



## Hazard Analysis

Work Activity: **Sheet Metal & HVAC**

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Task: **Weld, Braze and Solder Seams and Joints**

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Hazard: **Stooped Postures**

**Problem:** Welding, brazing and solder seams and joints may involve work in stooped postures. The 'stooped' position is characterized by prolonged periods of forward bending of the back, which is considered an extreme back posture.

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**Risk Description:** Prolonged bending of the back while welding, brazing and solder seams can cause injury to muscles, nerves, discs and ligaments of the low back. Non-specific low back pain is not the result of a fall or some other acute traumatic injury, so it can be difficult to identify a specific event that led to the injury. Continuous work in a 'stooped position' can lead to low back muscle strain, ligament sprain, a bulging or herniated disc, or other back problems.

### Low Back Pain and Disorders

Low back pain (LBP) is among the most common health complaints in working-aged populations worldwide. In the U.S., 70%-80% of adults will experience a significant episode of LBP at least once in their lives. Low back disorders are conditions associated with lifting and other forceful movements of the back. Episodes of LBP are characterized by varying levels of pain and symptoms in the low back (lumbar spine). Low back disorders can even cause leg pain at times.

#### Work-Related Risk Factors

- Work-related lifting and forceful movements
- Whole body vibration
- Awkward postures (bending and twisting)
- Heavy physical work
- Poor job satisfaction, perception of intensified workload, lack of job control, and certain personality traits

#### Development and Progression

The low back may be injured due to either a sudden stressful event or the cumulative effect of stressful activities. Strain of the muscles or sprain of the



ligaments surrounding the spinal joints occur most commonly. Injuries to the low back may also involve the intervertebral disc.

The intervertebral disc is composed of a ring of fibers surrounding a sac of fluid or gel-like material. Discs may be damaged due to a sudden stress (e.g. a fall, slip, or catching an unexpected load), or due to cumulative problems when stressful activities stretch, tear, or unravel the protective fibers surrounding the sac of fluid. When the fibers can no longer contain the fluid, small leaks or bulges can occur or the disc may flatten. The most commonly injured low back discs are between the 4<sup>th</sup> and 5<sup>th</sup> lumbar vertebrae (L4-L5), and between the 5<sup>th</sup> lumbar vertebrae and the sacrum (L5-S1). Disc problems may lead to a pinched nerve.

The causes of many episodes of LBP are unclear. Even with clinical tests and imaging procedures, about 85% of patients cannot be given a precise diagnosis. The pain in these cases is presumed to be related to muscle, ligament, or tendon injury or degenerative changes.

#### Common Symptoms

Individuals with low back problems typically experience pain in the low back (lumbar spine). Leg pain or numbness may accompany low back pain. Often, leg pain is localized to the side or back of the thigh, but sometimes the pain may go all the way to the foot. This leg pain is called "sciatica." Individuals may also have tenderness in the low back and a limited range of motion for bending forward, backward, sideways, or twisting. Bending forward tends to increase pain levels.

#### Common Treatment

Initial treatment for most episodes of low back pain includes avoidance of stressful activities and gradual exercise. Nonsteroidal anti-inflammatory drugs (NSAIDs, e.g. ibuprofen or naproxen) are often helpful, and stronger drugs may be prescribed (muscle relaxants or narcotics) for more severe, acute pain. Other treatment options may include application of heat and cold, physical therapy, spinal manipulation, or injections. Some LBP cases may require surgery (ruptured disc or severe trauma cases).

Most workers with occupational LBP get better. Half of workers improve in one week and 90% improve in 30 days, regardless of treatment. Light duty work activities may be prescribed by the physician during the recovery period. The remaining 10% of workers may have a chronic condition and may not be able to return to their previous jobs. Many workers may suffer from residual pain that



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may affect work or activities of daily living.

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**Level of Risk:** Workloads or activities are of such a magnitude and character that a significant number of workers risk developing an MSD in the short or long term.

The 'stooped' position, characterized by prolonged periods of forward bending of the back, is considered one type of awkward back posture that is a risk factor for low back pain (LBP). Several scientific studies have found that stooped postures may cause low back pain compared to work that does not require stooping. Furthermore, it appears that the risk for LBP increases when more time is spent in the awkward postures or if forward bending is more pronounced. Biomechanics research shows that forces within the lumbar spine are higher when the lumbar spine is bent forward fully. In these postures, the spine is weaker and is supported by the ligaments instead of the back muscles. Research has shown that reliance on ligaments instead of muscles may increase the risk for LBP.

Stooped postures are common in construction work. In 2002, over 29% of lost work days in the construction industry were due to back injuries. Studies also show that back pain is common among construction workers, with over 50% of workers reporting low back pain in a year. In 1996, the University of Iowa surveyed 2,929 workers representing 13 different construction trades and found that 70% of workers experienced low back pain in the previous 12 months.

There has not been specific research on the development of back disorders in construction work due to stooped postures. However, the evidence cited above on stooped posture as a risk factor, and high rates of back disorders in the construction industry, show that there is an increased risk of LBP among any construction worker who often works in stooped postures.

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**Assessment** To assess exposure to stooped postures, determine how many hours per day the worker spends in with their back bent forward  $>30^\circ$ , bent forward  $>45^\circ$ , or twisted  $>30^\circ$ . Also, visit [Thomas Bernard's website](#) for a host of practical ergonomic tools.

To assess the exposure to stooped postures, it is necessary to observe a worker welding, brazing and soldering seams and joints. Look for:



- time spent with the back bent forward more than 30°
- excessive trunk twisting more than 30°

The risk of injury increases with more time spent in a bent forward posture and a greater degree of forward bending. General guidelines include:

- Working with the back bent forward >30° for more than 2 hours a day is a moderate risk.
- Working with the back bent forward >30° for more than 4 hours a day is a significant risk.
- Working with the back bent forward >45° for more than 2 hours a day is a significant risk.

Quantitative methods of measuring back posture are available (e.g. Lumbar Motion Monitor) but require technical expertise. [Thomas Bernard's website](#) has a host of practical ergonomics tools, including the Washington Department of Labor and Industries Checklist and the Rodgers Muscle Fatigue Assessment.

#### References

[Thomas Bernard's website](#) has a host of practical ergonomic tools, including three Microsoft Excel based analysis tools based on the Liberty Mutual Manual Material Handling Tables.

<http://personal.health.usf.edu/tbernard/ergotools/index.html>