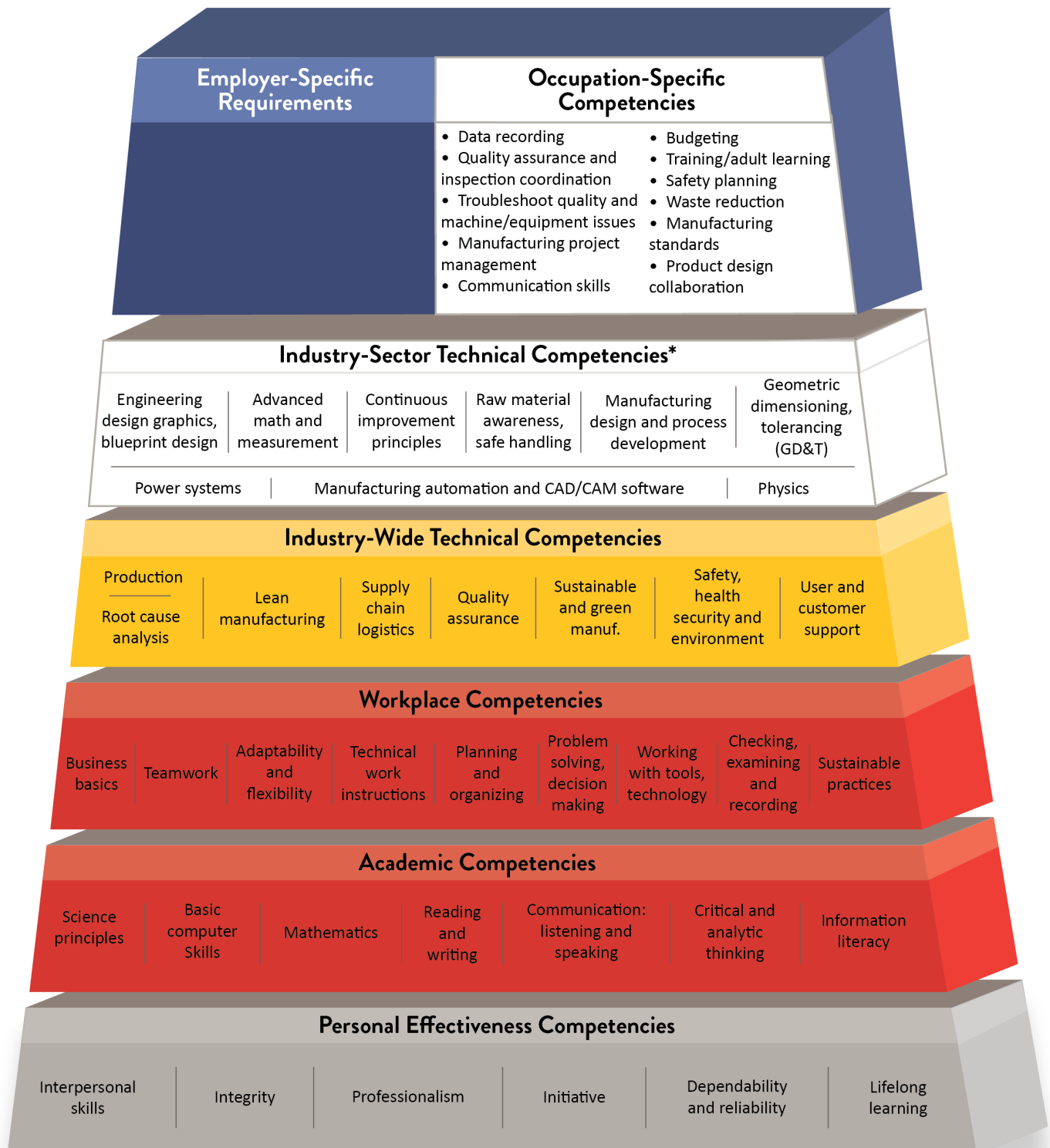# Minnesota Dual-Training Pipeline
Competency Model for Advanced Manufacturing
Occupation: Manufacturing Engineer

Employer-Specific Requirements

Occupation-Specific Competencies

- Data recording
- Quality assurance and inspection coordination
- Troubleshoot quality and machine/equipment issues
- Manufacturing project management
- Communication skills
- Budgeting
- Training/adult learning
- Safety planning
- Waste reduction
- Manufacturing standards
- Product design collaboration

Industry-Sector Technical Competencies*

Engineering design graphics, blueprint design	Advanced math and measurement	Continuous improvement principles	Raw material awareness, safe handling	Manufacturing design and process development	Geometric dimensioning, tolerancing (GD&T)

Power systems	Manufacturing automation and CAD/CAM software	Physics

Industry-Wide Technical Competencies

Production / Root cause analysis	Lean manufacturing	Supply chain logistics	Quality assurance	Sustainable and green manuf.	Safety, health security and environment	User and customer support

Workplace Competencies

Business basics	Teamwork	Adaptability and flexibility	Technical work instructions	Planning and organizing	Problem solving, decision making	Working with tools, technology	Checking, examining and recording	Sustainable practices

Academic Competencies

Science principles	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 Manufacturing Engineer

Manufacturing Engineer– This position is generally responsible for creating manufacturing processes that develop products which meet customer demands of product specifications and quality standards. The position also helps lead the work to create improvements to production processes, methods and controls, and works with the manufacturer to develop marketing and delivery of new and/or existing manufactured product lines. Often, the manufacturing engineer will also assist with training and overseeing production employees in achieving the processes necessary for successful and high-quality production. In some instances, this person will collaborate with individual in charge of product design to ensure product can be made at facility and may at times also assist with overall product design.

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.

- **Engineering design, blueprint reading and design** – Know how to read and understand industrial prints for products as well how to sometimes design industrial prints using engineering graphics software to produce manufactured items.

- **Manufacturing design and process development** – Know how to create plans to maximize efficient shop production flow and tooling design while developing mathematically driven business processes to reduce the probability that an error or defect in production will occur.

- **Advanced math and measurement** – Understanding of how to apply math skills, typically through calculus, understand statistics, make accurate measurements, use conversion charts, and use measuring tools regarding various aspects of the manufacturing process.

- **Continuous improvement principles** – Understanding of how to look for ways to minimize and reduce process wastes, to notice and correct machine abnormalities, to maintain records and to adapt to process changes such as cycle times, set-ups, and tooling.

- **Raw material awareness and safe handling** – Understanding of the different raw materials possibly involved in production and how certain machine settings, temperatures, etc. can potentially impact different materials.

- **Geometric dimensioning and tolerancing (GD & T)** – Understanding of the system for defining and communicating engineering tolerances through symbolic language on engineering drawings and blueprints.

- **Physics** – Understand principles of physics and how they are applied in the manufacturing production floor setting.

- **Power systems** – Understand the principles of all different systems, with a primary focus on electricity, through both its effect and needs for product development, implementation, and production.

- **Manufacturing automation and CAD/CAM software** – Know how to do the basics of CNC programming, CAD/ CAM software, and how to incorporate robotics and automation into manufacturing design and production processes.

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.

- **Data recording** – Know how to regularly maintain records of materials used, products made and timing for set-up, operation cycle time and change over to new / different product(s).

- **Safety planning** – Understand how be safe in the production environment and develop processes that ensure safety standards for staff during the production process.

- **Waste reduction** – Know how to develop processes that maximize material efficiently to lower the amount of waste during production.

- **Manufacturing standards** – Work to design, implement and oversee standards for how production will flow and be conducted in the manufacturing facility.

- **Product design collaboration** – Understand how to collaborate with individual(s) responsible for designing the manufactured product to ensure it can be efficiently produced at the facility and in some instances assist with overall product design.

- **Quality assurance and inspection coordination** – Understand how to work effectively with quality assurance and inspection team to ensure that products are meeting design and customer requirements.

- **Troubleshoot quality and machine/ equipment issues** – Know how to strategically think through what may be causing quality defects as well as machine / equipment issues and quickly brainstorm and implement approaches to address these concerns.

- **Manufacturing project management** – Know how to take a product design project from design elements to production implementation and ultimately full-scale production.

- **Communication skills** – Know how to effectively communicate with production floor staff and manufacturing team to ensure product design enters production floor and comes out with a successfully made product. Also know how to communicate well with marketing, management, and supply vendors to see through overall success of product.

- **Budgeting** – Understands how to plan for costs associated with projects, while considering for cost of materials, process and time estimates to stay within budget and meet gross margin targets.

- **Training / adult learning** – Know how to train adults on new processes and/or new equipment that may be necessary as a result of newly designed engineered products created by the manufacturing engineer.

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