

## **ERGONOMIC IMPROVEMENT**

### **Welding Manipulator at Access Ability, Inc.**

Access Ability, Inc. is a metal fabrication business founded in 1996 for the purpose of manufacturing modular access ramps. At the beginning of the OSHA Worksite Redesign project Access Ability had one full time employee and limited part time employee help. The company has since expanded into divisions of metal fabrication including mild steel railings, custom fabrication products and aluminum specialties. Access Ability has done work for a number of notable clients including Tri-Met, Tom Walsh Company, R & H Construction, Housing Authority of Portland, and the State of Oregon's Disability Services Offices. The products now include ramps, railings, architectural and ornamental metals and, the newest product, aluminum workstations for hospital environments.

When the company was founded, owner, Gale Schmidt, was recovering from a disability that had curtailed her mobility. Discovering that wheelchair access was a major deficiency in many public places, Gale wanted to find a way to make ramp installations easier and more affordable. She designed a modular system that consists of a small number of interchangeable components that can be configured in a multitude of ways. By using standard components, ramps can be made in varying lengths and shapes such as straight, "L" shaped, switchbacked, or in combinations of these shapes. The modular ramp design has all the Americans with Disabilities Act (ADA) features built into it. The proper slope, handrail height, bumpers, etc. are part of the features. The design has been awarded a Master permit for the State of Oregon, which is essentially the seal of approval from the State for code compliance.

The ramps are made of steel frame components that are powder-coated for an attractive, durable finish. The decking of the ramps consists of plywood panels that are specially treated and coated with an abrasive slip resistant topping. This design is doubly attractive to the owner because they are virtually maintenance-free, (unlike wood ramps that need sealing and sanding every few years), and they are more attractive than bulky lumber ramps.

Because the ramps are produced in our shop in production fashion, they can be made affordably. The component nature of the design means that they can fit almost any landscape setting and be easily assembled in the field. For comparison, a straight, 30' Modular Access Ramp can be installed in 1 hour on level ground (two hours on uneven ground). It would take approximately 8 hours to build the same ramp out of lumber after receiving approval of the engineering design through the state permitting process.

The Modular Ramp system is fast becoming the ramp system of choice in the Portland area and the company is looking to expand sales to the national market.

As a small, non-automated company there are some production challenges. One of the components of the ramp system is a small connector that is fabricated out of several formed-steel subcomponents. The overall dimension of the finished assembly is 3" x 1.5" x 3"h and contains over 10" of weld seams. Once welded, the part must ground and

finish smoothed. It was very difficult to hold the part for welding or grinding. The operator tried a variety of techniques and devices to hold the part but nothing proved effective.

Conventional vice clamps were cumbersome and inefficient. The operator would have to clamp and reclamp the part three or four times to weld up or grind the part. This meant that the powered grinding tool would have to be set down, the clamp undone, the part reset, the clamp secured again and the tool picked up again. It took longer to manipulate the part than to weld or grind it. This happened multiple times on each part.

The operator often reverted to holding the part with one hand while grinding with the other. This created an unsafe condition whereby the grinder was held by one hand only and could easily slip or catch the part wrong and dislodge it. Another method was tried in-house, that provided some improvement to the problem. A fixture was fabricated that the part could be placed into. The fixture had two compartments – one for an up-down orientation and one for a side-side orientation. This held the part securely in one plane of orientation. Even though the fixture eliminated the need to clamp and unclamp a vice it still required the operator to use one hand for manipulating the part in the fixture, while holding the grinder in the other hand. A more efficient and safer solution was needed. We needed to find a way to maintain two-handed use of the grinder while working on the parts.

Access Ability, Inc. applied to the Oregon OSHA Worksite Redesign Program for help in solving the part-manipulating problem. Upon review of the situation Oregon OSHA determined that the problem was one that occurred in many shops and a solution to this problem could have widespread benefits. A Worksite Redesign Grant was awarded.

Concept Designer, Alan Walters, was hired to design a device to both hold and manipulate the part while it was being worked on. He determined that a device could be produced by using a combination of some off the shelf components, with a few custom attachments. A part indexer became the hub of the device. This unit rotates by means of a motor, operated by a foot pedal. It can be swiveled and lock in a range from horizontal to vertical so parts in the clamping system can be worked on while oriented on their side, or laying flat. Attached to the front of the indexer was a custom clamping system with a quick release lever. The jaw of the clamp slides up and down an arm, and a turn of a lever tightens it onto the part. The clamping system and the rotating features work great. The last part of the device was to make the indexer and clamping fixture height-adjustable. For this feature a scissor table cart was used. The table could be raised and lowered by means of a foot pump and hand release. The part indexer was mounted to the cart and it was ready to use.

The welding manipulator proved immediately effective in improving the safety, quality, and productivity of the fabrication of the components. The operator is able to weld and/or grind up to 5 surfaces of a part with just one clamping action. The parts stay securely in place and are rotated at will by the foot pedal by the operator. Two hands are

maintained on the grinder, which has increased the safety of the tasks considerably. There is now little risk of dropping the grinder or damaging the part in production.

This fixtured manipulator device will be of use to companies in all industries that deal with small parts that must be handled and worked or finished by hand. The design of the clamping system allows for a wide range of adjustability in its ability to hold varied shaped parts.

Oregon OSHA's (OR-OSHA) Worksite Redesign Grant program provided up to \$19,000 in grant monies for this project. This covered some of the costs to design, prototype, and install the system to its final configuration. It also included the pre and post ergonomic evaluation reports and documentation of the workstation so that others could benefit from the research. Access Ability Inc. contributed the required 10% match, in the form of meetings, testing and reporting on the outcomes of the welding manipulator system. While the system was designed for their special needs, Gale believes it may be of interest to many companies with similar applications and issues.

All product designs developed through this program are public property. The design is complete, and will be available to anyone wishing to duplicate or further develop the welding manipulator system. A web based project archive is in the process of being constructed, that will provide details on this and many of the 35 to 40 grants being completed. It will be linked from the main Oregon OSHA website and will provide information such as project overviews, ergonomic reports on the projects, as well as design and vendor information so that anyone may research the results and adopt the technologies.

Information about developments and the status of this program can be obtained from Oregon OSHA ([www.orosha.org](http://www.orosha.org)).

Phone: 1-800-922-2689

<http://www.cbs.state.or.us/osha/grants/worksitere design.htm>

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