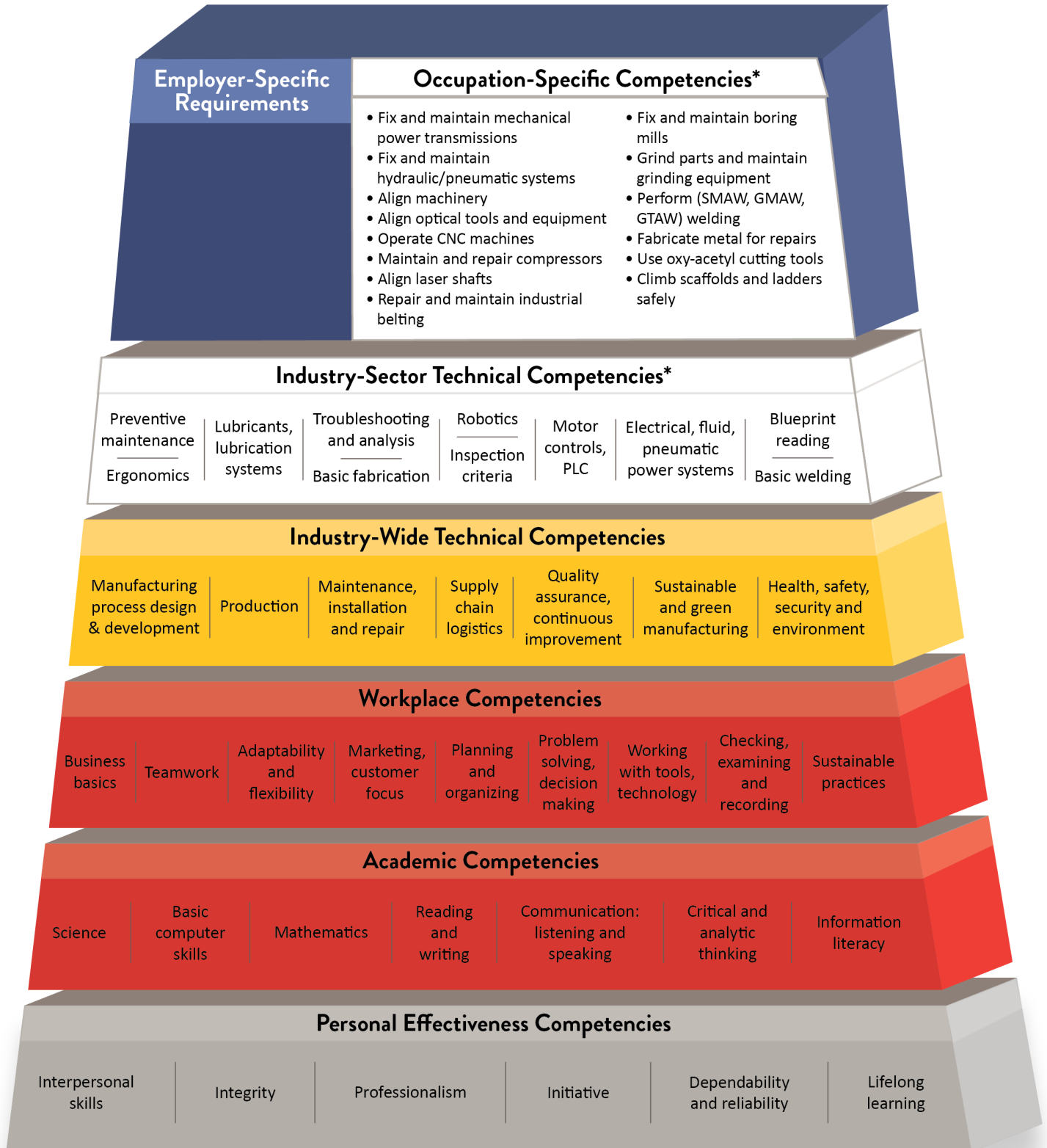


# Minnesota Dual-Training Pipeline

## Competency Model for Advanced Manufacturing

### Occupation: Maintenance and Repair Worker



#### Employer-Specific Requirements

#### Occupation-Specific Competencies\*

- Fix and maintain mechanical power transmissions
- Fix and maintain hydraulic/pneumatic systems
- Align machinery
- Align optical tools and equipment
- Operate CNC machines
- Maintain and repair compressors
- Align laser shafts
- Repair and maintain industrial belting
- Fix and maintain boring mills
- Grind parts and maintain grinding equipment
- Perform (SMAW, GMAW, GTAW) welding
- Fabricate metal for repairs
- Use oxy-acetyl cutting tools
- Climb scaffolds and ladders safely

#### Industry-Sector Technical Competencies\*

- |                        |                                 |                              |                     |                     |  |                   |
|------------------------|---------------------------------|------------------------------|---------------------|---------------------|--|-------------------|
| Preventive maintenance | Lubricants, lubrication systems | Troubleshooting and analysis | Robotics            | Motor controls, PLC | Electrical, fluid, pneumatic power systems | Blueprint reading |
| Ergonomics             |                                 | Basic fabrication            | Inspection criteria |                     |  | Basic welding     |

#### Industry-Wide Technical Competencies

- |  |            |                                      |                        |   |                                     |  |
|--|------------|--------------------------------------|------------------------|---|-------------------------------------|--|
| Manufacturing process design & development | Production | Maintenance, installation and repair | Supply chain logistics | Quality assurance, continuous improvement | Sustainable and green manufacturing | Health, safety, security and environment |
|--|------------|--------------------------------------|------------------------|---|-------------------------------------|--|

#### Workplace Competencies

- |                 |          |                              |                           |                         |                                  |                                |                                   |                       |
|-----------------|----------|------------------------------|---------------------------|-------------------------|----------------------------------|--------------------------------|-----------------------------------|-----------------------|
| Business basics | Teamwork | Adaptability and flexibility | Marketing, customer focus | Planning and organizing | Problem solving, decision making | Working with tools, technology | Checking, examining and recording | Sustainable practices |
|-----------------|----------|------------------------------|---------------------------|-------------------------|----------------------------------|--------------------------------|-----------------------------------|-----------------------|

#### Academic Competencies

- |         |                       |             |                     |                                       |                                |                      |
|---------|-----------------------|-------------|---------------------|---------------------------------------|--------------------------------|----------------------|
| Science | Basic computer skills | Mathematics | Reading and writing | Communication: listening and speaking | Critical and analytic thinking | Information literacy |
|---------|-----------------------|-------------|---------------------|---------------------------------------|--------------------------------|----------------------|

#### Personal Effectiveness Competencies

- |                      |           |                 |            |                               |                   |
|----------------------|-----------|-----------------|------------|-------------------------------|-------------------|
| Interpersonal skills | Integrity | Professionalism | Initiative | Dependability and reliability | Lifelong learning |
|----------------------|-----------|-----------------|------------|-------------------------------|-------------------|

Based on: Advanced Manufacturing Competency Model Employment and Training Administration, United States Department of Labor, April 2010.

\*Pipeline recommends the Industry-Sector Technical Competencies as formal training opportunities (provided through related instruction) and the Occupation-Specific Competencies as on-the-job training opportunities.



## Competency Model for Maintenance and Repair Worker

**Maintenance and repair worker** – Individual who works in manufacturing whose job it is to maintain and repair manufacturing equipment and other industrial machinery, such as conveying systems, production machinery, and packaging equipment.

### Industry-Sector Technical Competencies

**Related Instruction** for dual training means the organized and systematic form of education resulting in the enhancement of skills and competencies related to the dual trainee's current or intended occupation.

- **Ergonomics** – Knowledge of how to modify machines so operation is safe and productive for operator.
- **Preventative maintenance** – Training to anticipate and prevent potential malfunction of tools and machinery.
- **Lubricants/lubrication systems** – Understanding of why lubricants and lubricant systems are used and when it is most beneficial to use them.
- **Troubleshooting and analysis** – Training in troubleshooting issues with machinery using tools and knowledge of machinery.
- **Robotics** – Understand how to maintain and repair robotic devices.
- **Inspection criteria** – Know how to do proper machine inspection.
- **Motor controls and PLCs** – Understanding of how to program motor controls and PLCs and how to use them for interfacing, operation, and programming.
- **Blueprint reading** – Training on how to interpret blueprints and use those blueprints to build reliable and serviceable objects.
- **Electrical, fluid, pneumatic power systems** – Understand how electrical, fluid, and pneumatic power systems function, and know how to maintain them.
- **Basic welding** – Know how to operate welding equipment to safely perform welds that repair and maintain manufacturing machines and equipment.

- **Basic fabrication** – Demonstrate an understanding of metal fabrication by cutting, altering, and shaping steel or other materials through use of different tools, techniques, and processes prior to welding.

## Occupation-Specific Competencies

**On-the-Job Training (OJT)** is hands-on instruction completed at work to learn the core competencies necessary to succeed in an occupation. Common types of OJT include job shadowing, mentorship, cohort-based training, assignment-based project evaluation and discussion-based training.

- **Fix and maintain mechanical power transmissions** – Demonstrate machine operation with mechanical power transmissions to know how to maintain and repair them.
- **Fix and maintain hydraulic/pneumatic systems** – Demonstrate function and operation of manufacturing hydraulic and pneumatic systems to know how to maintain and repair them.
- **Align machinery** – Ability to make repairs and adjustments that align manufacturing machinery for proper operation.
- **Align optical tools and equipment** – Ability to make repairs and adjustments to optical tools and equipment that align advanced manufacturing optical systems.
- **Operate CNC machines**– Know how to operate a CNC machine to be able to perform maintenance and repair on the CNC machine.
- **Maintain and repair compressors** – Understand how to operate compressors in order be able to perform repair and maintenance on factory compressors.
- **Align laser shafts** – Know how to demonstrate proper alignment principles and practices including troubleshooting by use of a laser shaft alignment tool.
- **Repair and maintain industrial belting** – Understand how to operate industrial belting equipment to know how to maintain and repair these types of assembly systems.
- **Fix and maintain boring mills** – Understand how to operate boring mills to be able to maintain and repair them in the manufacturing production facility.
- **Grind parts and maintain grinding equipment** – Know how to perform grinding on parts as needed, as well as know how to maintain the grinding equipment.

- **Perform (SMAW, GMAW, GTAW) welding**— Exhibit knowledge and ability to perform shielded metal arc welding (SMAW), gas metal arc welding (GMAW), and gas tungsten arc welding (GTAW) in a safe manner to conduct repairs to manufacturing machines and equipment.
- **Fabricate metal for repairs** – Know how to perform metal fabrication to repair manufacturing machines and equipment.
- **Use oxy-acetyl cutting tools** – Know how to safely use tools that perform oxy-acetyl cutting.
- **Climb scaffolds and ladders safely** – Demonstrate how to safely ascend and perform job functions while using a scaffold and/ or ladder when working on manufacturing machines that are tall and need use of scaffolds/ ladders to reach to perform repairs and maintenance.

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