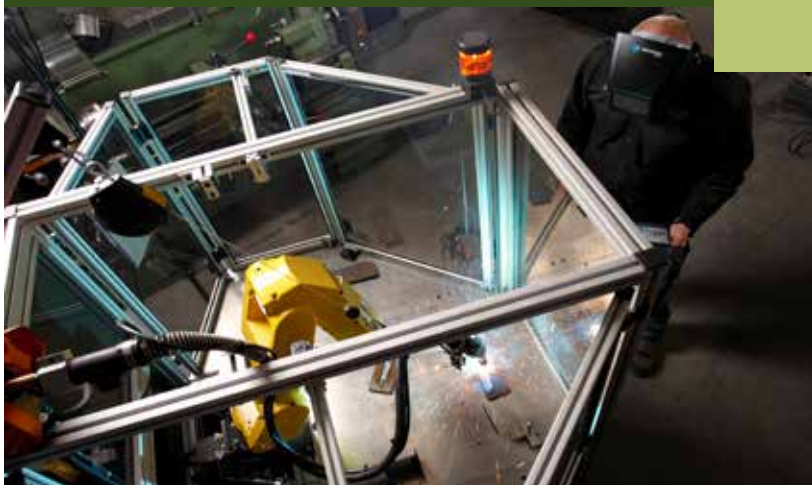


# Welding & Manufacturing Program Expansion Proposal



Presented to the South Dakota  
State Board of Education  
March 2017  
For Implementation  
Fall 2017



**Mitchell Technical Institute**  
1800 E. Spruce St. • Mitchell, SD 57301



## **Mitchell Technical Institute**

<b>Program Expansion:</b>	<b>Welding and Manufacturing</b>
<b>Length of Program:</b>	<b>Two-Year Associate Degree</b>
<b>Number of Students:</b>	<b>18</b>
<b>Projected Start Date:</b>	<b>Fall of 2017</b>

### **Executive Summary**

Mitchell Technical Institute is proposing an expansion of the Welding and Manufacturing AAS diploma and degree options to include an additional pathway for progressive welding. This second year option will allow for two distinct AAS degree paths: the current machining/manufacturing emphasis, and the proposed progressive welding emphasis.

Students enrolled in the Welding and Manufacturing program have shown an interest in continuing their education in welding only. Currently, the second year AAS option introduces students to the machining side of the industry. The additional pathway would allow students to advance their skills with specialized welding processes that include gas metal arc, gas tungsten arc, shielded metal arc, and flux core arc. Instructors in the program are certified by the American Welding Society which allows for students in the proposed pathway to have the opportunity to test for an American Welding Society certification. The progressive welding pathway will focus on higher end skill development and hands-on experience in nondestructive weld testing methods such as visual, die penetrant, magnetic, radiographic, and ultrasound.

Careers in the welding industry are numerous and industry demand for welders is strong. The proposed progressive welding pathway opens career opportunities in agriculture, construction

or mining. The skills learned in the progressive welding pathway will make graduates more viable in the job market. Additionally, graduates of either pathway can return for a third year to earn an additional AAS degree.

Industry partners are in full support of this proposal and have assisted in identifying curriculum topics that reflect the expected outcomes of the proposed pathway.

### **Identification and Description of Program Expansion**

The current Welding and Manufacturing program at Mitchell Technical Institute offers students who wish to obtain an Associate of Applied Science degree a curriculum that focuses on machining. The proposed program expansion will provide the opportunity for students to hone proper skills to excel in welding, welding inspection and lean manufacturing techniques. Instruction is AWS (American Welding Society) code-based so that students may sit for welding certification testing, assuring future employer requirements. Additionally, the proposed program expansion provides a path to industry leadership. With the knowledge and abilities gained, graduates will have the training necessary to become certified and help fill the demand in today's highly technical manufacturing environment.

The proposed curriculum will cover theory, advanced welding skills, preparation for certifications specific to advanced welding, and robot operation. Welding is a mix of many processes including SMAW (stick), GMAW (mig), FCAW (flux core mig), and GTAW (tig). Manufacturers are able to choose from hundreds of metals, dozens of welding processes, filler metals and shielding gasses. Progressive welding addresses the growing need for advanced welding. Additional topics such as lap, butt, and corner joints, basic cutting torch procedures, and different types of steel and weld ability are included in the curriculum.

Numerous career opportunities, unique to entry-level welding positions, exist for graduates of the proposed progressive welding pathway. Graduates will be skilled to seek employment as an Arc or Gas Welder, MIG or TIG Welder, Layout Technician, Specialized Welder, Aerospace Welder, Oxyacetylene Welder or Robotic Welder.

## **Objectives and Purpose of the Program**

The primary objective of this program expansion is to offer students the experience and overall education to become a successful advanced welding technician. This program will provide attention to professionalism and communication skills, as well as the important mastery of technical skills.

General program expansion objectives:

- Set-up and operate a welding power source
- Weld on various types and thicknesses of materials
- Weld in all positions
- Weld with various non-traditional welding processes
- Build products, from shop drawings, acceptable to industry standards
- Fabricate and repair parts using thermal cutting equipment
- Determine costs of welding
- Analyze best practice of weld design
- Understand electrical safety and theory as it relates to the welding industry
- Write welding procedures
- Qualify weld tests
- Write weld test reports
- Understand the metallurgy of welding
- Develop a working knowledge of welding alloys
- Program a robotic arc welding cell
- Robot Qualification with possible Certification
- Operation and understanding of ultrasonic inspection
- Operation and understanding of magnetic particle inspection
- Operation and understanding of radiographic interpretation inspection
- Interpret the AWS/ASME code book
- Perform unique weld fit ups
- Master competencies that lead to AWS welding certification

The proposed progressive welding pathway provides hands-on training and a curriculum supported by industry standards. Students will be prepared to meet the competencies required for employment in a variety of industries.

### **Methods of Attaining the Objectives of the Program**

Pending approval, MTI will develop marketing materials and recruit students. Current instructors in the Welding and Manufacturing program and, with assistance from an advisory committee, will finalize course syllabi, purchase equipment and supplies, arrange classrooms, develop schedules, and secure resource materials. MTI provides assurance that it possesses the resources and staff necessary to:

- Develop marketing materials and recruit students
- Assess the abilities of students for good program and course placement
- Provide tutoring for students needing extra academic help
- Develop and administer budgets
- Make available textbooks and other instructional resources
- Provide career and personal counseling to students
- Evaluate programs and staff
- Assist students in finding jobs
- Secure input from industry through advisory committees
- Maintain membership in professional organizations
- Provide financial aid and scholarships
- Provide a typical two-year technical institute climate
- Assist students with housing and provide daytime food service
- Provide services to disabled and nontraditional students
- Provide classrooms and laboratories
- Provide general education courses to meet associate of applied science degree requirements

## **Graduation Requirements**

Graduates of the program must complete all prescribed coursework, earn a cumulative GPA of 2.0 and not have a failing grade in program courses.

## **Description of the Needs Based on Labor Market Demand**

According to Ray Shook, the executive director of the American Welding Society, for the past few years, the metal fabrication and construction industries have faced a challenge in finding skilled welders. With approximately 500,000 welders in the workforce, the average welder today is in his or her mid-50s and nearing retirement. With welders retiring at twice the pace of new welders coming into the field, it's anticipated that in the years to come, we will have a significant shortfall of qualified welders. Based on U.S. Bureau of Labor statistics, the American Welding Society (AWS) estimates a welder shortage of 372,000 in the U.S. by 2026.

Since welding is the most common way to join metals—which is critical to manufacturing, construction, energy and infrastructure—it is vital to rebuild our welding workforce. Job prospects will vary with welder's skill level. Mitchell Technical Institute has placed over 90% of graduates of the current Welding and Manufacturing program. The proposed progressive welding pathway meets current industry need for welders with advanced skills in addition to continuing to provide opportunities for basic welders and machinists.

Welders, Cutters, Solderers & Brazers	2014 Estimated Employment	2024 Projected Employment	Employment Change	Percent Change
United States	397,900	412,300	12,850	+4%
South Dakota	3,250	3,660	130	+13%

Source: [https://www.careerinfonet.org/occ\\_rep.asp?next=occ\\_rep&Level=&optstatus=011000000&id=1&nodeid=2&stfips=46&jobfam=51&soccode=514121](https://www.careerinfonet.org/occ_rep.asp?next=occ_rep&Level=&optstatus=011000000&id=1&nodeid=2&stfips=46&jobfam=51&soccode=514121)

## **Population Served by the Program**

Specific to the progressive welding pathway, the intended audience will be from current MTI students, past graduates, industry workers and the nontraditional student. A recent survey of current students indicates that 50% of students seeking an AAS degree prefer the proposed progressive welding pathway. The other 50% of students seeking an AAS degree will enroll in the manufacturing pathway. The option to complete two AAS degrees in three years is appealing to many current students.

## **Admissions Requirements**

The program is available to any applicant who has successfully completed the admission requirements set by MTI. Mitchell Technical Institute does not discriminate in its educational programs on the basis of race, color, creed, religion, age, sex, disability, national origin or ancestry. Applicants must be at least 16 years of age or older, provide proof of US legal residency, have a high school diploma or GED, and complete entrance examinations.

## **Projected Three Year Budget**

Costs for the expansion of the existing Welding and Manufacturing program will be manageable. Current instructors have the experience, education, and credentials to teach the new courses. There will be some supplies and equipment purchases as projected below.

	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>
<b>Salaries/Benefits</b>	N/A	N/A	N/A
<b>Equipment</b>	\$4300	\$6000	\$6000
<b>Supplies</b>	\$5000	\$5000	\$5000
<b>Travel</b>	\$5000	\$5000	\$5000
<b>Instructional Materials</b>	\$5000	\$5000	\$5000
<b>Marketing</b>	\$1000	\$1000	\$1000
<b>Total</b>	\$20,300	\$22,000	\$22,000

## **Program Competencies and Entry and Exit Points**

The entry and exit points are for that of a traditional two-year AAS degree. Students will be accepted each fall beginning in 2017. The exit point will be at the completion of all coursework and graduates will have an accumulated GPA of 2.0 or higher. The curriculum will have defined and assessed learning outcomes in accordance with the guidelines set by the Higher Learning Commission. These outcomes will be reviewed and approved by a program advisory board and evaluated annually.

## **Statement of Non-duplication**

Welding programs designed to train entry-level welders and fabricators are offered at all four technical institutes in South Dakota. The proposed progressive welding pathway focuses on skills needed for the administration of the American Welding Society certifications. With the rapid growth of career opportunities in advanced welding, the progressive welding pathway will fill industry demands.

## **Proposed Curriculum Expansion Design:**

<b>Fall Semester</b>			Semester Credits
WMT	201	Quality & Productivity Improvement	2
WMT	230	Welding Robotic Lab	3
WMT	232	Weld Testing Methods (NDT/DT)	3
WMT	262	Advanced Welding Lab	4
		Social Science Elective	3
<b>Spring Semester</b>			Semester Credits
WMT	242	Welding Code	3
WMT	252	Mechanical Workmanship Lab	4
WMT	271	AWS Robot Certification	2
WMT	272	AWS Welder Certification	2
		Behavioral Science Elective	3

## **Course Descriptions**

### **WMT 201**

Quality & Productivity Improvement (2 credits)

Quality and productivity improvement. Will appeal to everyone concerned with enhancing productivity in the Welding workplace. Reviews management systems for welding supervisors, requirements of welds, welding instruction, and application of welding standards, welding inspection, health, safety, work reports, and records.



**WMT 230**

Welding Robotic Lab (3 credits)

Introduction to welding robotics. Goal is to help students develop the necessary skills to thrive in an advanced manufacturing environment with the use of Weldpro FANUC robot. Students will assume responsibility for complete part make-up from programming to weldment.

**WMT 232**

Weld Testing Methods (3 credits)

Discovering code related testing methods and practice of various nondestructive and destructive applications to weldments in order to comply to code testing requirements. Methods include: Visual, Die Penetrant, Magnetic, Radiographic and Ultrasound.

**WMT 242 (3 credits)**

Welding Code

Designed to address manufacturing needs. Allows students to evaluate code books published from the American Welding Society, American Society of Mechanical Engineers and the American Petroleum Institute.

**WMT 252**

Mechanical Workmanship Lab (4 credits)

Students will work in teams to complete a large fabrication project. Example student projects include a 20-foot (16' long with 4' stationary deck) tilt utility trailer. During this lab the students will apply the cumulative skills they have developed in the WMT program and use them to fabricate the final project.

**WMT 262**

Advanced Welding Lab (4 credits)

Advanced skills involving various welding processes that include gas metal arc, gas tungsten arc, shielded metal arc, and flux core arc. Difficult joint configurations along with various structure and pipe practices. Students are introduced to different welding gasses and application of different welding wires and processes. Specialty steels require specialty filler metals and gasses.

**WMT 271**

AWS Robot Certification (2 credits)

Designed to help prepare students to accomplish American Welding Society welding robot operator certification. Various practice assignments will help the student acquire the skill level to accomplish most scenarios in a manufacturing environment.

**WMT 272**

AWS Welder Certification (2 credits)

Students will have the opportunity to sit and test for an American Welding Society certification exam. Based on previous education and skill, students will have time to practice and select a qualifying welding procedure specification and complete an exam.

## **Instructor Credentials:**

Instructors for the proposed progressive welding AAS pathway will have a minimum of 6,000 hours of industry experience, complete an approved Career and Technical Education methods course, participate in a peer mentoring program, and hold at least one American Welding Society (AWS) certification.

## **Wage Factor**

Location	Pay Period	2015				
		10%	25%	Median	75%	90%
United States	Hourly	\$12.47	\$15.18	\$18.34	\$23.01	\$28.85
	Yearly	\$25,900	\$31,600	\$38,100	\$47,900	\$60,000
South Dakota	Hourly	\$12.67	\$14.43	\$16.63	\$18.64	\$21.91
	Yearly	\$26,400	\$30,000	\$34,600	\$38,800	\$45,600

Source: [https://www.careerinfo.net/occ\\_rep.asp?](https://www.careerinfo.net/occ_rep.asp?next=occ_rep&Level=&optstatus=011000000&id=1&nodeid=2&stfips=46&jobfam=51&soccode=514121)

[next=occ\\_rep&Level=&optstatus=011000000&id=1&nodeid=2&stfips=46&jobfam=51&soccode=514121](https://www.careerinfo.net/occ_rep.asp?next=occ_rep&Level=&optstatus=011000000&id=1&nodeid=2&stfips=46&jobfam=51&soccode=514121)

## **CIP Code**

**15.0614 – Welding Engineering Technology/Technician.** A program that prepares individuals to apply basic engineering principles and technical skills to the design and engineering of welding and joining systems and the implementation of welding processes. Includes instruction in materials science; computer-aided design; welding design; welding processes; welding metallurgy; automation and robotics; and codes, inspections, testing, and quality assurance.

## **Letters of Support**



# TRAIL KING Industries, Inc.

1200 Gehl Drive  
Yankton, SD 57078  
Phone: (605) 665-8415  
Fax: (605) 665-0810

2200 S. Ohlman Rd  
Mitchell, SD 57301-7064  
Phone: (800) 843-3324  
Fax: (605) 995-3749

2130 3<sup>rd</sup> Ave NW  
West Fargo, ND 58078  
Phone: (800) 762-5557  
Fax: (701) 282-3039

300 E. Norway Avenue  
Mitchell, SD 57301-7064  
Phone: (800) 843-3324  
Fax: (605) 996-4727

September 29, 2016

Mr. Mark Wilson, President  
Mitchell Technical Institute  
1800 East Spruce Street  
Mitchell, SD 57301

RE: Letter of Support, Progressive Welding Technology Program

Dear Mr. Wilson,

Trail King Industries strongly supports the Progressive Welding Technology Program proposed by Mitchell Technical Institute. The proposal will enhance and expand welding opportunities for students and will continue to address the critical welding needs of manufacturing companies like Trail King. The current Welding and Advanced Manufacturing program does a great job of preparing students and provides them a general background in manufacturing. These students are flexible, and fit well in the many positions we offer at Trail King. We have had success with the fourteen graduate students we have hired from the Welding and Advanced Manufacturing program at Mitchell Technical Institute. But, more needs to be done in providing students with a higher level of welding skills.

Trail King Industries is the leading open-deck and material handling trailer manufacturer in North America. We pride ourselves in solving customer problems through our design innovation and manufacturing expertise. As you know, Trail King provides products that have thousands of inches of weld on them. One of Trail King's needs is with the student continuing their education in the field specific to welding only. Currently your second year students are introduced to more of the machining side of education rather than the traditional welding knowledge. Looking at this avenue as an opportunity to help retain your current students and continue on the path for quality and growth, your Progressive Welding Technology program provides different pathways for your student's second year education option. The second year option would allow them two different paths, one of machining and the other being a progressive welding path. Specific to your proposed program, MTI could gain audiences from current MTI students, past graduates, industry workers, career and educational teachers as well as nontraditional students. This would provide companies like Trail King access to more skilled workers, specific to the highly demanded skill of welding.

Trail King Industries has been a long-time supporter of MTI through our participation on advisory committees providing input regarding industry needs and curriculum planning. We have worked with MTI to deliver customized short-term training for our existing employees. We anticipate the proposed Progressive Welding Technology program will bring additional workers into the manufacturing field, specific to companies like Trail King that have a high demand for **Skilled Welders.**

Sincerely,

Bruce D. Yakley  
Trail King Industries  
President & CEO



# Twin City Fan Companies, Ltd.

Brookings Plant

101 Sunrise Ridge Road South • Brookings, SD 5  
Phone (605) 692-7333 • Fax (605) 692-8011



October 3, 2016

Mark Wilson, President  
Mitchell Technical Institute  
1800 East Spruce Street  
Mitchell, SD 57301

Progressive Welding Technology program at MTI:

On behalf of Twin City Fan, I am proud to support the new "Progressive Welding Technology Program".

TCF is one of South Dakota's largest employers, and we rely on technical colleges, such as MTI, to ensure students acquire the knowledge, skills, abilities and advanced education credits needed for higher-wages. I have heard about your "Progressive Welding Technology" and support it to the fullest. We need general welders, robotic operators, destructive and non-destructive examinations.

TCF relies on local communities to support our employment needs, and without this basic need, our jobs would be sent off shore.

If there is something more you need from us, or how further we can support MTI, please feel free to call me directly.

Twin City Fan Companies, Ltd. is comprised of a diverse group of fan companies that manufacture a full spectrum of air moving equipment. The list of applications that utilize our products is practically endless and ranges from heavy duty custom fans for industrial applications to custom OEM fans to a wide variety of HVAC supply and exhaust fans for commercial plan and spec market.

Sincerely,

Scott Wingen  
Vice President of Manufacturing

October 12, 2016

Mark Wilson, President  
Mitchell Technical Institute  
1800 East Spruce Street  
Mitchell, SD 57301

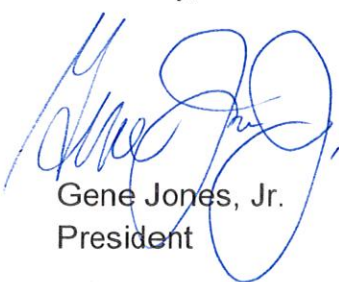
Dear Mr. Wilson,

As owners of a local business that relies heavily on the availability of skilled welders and the institutions that provide that training, we appreciate any opportunities for students to be more prepared when they enter the workforce.

In our opinion, the proposed new curriculum, Progressive Welding Technology appears to be an opportunity for students within the Welding and Advanced Manufacturing Technology program(s) to broaden their understanding of their desired career. Further, with these expanded opportunities, if taken advantage of by students, certainly give the student the ability to walk into an organization such as ours and hit the ground running.

We fully endorse your efforts to add the Progressive Welding Technology as an additional pathway at MTI.

Sincerely,



Gene Jones, Jr.  
President



Scott Jones  
Vice President



Brad Jones  
Vice President