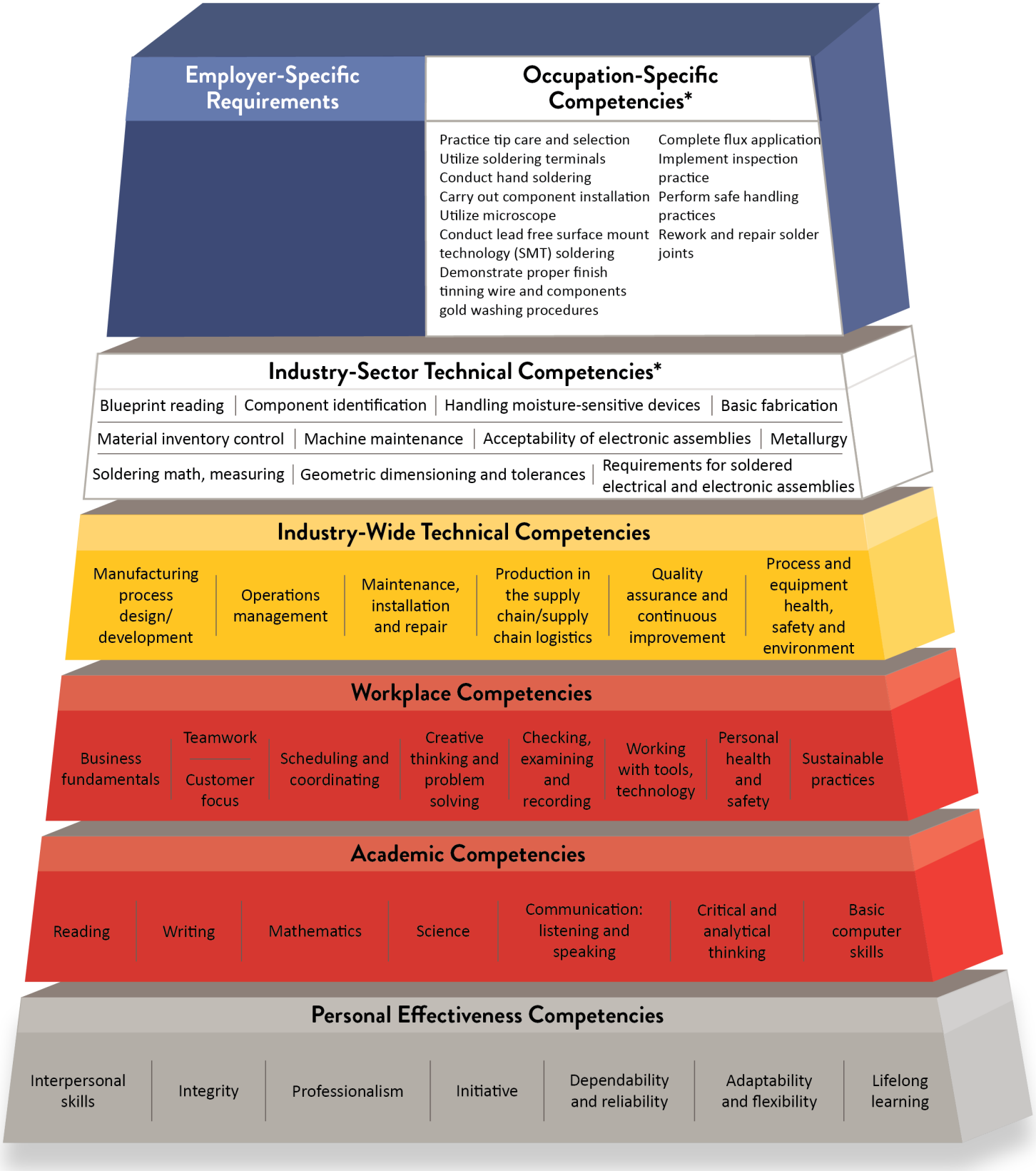
Minnesota Dual-Training Pipeline

Competency Model for Advanced Manufacturing
Occupation: Solderer



Based on: Advanced Manufacturing Competency Model, Employment and Training Administration, United States Department of Labor, February 2025. For more detailed information about competency model creation and sources, visit dli.mn.gov/business/workforce/advanced-manufacturing.

Competency Model for Solderer

Solderer – An individual who is responsible for the proper mechanical and electrical assembling of metals and various components together with various hand soldering procedures to help create a product within a manufacturing environment.

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

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.

- **Blueprint reading** – Know how to read and understand work instructions and technical documents. Develop the skills necessary to interpret drawings common to electronics manufacturing. Basic understanding of orthographic projection drawings and interpreting specified information and symbols.
- **Component identification** – Ability to identify electronic components and to interpret and understand markings, values and how they impact the product throughout assembly stages.
- **Handling moisture sensitive devices** – Know how to properly identify and handle electronic components susceptible to damage from exposure to moisture.
- **Basic fabrication** – Understanding of component fabrication by cutting, altering, and shaping of other materials using different tools, techniques, and processes prior to soldering.
- **Material inventory control** – Knowledgeable of how to manage stock materials as well as track and purchase necessary items to support the manufacturing process.
- **Machine maintenance** – Understand how to complete appropriate and thorough maintenance procedures to keep soldering tools and equipment running safely and reliably.
- **Acceptability of electronic assemblies** – Understand how to identify product acceptance criteria for consumer and high reliability printed wiring assemblies.

- **Metallurgy** – Ability to select the appropriate soldering process for a particular application, choose or adjust solder iron parameters and techniques to optimize soldering properties and avoid solder defects.
- **Soldering math and measuring** – Ability to apply basic math skills, make accurate measurements and use measuring tools regarding various aspects of the soldering process.
- **Geometric dimensioning and tolerances** – Knowledge of the symbolic way that specific tolerances on blueprint drawings are shown and how these tolerances impact the manufactured part.
- **Requirements for soldered electrical and electronic assemblies** – Understand properties of solder materials and processes in conducting electricity. Focus on understanding criteria for materials, methods and verification of quality soldered joints and defects.

Occupation-Specific Competencies

On-the-Job Training 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.

- **Practice tip care and selection** – Knowledgeable on how to properly maintain soldering tips and extend tip life by proper tip size selection for appropriate application.
- **Utilize soldering terminals** – Understand the details required for soldering wires to electronic terminals.
- **Conduct hand soldering** – Know how to safely conduct tin lead and lead-free hand soldering.
- **Carry out component installation** – Understand common techniques for hand soldering surface mount components using a hand soldering iron.
- **Utilize microscope** – Ability to routinely utilize a microscope to ensure that soldering is done exactly at points that it should be on the given part.
- **Conduct lead free surface mount technology (SMT) soldering** – Ability to conduct lead free soldering application in surface mount processes.
- **Demonstrate proper finish tinning wire and components gold washing procedures** – Demonstrate how to remove and reapply gold finish on variety materials using the correct procedures. Practice safe working procedures for handling the equipment and tools in the tinning process.

- **Complete flux application** – Understand proper use and chemistry types for specified flux application.
- **Implement inspection practice** – Demonstrate how to identify soldering defects, confirm product is up to customer standards, and use appropriate tools to accomplish solder joint inspections.
- **Perform safe handling practices** – Knowledgeable of how to safely work with materials that get very hot and can cause burns to skin. Understand best practices to stay safe in the occupation.
- **Rework and repair solder joints** – Know how to refine solder joints after inspection without compromising the integrity of the main part component and solder joint.

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