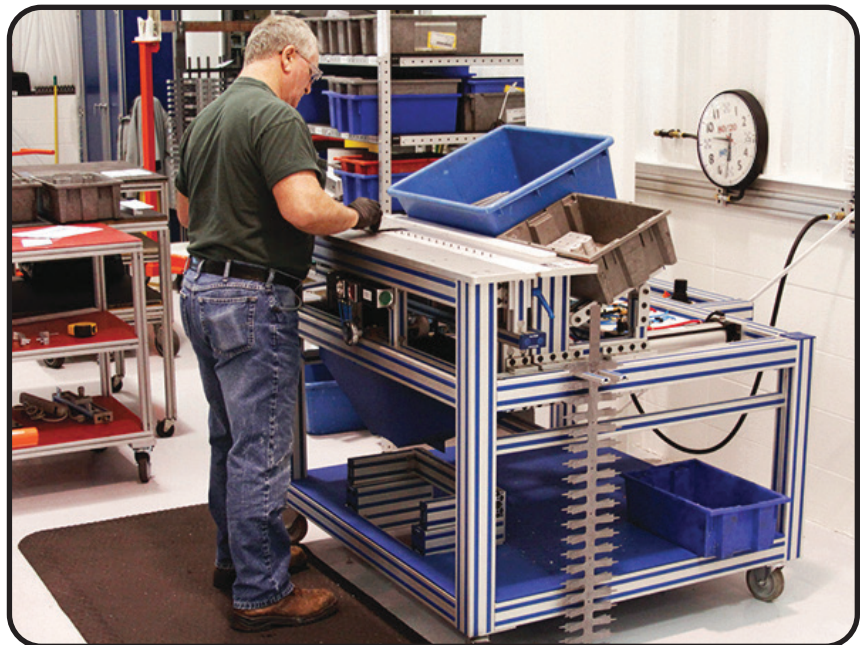
Indirect Costs of MSDs Compared to Direct Costs



³Bureau of Labor Statistics. (2015). "Nonfatal Occupational Injuries and Illnesses Requiring Days Away From Work, 2014 [News Release]. Retrieved from <http://www.bls.gov/bls/newsrels.htm>

A well-designed workstation can decrease the occurrence of musculoskeletal disorders and lead to greater productivity. A workstation that protects against MSD disorders should be “easily tailored to the physical attributes and work habits of those using them.”⁴ This means it needs to conform to the natural movements, reach, and body posture of the operator. Understanding personnel as well as the nature of the task, such as the size and shapes of the required equipment, material and tools, can help reduce or eliminate safety hazards. 80/20 T-slot aluminum profiles and products provide a custom solution that allow you to do just that. Some pointers to consider when designing an ergonomic workstation:

- ◆ Keep reach distances for tools within 2 feet of the operator
- ◆ If there are multiple operators try to use height-adjustable work areas
- ◆ Ensure workers can perform tasks with arms and elbows close to the body and wrists in a neutral position
- ◆ Ensure adequate lighting
- ◆ Minimize obstructions that increase reaching
- ◆ Use gravity to your advantage – consider using rollers
- ◆ Minimize the distance between parts, fixtures, and disposal points
- ◆ Eliminate sharp edges on work surfaces
- ◆ Minimize vibration levels
- ◆ Provide good visual access



Studies show that a decluttered environment is associated with better health, self-regulation, and improved quality of life. Essentially, neatness and organization improve work performance. A safe workstation also needs to be free from other dangers to people and property. Tools need to be secured while not in use and should not interfere with the user’s tasks. Sharp edges need to be protected. For workstations on wheels, optimally that they have the ability to be easily immobilized, for instance with wheel brakes. Shoddy or poorly constructed workstations can become a risk if not properly planned.

Keep in mind that inferior products increase hazards to people and property. Lower quality resources used in flimsier workstations are more prone to structural issues as well as injuries if the material breaks down or collapses. 80/20 T-slot aluminum profiles are strong and durable while also being readily adjustable to conform to changing personnel and processes.

⁴Weber, A. (2005, February). Lean Workstations: Organized for Productivity. Assembly. Retrieved from www.assemblymag.com/articles/84001-lean-workstations-organized-for-productivity

Eliminate Waste

The core principle in lean manufacturing is that wasted motion does not add value to the end customer. This simple concept is frequently overlooked when evaluating the entire cycle of a workstation. An effective workstation that eliminates wasted motion should be flexible, designed to optimize floor space, support clear lines of sight, provide appropriate storage, and promote organization.⁵ Note that these considerations also go hand-in-hand with those that help create a safe workstation.

Flexible Design

Flexibility is imperative when creating a lean workstation. Not only does an adaptable station eliminate waste, but it also facilitates new product lines as well as changes, crucial to the current environment of high-mix/low-volume production. A workstation that is not flexible becomes a barrier to innovation and change. Equipment should be constructed to anticipate shifts in schedules, operators, run quantities, and products. It should be easy to integrate and combine with additional units and material handling applications such as conveyors or carts. Modular workstations, such as those built with 80/20 T-slot aluminum profiles, are an excellent choice for an adaptable solution. They enable easy and fast reconfiguration to accommodate fluctuating layouts without an additional outlay of significant expenditures.

Optimize Floor Space

The right workstation should make the best use of floor space, taking into consideration the layout of the entire work area as well as individual tasks. Workstations can save valuable space by utilizing vertical area above the work surface. Use strong, durable materials that allow you to optimize the footprint of the workstation by reducing the number of interfering columns while enabling you to add shelves, and mount tools, safety equipment, and user-interface devices.



Support Clear Lines of Sight

Clear lines of sight are crucial to maintain productivity and reduce the risk of injuries. Disorganized or poorly designed workstations make it difficult to find frequently used tools and equipment and create waste. A workstation should be free of visual obstacles and clutter, making it easy to see and identify needed materials quickly. Clear lines of sight allow organizational indicators, such as color identifiers, to promote increased efficiencies.

⁵Leskova, A. (2013). Principles of Lean Production to Designing Manual Assembly Workstations. Annals of Faculty Engineering Hunedoara, 11. Retrieved from <http://annals.fih.upt.ro/pdf-full/2013/ANNALS-2013-2-03.pdf>

Promote Organization

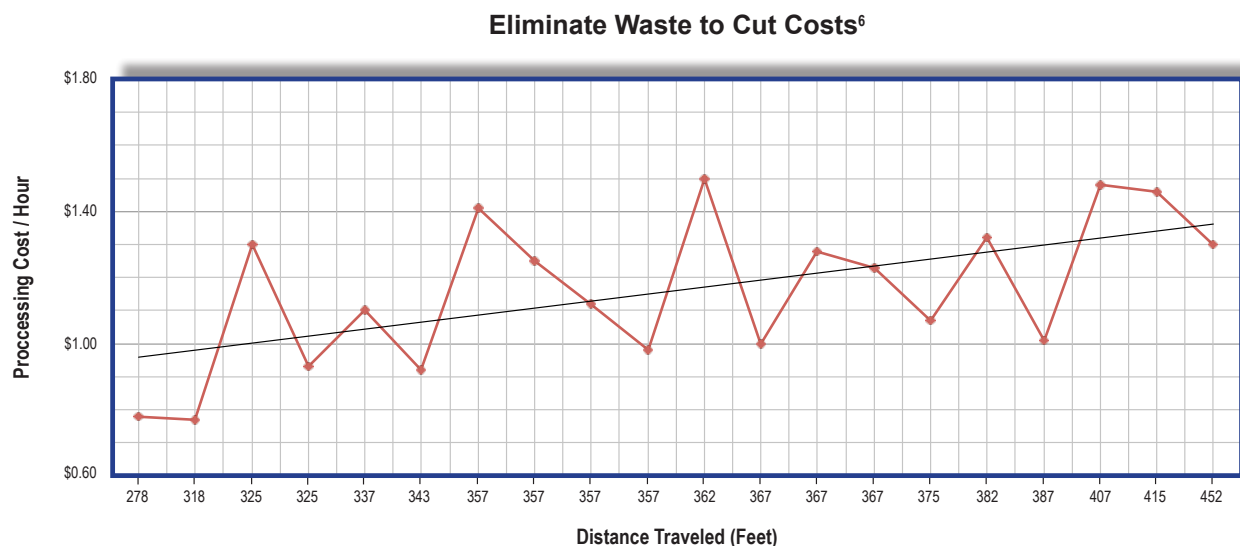
Design a workspace that is well thought out, considering the best place for tools, gauges, and equipment. The layout should be established for easy operator access. Determine all of the steps needed through each phase of the operator's process and create a workstation that reduces the amount of tools needed, optimizes reach, and minimizes the distance between parts, fixtures, and disposal points. The most frequently used parts should be closest to the operator. When spaces are not organized users will waste time and reduce productivity searching through equipment and materials to find what they need.

Provide Appropriate Storage

Workstations should have the appropriate amount of materials on hand to maintain production without excess. This decreases travel time between tasks and allows longer replenishment intervals. Materials should be stored in organized bins or containers and placed as close as possible to the point of use. Storage containers should also have a designated usage system, such as color-coding, for quick visual reference.

Reduce Setup Time

Frequently, multiple operators will be using the same workstation, whether this is due to different shifts, or processes. The time it takes to make necessary adjustments to tools, equipment and accessories should be minimal. For instance, bins, shelves, and lighting might need to be adjusted. This can happen faster if the changes do not require specialized tools or the help of additional people. If tools are required, be sure that they are also stored on the workstation to minimize the travel and setup time required.



⁶Ulmer, J. M. (2014). A comparative analysis between batch and cellular manufacturing methods in application of lean manufacturing principles. *Business Journal for Entrepreneurs*, 2014(2), 136.

Summary

Investing the time upfront to thoroughly plan a workstation will enhance lean initiatives. An optimal design will conform to people and processes in order to decrease injuries and waste while improving productivity. A flexible and adaptable option accommodates changes to support both your current and future goals.

This white paper provides principles to help you design and build safe and efficient workstations. Use it as a guide while reviewing your specific requirements. If you would like assistance creating a custom workstation, we can connect you with your local 80/20 distributor for a consultation. 80/20 T-slot aluminum profiles and parts provide a modular, adjustable, ergonomic solution to promote your lean strategies. Learn more about 80/20 at 8020.net.

About 80/20

80/20 Inc. is the originator and manufacturer of “The Industrial Erector Set®,” a modular T-slot aluminum building system for every industry or application. From light to heavy-duty, 80/20 is a perfect solution for machine frames, guarding, enclosures, displays, workstations and the DIY home hobbyist. With a catalog of over 8,000 products to choose from, free design assistance and 80/20 Builds assembly support, 80/20 Inc. will ensure your project is completed to the highest standards.

80/20 Inc.

1701 South 400 East
Columbia City, IN 46725

Ph: 260-248-8030

Fax: 260-248-8029

www.8020.net

80/20® Inc.

*The **Industrial Erector Set***

Workstation Design Checkoff List

Use this guide as an outline when planning and implementing your workstation to help optimize your design and ensure the application is supporting both the operator as well as your lean initiatives.⁷

» Determine the Process

- ☐ What materials are being used?
- ☐ What tools are needed?
- ☐ Evaluate location(s) to minimize walking, waiting and lifting

» Analyze the Operators

- ☐ Tools and equipment should not cause ergonomic strain on the operator
- ☐ Ensure operator does not have to climb on, in or under the workstation to complete tasks
- ☐ Enable height adjustment, when possible; if it is not possible, address other possibilities e.g. height adjustable chairs
- ☐ Are there heavy parts that need moved?
Minimize to avoid risk of injury and ergonomic strain – provide lifting equipment, as needed

» Implement

- ☐ Run trial tests using real-life scenarios
- ☐ Include multiple users
- ☐ Ensure compliance with safety regulations

» Follow Up

- ☐ Does the workstation remain clean and tidy over a period of time?
- ☐ Does every tool have a designated place and get returned to that spot consistently?

⁷Chicoine, D., Tellier, C., St. Vincent, M. (2006). An ergonomic analysis process for MSD prevention. Retrieved from www.irsst.qc.ca/media/documents/pubirsst/rg-483.pdf