

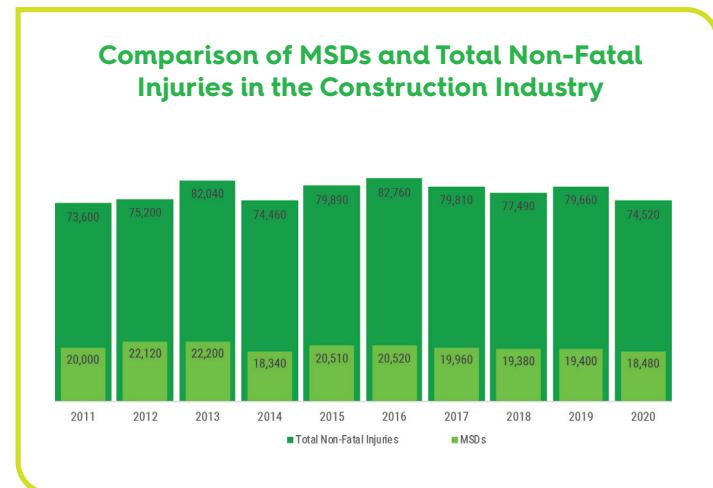
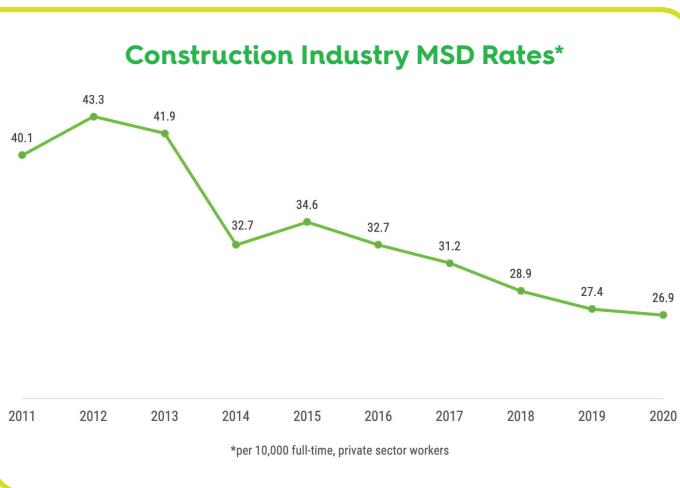
Industry Spotlight: Construction

Purposeful interventions can prevent work-related musculoskeletal disorders (MSDs).

Injury Trends

The construction industry sector includes three subsectors: the construction of buildings, heavy and civil engineering construction, and specialty trade contractors. While MSD rates in the construction industry sector have been steadily declining over the past decade, **Injury Facts** and **BLS** show that in 2020, 27 MSD cases resulting in lost workdays were experienced for every 10,000 workers in the construction industry.[†] MSDs also constitute approximately one-quarter of all non-fatal injuries within the construction industry over the past decade.

Additionally, in 2019, the construction industry lost **\$11.3 billion** due to non-fatal workplace injuries, with \$1.8 billion lost to overexertion due to object handling and \$850 million being lost to awkward postures and other bodily exertions.[‡]



[†]These numbers represent the number of nonfatal occupational injuries and illnesses involving days away from work with the US and private industry.

[‡] Based on the 2022 Liberty Mutual Workplace Safety Index

Potential Risks

Common MSD risk factors in the construction industry include:

- Overexertion
- Manual material handling involving pushing, pulling, lifting (especially uneven lifting), lowering, carrying and extended holding
- Awkward postures, including twisting, reaching or bending
- Working in a sustained, static or stooped position
- Repetitive movements
- Prolonged grip from holding powered and non-powered hand tools
- Strain from wearing heavy toolbelts
- Whole body vibration from large equipment operation or hand-arm vibration from power tool operation
- External contact stress from tools and sharp objects
- Fatigue from temperature extremes
- Long working hours
- Inadequate rest breaks
- Stress due to staffing shortages
- Shift work or non-traditional work schedules
- Lack of proper training, education or instruction regarding job tasks



Potential Solutions

Employers are encouraged to create tailored MSD solutions best suited for their workers. However, below are potential solutions for musculoskeletal pain, discomfort or injury in the construction industry. **The ANSI A10 standard** on the reduction of musculoskeletal problems in construction also provides potential solutions.

- **Plan** for how materials will be stored, lifted and moved to reduce manual material handling
 - Use of the ANSI A10 standard on pre-project and pre-task safety and health planning may also be beneficial
- Provide ergonomic equipment or workstations to prevent working in a stooped, bent or awkward position
 - Mast climbing work platforms or portable scaffolding allow brick layers to work at waist height
 - Powered screeds for spreading wet concrete allow workers to stand upright instead of bending over to pull the board by a hand screed
 - Monitor hand-arm vibration during use
 - Auto-feed screw guns with extension devices can allow subfloor or low drywall to be screwed down without having to bend over
 - Extension shafts for tools can eliminate reaching or other awkward postures
 - Quick frame support is fast to set up, adjustable and light to keep frames flush as walls are built around it
 - Motorized lifts and work benches raise materials to a more appropriate working height
 - Excavator cabins can be modified by raising the cabin above the regular position, allowing an operator to see without straining
 - Scissor tables or mobile lift tables can help store materials off the ground by placing the load close to waist height
 - Safe cutting stations keep appropriate tools for cutting conduit or other materials in a single area and help eliminate cutting overhead and on lifts
- Utilize tools and equipment that help to reduce or eliminate the risks of manual material handling (i.e., carts, dollies, motorized/vacuum lifts or exoskeletons)
 - Drywall lifters can assist residential construction workers in raising the walls of a house with only two workers by using a wall jack with a hand crank to raise the wall from the floor
- Alter or provide new tools/equipment, materials or work processes to reduce or eliminate overhead and sustained work
 - Hydraulic technology can lift ladders onto trucks to reduce the compression force placed on workers
 - Mechanical devices can help hold a heavy tool in place and reduce the physical burden
 - Anchor jacks reduce overhead work by inserting an anchor into a pre-drilled hole and using a foot-actuated system
 - Drill jacks that affix to a drill with a foot-actuated drilling system allow the worker to slide the jack to the next hole, line up the drill and press down on a foot pad which presses the drill's bit into overhead concrete to reduce overhead work
- Use ergonomically designed tools to reduce or eliminate the risk of trigger finger, carpal tunnel syndrome or tendinitis
 - Rebar tying machines that contain a spool of wire, as well as a feeding, twisting, tying and cutting mechanism, and a trigger, eliminate the manual performance of such tasks
 - Properly sized tools and equipment, (i.e., tools with handles that are more comfortable, have better grips, are the right size for the hand, allow a power grip for heavy work and pinch grip for fine work, and allow a neutral wrist posture) should be used

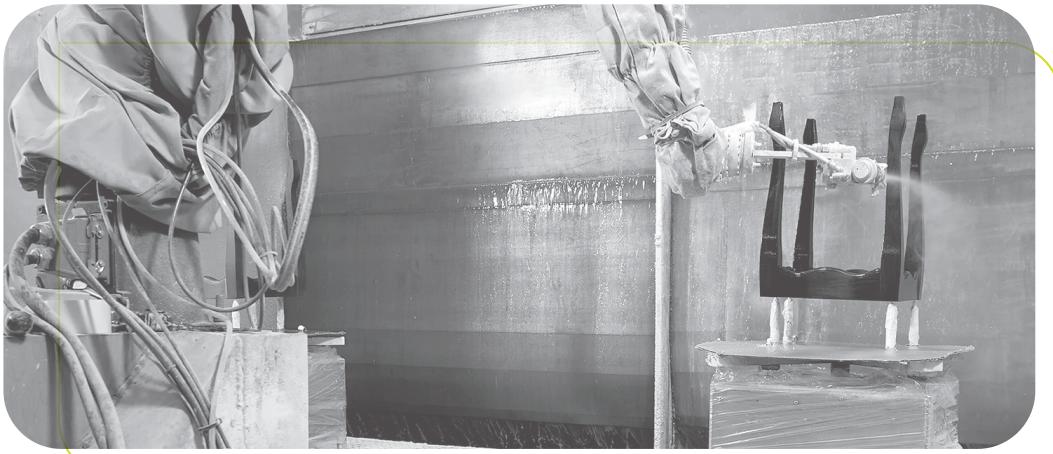
- Use approved prefabricated or lightweight building materials and other work equipment when possible
 - Plastic piping used for sprinkler systems is flexible, lightweight and can be easily cut and glued
 - Hydraulic mixers in masonry, such as mud hog mixers or silo mixers, can eliminate manual mixing and increase productivity
 - Hydraulic masonry chain saws used for cutting masonry blocks are much lighter and use a compressor placed away from the worker that reduces fume exposure
 - Aluminum bulkheads used for slab and beam edges in masonry are lighter and easier to cut than traditional plywood
 - Airplane cables for duct work are lighter and easier to manipulate than traditional duct straps
- Use innovative safety technology when possible to prevent workplace injuries
 - Artificial intelligence-powered technologies can detect risk factors and alert management to remove hazards, and improper worker techniques can be corrected in real time
 - Wearable sensors can identify tasks and detect postures posing MSD risks, and alert workers to change their behavior
 - Robotics or crawlers can be used to paint, climb for inspections or do other work at height
- Hire and have safety personnel visible on job sites to enhance a healthy work environment and to provide on-site coaching and observation
- Provide onsite therapy options to address pain and injuries before they develop into MSDs
- Engage in proactive, daily dynamic stretching to prepare the body for the physical demands of work
- Implement a participatory ergonomics committee with worker input
- Offer site-specific ergonomics and safety training, as construction hazards vary from job site to job site
- Allow frequent rest breaks and provide safe rest spaces for all workers
- Consider prefabrication to take the work out of a highly dynamic job site and move into a controlled environment

Important Considerations Regarding Technology

Technologies, while a powerful resource for ergonomic safety and MSD prevention, are just one of many tools for MSD prevention. Employers should always have a comprehensive ergonomic process and plan in place. Additionally, the adoption of new technologies may be difficult for a multitude of reasons. Given that most contractors and subcontractors win work based on low bids, including innovative technologies could make them non-competitive if bids are too high. If bids could receive “credit” for including an experimental solution, this may help the uptake of new technologies in the construction industry.

Key Takeaway

Employers are encouraged to use this information and assess the risk factors of their unique workplaces by consulting with their employees to create tailored MSD solutions for their workforce. While manual material handling, bending and using power tools are major MSD risk factors in the construction industry, many viable solutions have been designed to eliminate and reduce such risks. Manual materials handling guidelines, assistive devices, lightweight materials and technology should be leveraged to mitigate MSDs within construction.



DISCLAIMER: This educational Industry Spotlight was created by the National Safety Council for educational purposes only; as well as to provide general information and a general understanding of musculoskeletal disorders; not to replace or list the comprehensive rules and regulations relating to safety compliance and musculoskeletal disorders; and not to offer specific medical advice. This Industry Spotlight should not be used as a substitute for competent medical advice from a licensed health care professional or medical practitioner.

References

Albers, J.T. & Estill, C.F. (2007). *Simple solutions: Ergonomics for construction workers*. U.S. Department of Health and Human Services, DHHS (NIOSH) Publication No. 2007-122.

Choi, S. D., Yuan, L., & Borchardt, J. G. (2014, September). *Critical analyses of work-related musculoskeletal disorders and practical solutions in construction*. In Proceedings of the Human Factors and Ergonomics Society Annual Meeting (Vol. 58, No. 1, pp. 1633-1637). Sage CA: Los Angeles, CA: SAGE Publications.

Electronic Library of Construction Occupational Safety & Health. (n.d.). *Preventing musculoskeletal disorders in construction workers*. The Center for Construction Research and Training. <https://www.elcosh.org/document/1648/d000560/Preventing+Musculoskeletal+Disorders+in+Construction+Workers.html>

Howard, N., Bao, S., Lin, J., Hunter, D., Haas, A. (2016). *Work-related musculoskeletal disorders (WMSDs) in Washington state construction: A summary of research study findings*. Washington State Department of Labor & Industries. https://lni.wa.gov/safety-health/safety-research/files/2016/Construction_summary_FINAL.pdf

Kramer, D., Bigelow, P., Vi, P., Garritano, E., Carlan, N., & Wells, R. (2009). Spreading good ideas: A case study of the adoption of an innovation in the construction sector. *Applied Ergonomics*, 40(5), 826-832.

Kramer, D. M., Bigelow, P. L., Carlan, N., Wells, R. P., Garritano, E., Vi, P., & Plawinski, M. (2010). Searching for needles in a haystack: Identifying innovations to prevent MSDs in the construction sector. *Applied Ergonomics*, 41(4), 577-584.

Lombardo, K. (2018, July 19). *Managing MSDs among construction workers*. Dorn. <https://www.dorncompanies.com/managing-msds-among-construction-workers/>

OSHA. (1999). *Women in the construction workplace: Providing equitable safety and health protection*. U.S. Department of Labor. <https://www.osha.gov/advisorycommittee/accsh/products/1999-06-01>

Reddy, G. M. M., Nisha, B., Prabhushankar, T. G., & Vishwambhar, V. (2016). Musculoskeletal morbidity among construction workers: A cross-sectional community-based study. *Indian Journal of Occupational and Environmental Medicine*, 20(3), 144–149. <https://doi.org/10.4103/0019-5278.203134>

Zhao, J., Obonyo, E., & G. Bilén, S. (2021). Wearable inertial measurement unit sensing system for musculoskeletal disorders prevention in construction. *Sensors*, 21(4), 1324.