## Mechanical/Electrical Engineering



Youth Apprenticeship

#### MECHANICAL/ELECTRICAL ENGINEERING

Mechanical/Electrical Engineering youth apprentices use mechanical/electrical drawings to contribute to the construction of prototypes, concepts, and mechanical/electrical engineering projects. Apprentices must adhere to industry safety and security standards.

**Length of Apprenticeship:** One year. Completion of the Engineering Drafting pathway is a prerequisite to this program.

#### REQUIRED COMPETENCIES

Youth apprentices must become proficient in both general employability and occupation-specific competencies. All of these, and examples of how each can be demonstrated, are found in the following pages. A total of 11 occupational competencies must be learned for this occupation. Employers may substitute out one of these and should write in the competency they are adding. Youth apprentices must be evaluated on these competencies at least two times each year of their apprenticeship.

#### **Competencies**

- 1. Interpret mechanical and/or electrical technical drawings
- 2. Develop the engineering problem and plan with team
- 3. Research physical limitations
- 4. Research required material properties
- 5. Research manufacturing/assembly process and limitations
- 6. Design prototype with team
- 7. Prepare prototype technical drawings
- 8. Prepare technical drawing prototype
- 9. Test and revise prototype
- 10. Analyze prototype test results
- 11. Apply quality concepts to project

#### POST-SECONDARY PATHWAY OPPORTUNITIES

There are several post-secondary pathway opportunities in this area. The following is a partial list.

- Mechanical Design Technology
- Mechanical Engineering Technology

# WISCONSIN— YOUTH APPRENTICESHIP SINCE 1991

# **Mechanical/Electrical Engineering**

Youth Apprenticeship

#### ON-THE-JOB LEARNING PERFORMANCE STANDARDS GUIDE

#### YOUTH APPRENTICE INFORMATION

| Youth Apprentice Name                        |  |
|--|--|
| YA Coordinator                               |  |
| YA Consortium                                |  |
| School District                              |  |
| SIGNATURES                                   |  |
| The On-the-lob Learning Performance Standa   | ards Guide includes a list of competencies youth   |
| apprentices learn through mentoring and trai | ·  |
| should be reviewed with the employer/mento   | tors and School-Based or YA coordinators: This document<br>or, school-based or YA coordinator on a regular basis with<br>plan future steps to ensure completion of the required<br>ordinator, and the apprentice sign below. |
| Em<br>1 <sup>st</sup> Evaluation (Required)  | ployer/Mentor<br>2 <sup>nd</sup> Evaluation (Required)   |
| Employer/Mentor Signature                    | Employer/Mentor Signature  |
| Employer/Mentor                              | Employer/Mentor  |
| Business/Company                             | Business/Company   |
| Date Signed                                  | Date Signed  |
| 3 <sup>rd</sup> Evaluation (Optional)        | 4th Evaluation (Optional)  |
| Employer/Mentor Signature                    | Employer/Mentor Signature  |
| Employer/Mentor                              | Employer/Mentor  |
| Business/Company                             | Business/Company   |
| Date Signed                                  | Date Signed  |

## **School-Based and/or YA Coordinator**

#### 1<sup>st</sup> Evaluation (Required)

#### 2<sup>nd</sup> Evaluation (Required)

| School-Based and/or YA Coordinator Signature | School-Based and/or YA Coordinator Signature |
|--|--|
| School-Based and/or YA Coordinator           | School-Based and/or YA Coordinator           |
| School District or Organization              | School District or Organization              |
| Date Signed                                  | Date Signed                                  |

#### 3<sup>rd</sup> Evaluation (Optional)

#### 4th Evaluation (Optional)

| School-Based and/or YA Coordinator Signature | School-Based and/or YA Coordinator Signature |
|--|--|
| School-Based and/or YA Coordinator           | School-Based and/or YA Coordinator           |
| School District or Organization              | School District or Organization              |
| Date Signed                                  | Date Signed                                  |

#### **Youth Apprentice**

#### 1<sup>st</sup> Evaluation (Required)

#### 2<sup>nd</sup> Evaluation (Required)

| Youth Apprentice Signature    | Youth Apprentice Signature    |
|-------------------------------|-------------------------------|
| Youth Apprentice              | Youth Apprentice              |
| School District / High School | School District / High School |
| Date Signed                   | Date Signed                   |

#### 3<sup>rd</sup> Evaluation (Optional)

#### 4th Evaluation (Optional)

| Youth Apprentice Signature    |
|-------------------------------|
| Youth Apprentice              |
| School District / High School |
| Date Signed                   |
|                               |

#### EMPLOYABILITY SKILLS (TO BE COMPLETED BY YA EMPLOYER/MENTOR)

All youth apprentices must demonstrate the key employability skills listed below in order to complete the YA program. They do so by earning at least a "Meets Expectation" rating in each. **At least two evaluations are required each year of a youth apprenticeship.** More columns are included below for those who choose to conduct more frequent reviews.

| 1 | Working to Meet Expectations: Needs improvement; requires much assistance and supervision;     |
|---|--|
|   | rarely displays this behavior  |
| 2 | Meets Expectations: Meets entry-level criteria; requires some supervision; often displays this |
|   | behavior   |
| 3 | Exceeds Expectations: Exceeds entry-level criteria; requires minimal supervision; consistently |
|   | displays this behavior   |

| Employability Skills   |                            | Rati          | ing           |       |
|--|----------------------------|---------------|---------------|-------|
|  | Year One Evaluation Rating |               |               | iting |
| Competency and Rating Criteria   | Initial                    | Mid<br>Year 1 | Mid<br>Year 2 | Final |
| <ol> <li>Develops positive work relationships with others.         Examples of qualities and habits that the employee might exhibit include         Interacts with others with respect and in a non-judgmental manner         Responds to others in an appropriate and non-offensive manner         Helps co-workers and peers accomplish tasks or goals         Applies problem-solving strategies to improve relations with others         When managing others, shows traits such as compassion, listening, coaching, team development, and appreciation     </li> </ol>  | ☐ 1                        | ☐ 1           | ☐ 1           | ☐ 1   |
|  | ☐ 2                        | ☐ 2           | ☐ 2           | ☐ 2   |
|  | ☐ 3                        | ☐ 3           | ☐ 3           | ☐ 3   |
| <ul> <li>Communicates effectively with others Examples of qualities and habits that the employee might exhibit include</li> <li>Adjusts the communication approach for the target audience, purpose, and situation to maximize impact</li> <li>Organizes messages/information in a logical and helpful manner</li> <li>Speaks clearly and writes legibly</li> <li>Models behaviors to show active listening</li> <li>Applies what was read to actual practice</li> <li>Asks appropriate questions for clarity</li> </ul>   | ☐ 1                        | ☐ 1           | ☐ 1           | ☐ 1   |
|  | ☐ 2                        | ☐ 2           | ☐ 2           | ☐ 2   |
|  | ☐ 3                        | ☐ 3           | ☐ 3           | ☐ 3   |
| <ul> <li>Collaborates with others         Examples of qualities and habits that the employee might exhibit include     </li> <li>Works effectively in teams with people of diverse backgrounds regardless of sex, race, ethnicity, nationality, sexuality, religion, political views, and abilities</li> <li>Shares responsibility for collaborative work and decision making</li> <li>Uses the problem-solving process to work through differences of opinion in a constructive manner to achieve a reasonable compromise</li> <li>Avoids contributing to an unproductive group conflict</li> <li>Shares information and carries out responsibilities in a timely manner</li> </ul> | □ 1                        | □ 1           | □ 1           | □ 1   |
|  | □ 2                        | □ 2           | □ 2           | □ 2   |
|  | □ 3                        | □ 3           | □ 3           | □ 3   |

|    | Employability Skills  |                            | Rat        | ing                |            |
|----|---|----------------------------|------------|--------------------|------------|
|    |   | Year One Evaluation Rating |            |                    | iting      |
|    | Competency and Rating Criteria  | Initial                    | Mid        | Mid                | Final      |
|    |   |                            | Year 1     | Year 2             |            |
| 4. | Maintains composure under pressure  | <b>□1</b>                  | <b>□1</b>  | <b>□</b> 1         | <b>□1</b>  |
|    | Examples of qualities and habits that the employee might exhibit include  | □ <u>-</u>                 | ☐ 2        | □ <del>-</del> □ 2 | □ <b>2</b> |
|    | Uses critical thinking to determine the best options or outcomes when   |                            |            |                    |            |
|    | faced with a challenging situation  | ∐ 3                        | 3          | ☐ 3                | _          |
|    | <ul> <li>Carries out assigned duties while under pressure</li> </ul>  |                            |            |                    |            |
|    | Acts in a respectful, professional, and non-offensive manner while under  |                            |            |                    |            |
|    | pressure  |                            |            |                    |            |
|    | <ul> <li>Applies stress management techniques to cope under pressure</li> </ul>   |                            |            |                    |            |
|    | •   |                            |            |                    |            |
| 5. | Demonstrates integrity  | □ 1                        | □ 1        | □ 1                | □ 1        |
|    | Examples of qualities and habits that the employee might exhibit include  | □ 2                        | □ 2        | □ 2                | □ 2        |
|    | Carries out responsibilities in an ethical, legal and confidential manner   | <b>□</b> 3                 | □ <b>3</b> | 3                  | □3         |
|    | Responds to situations in a timely manner  The state of the state |                            |            |                    |            |
|    | Takes personal responsibility to correct problems   |                            |            |                    |            |
|    | Models behaviors that demonstrate self-discipline, reliability, and dependently.  |                            |            |                    |            |
|    | dependability   |                            |            |                    |            |
| 6  | Porforms quality work   |                            |            |                    |            |
| 6. | Performs quality work  Examples of qualities and habits that the employee might exhibit include   | <u></u> 1                  | 1          | <b>∐</b> 1         | <b>∐1</b>  |
|    | Carries out written and verbal directions accurately  | <b>□</b> 2                 | □ 2        | <b>2</b>           | <b>□</b> 2 |
|    | Completes work efficiently and effectively  | ☐ 3                        | ☐ 3        | ☐ 3                | ☐ 3        |
|    | Performs calculations accurately  |                            |            |                    |            |
|    | <ul> <li>Conserves resources, supplies, and materials to minimize costs and</li> </ul>  |                            |            |                    |            |
|    | environmental impact  |                            |            |                    |            |
|    | Uses equipment, technology, and work strategies to improve workflow   |                            |            |                    |            |
|    | Applies problem-solving strategies to improve productivity  |                            |            |                    |            |
|    | Adheres to worksite regulations and practices   |                            |            |                    |            |
|    | Maintains an organized work area  |                            |            |                    |            |
|    |   |                            |            |                    |            |
| 7. | Provides quality goods or services (internal and external)  | <b>□1</b>                  | <b>□1</b>  | <b>□1</b>          | <b>□1</b>  |
|    | Examples of qualities and habits that the employee might exhibit include  | _<br>2                     | 2          | 2                  | 2          |
|    | Shows support for the organizational goals and principles by own personal   | □ -                        | □ -<br>□ 3 | □ -                | □-         |
|    | actions   |                            |            |                    |            |
|    | Displays a respectful and professional image to customers   |                            |            |                    |            |
|    | Displays an enthusiastic attitude and desire to take care of customer needs   |                            |            |                    |            |
|    | Seeks out ways to increase customer satisfaction  |                            |            |                    |            |
|    | Produces goods to workplace specifications  |                            |            |                    |            |
|    | Charre initiative and call dispation  |                            |            |                    |            |
| 8. | Shows initiative and self-direction  Framples of qualities and habits that the ampleuse might exhibit include   | <u> </u> 1                 | <u> </u> 1 | <b>∐</b> 1         | <b>∐1</b>  |
|    | <ul> <li>Examples of qualities and habits that the employee might exhibit include</li> <li>Prioritizes and carries out responsibilities without being told</li> </ul>   | ☐ 2                        | □ 2        | □ 2                | □ 2        |
|    | <ul> <li>Responds with enthusiasm and flexibility to handle tasks that need</li> </ul>  | ☐ 3                        | ☐ 3        | <b>3</b>           | □ 3        |
|    | immediate attention   |                            |            |                    |            |
|    | Reflects on any unsatisfactory outcome as an opportunity to learn   |                            |            |                    |            |
|    | <ul> <li>Improves personal performance by doing something different or differently</li> </ul>   |                            |            |                    |            |
|    | <ul> <li>Analyzes how own actions impact the overall organization</li> </ul>  |                            |            |                    |            |
|    | Supports own action with sound reasoning and principles   |                            |            |                    |            |
|    | Balances personal activities to minimize interference with work   |                            |            |                    |            |
|    | responsibilities  |                            |            |                    |            |

| Employability Skills Rating  |                            |        |        |       |
|--|----------------------------|--------|--------|-------|
|  | Year One Evaluation Rating |        |        | ting  |
| Competency and Rating Criteria   | Initial                    | Mid    | Mid    | Final |
| 9. Adapts to change  | 1                          | Year 1 | Year 2 | 1     |
| <ul> <li>Examples of qualities and habits that the employee might exhibit include</li> <li>Shows flexibility and willingness to learn new skills for various job roles</li> <li>Uses problem-solving and critical-thinking skills to cope with changing circumstances</li> <li>Modifies own work behavior based on feedback, unsatisfactory outcomes, efficiency, and effectiveness</li> <li>Displays a "can do" attitude</li> </ul> | 2                          | 2      | 2      | 2     |
|  | 3                          | 3      | 3      | 3     |
| <ul> <li>10. Demonstrates safety and security regulations and practices Examples of qualities and habits that the employee might exhibit include <ul> <li>Follows personal safety requirements</li> <li>Maintains a safe work environment</li> <li>Demonstrates professional role in an emergency</li> <li>Follows security procedures</li> <li>Maintains confidentiality</li> </ul> </li></ul>                                      | ☐ 1                        | ☐ 1    | ☐ 1    | ☐ 1   |
|  | ☐ 2                        | ☐ 2    | ☐ 2    | ☐ 2   |
|  | ☐ 3                        | ☐ 3    | ☐ 3    | ☐ 3   |
| <ul> <li>11. Applies job-related technology, information, and media Examples of qualities and habits that the employee might exhibit include <ul> <li>Applies technology effectively in the workplace</li> <li>Assesses and evaluates information on the job</li> <li>Assesses training manuals, website, and other media related to the job</li> </ul> </li> </ul>  | ☐ 1                        | ☐ 1    | ☐ 1    | ☐ 1   |
|  | ☐ 2                        | ☐ 2    | ☐ 2    | ☐ 2   |
|  | ☐ 3                        | ☐ 3    | ☐ 3    | ☐ 3   |
| <ul> <li>12. Fulfills training or certification requirements for employment         Examples of this requirement may include</li> <li>Participation in required career-related training and/or educational programs</li> <li>Passing certification tests to qualify for licensure and/or certification</li> <li>Participation in company training or orientation</li> </ul>  | ☐ 1                        | ☐ 1    | ☐ 1    | ☐ 1   |
|  | ☐ 2                        | ☐ 2    | ☐ 2    | ☐ 2   |
|  | ☐ 3                        | ☐ 3    | ☐ 3    | ☐ 3   |
| <ul> <li>13. Sets personal goals for improvement  Examples of this requirement may include</li> <li>Setting goals that are specific and measurable</li> <li>Setting work-related goals that align with the organization's mission</li> <li>Identifying strategies to reach goals</li> <li>Reflecting on goal progress to regularly evaluate and modify goals</li> </ul>  | □ 1                        | □ 1    | □ 1    | ☐ 1   |
|  | □ 2                        | □ 2    | □ 2    | ☐ 2   |
|  | □ 3                        | □ 3    | □ 3    | ☐ 3   |

# OCCUPATIONAL COMPETENCIES (TO BE COMPLETED BY YA EMPLOYER/MENTOR)

Youth apprentices must earn a rating of at least "MEETS EXPECTATIONS" in each competency by the conclusion of the apprenticeship. A total of 10 must be from the list below. If necessary, employers can substitute one competency with another occupationally appropriate skill. That skill should be added to the competency list for assessment. At least two evaluations are required each year of a youth apprenticeship. More columns are included below for those who choose to conduct more frequent reviews.

| 1 | Working to Meet Expectations: Needs improvement; requires much assistance and supervision;     |
|---|--|
|   | rarely displays this behavior  |
| 2 | Meets Expectations: Meets entry-level criteria; requires some supervision; often displays this |
|   | behavior   |
| 3 | Exceeds Expectations: Exceeds entry-level criteria; requires minimal supervision; consistently |
|   | displays this behavior   |

|    | Occupational Competencies   |            | Rati       | ngs        |        |
|----|---|------------|------------|------------|--------|
|    | ·   |            | Evalua     | _          |        |
|    |   | Mini       | mum Rat    | ing of 2 E | ACH    |
|    | Competency and Rating Criteria  |            | Check I    | Rating     |        |
|    |   | Initial    | Mid        | Mid        | Final  |
|    |   | Illitial   | Year 1     | Year 2     | Fillal |
| 1. | Interpret mechanical and/or electrical technical drawings                             | □ 1        | □ 1        | □ 1        | □ 1    |
|    | <ul> <li>use appropriate terminology</li> </ul>                                       | <b>□</b> 2 | <b>□</b> 2 | <b>□</b> 2 | □2     |
|    | <ul> <li>identify basic elements of mechanical and/or electrical technical</li> </ul> | <u> </u>   |            |            |        |
|    | drawings  |            |            |            |        |
|    | <ul> <li>identify lines, views, symbols, and representations</li> </ul>               |            |            |            |        |
|    | <ul> <li>interpret dimensions and scale</li> </ul>                                    |            |            |            |        |
|    | <ul> <li>interpret product specifications</li> </ul>                                  |            |            |            |        |
|    | <ul> <li>interpret dimensioning and tolerancing symbols</li> </ul>                    |            |            |            |        |
|    | analyze part prints   |            |            |            |        |
| 2. | Develop the engineering problem and plan with team                                    | □ 1        | □ 1        | □ 1        | □ 1    |
|    | <ul> <li>review the engineering problem, project instructions, and/or</li> </ul>      | <b>□2</b>  | □2         | □2         | □2     |
|    | specifications requirements   |            | <br>3      | <br>3      | <br>3  |
|    | <ul> <li>brainstorm possible solutions to meet project specifications with</li> </ul> |            |            |            |        |
|    | engineering team  |            |            |            |        |
|    | <ul> <li>identify engineering work piece/part/process</li> </ul>                      |            |            |            |        |
|    | <ul> <li>contribute to a decision matrix based on the problem statement</li> </ul>    |            |            |            |        |
|    | <ul> <li>identify and plan requirements for research and drawing</li> </ul>           |            |            |            |        |
|    | <ul> <li>identify research needed prior to drawing</li> </ul>                         |            |            |            |        |
|    | <ul> <li>identify critical features on the part/process</li> </ul>                    |            |            |            |        |
|    | <ul> <li>identify the key control characteristics</li> </ul>                          |            |            |            |        |
|    | <ul> <li>research previous Failure Mode and Effectives Analysis (FMEA) and</li> </ul> |            |            |            |        |
|    | work projects for similar work pieces/parts/processes                                 |            |            |            |        |
|    | • assess the seriousness of the failure effect on the next component or               |            |            |            |        |
|    | the user  |            |            |            |        |
|    | <ul> <li>determine design methods or product features that help diagnose</li> </ul>   |            |            |            |        |
|    | failure   |            |            |            |        |
|    | review conclusions  |            |            |            |        |
|    | <ul> <li>document problem statement, planning and identification process</li> </ul>   |            |            |            |        |

| Occupational Competencies  |            | Rati       | ngs        |           |
|--|------------|------------|------------|-----------|
|  |            | Evalu      |            |           |
|  | Mini       | mum Rat    | _          | ACH       |
| Competency and Rating Criteria   |            | Check      |            |           |
|  | Initial    | Mid        | Mid        | Final     |
| 3. Research physical limitations   |            | Year 1     | Year 2     |           |
| review research strategies identified in the problem statement                           |            |            | ∐ <b>1</b> |           |
| obtain/contact resources for researching physical limitations of                         | <b>□ 2</b> | <u> </u>   | <u></u>    | ☐ 2       |
| piece/part/process   | ∐3         | ∐3         | ∐ 3        | 3         |
| research physical constraints of limitations   |            |            |            |           |
| analyze forces applied to structures and mechanical devices                              |            |            |            |           |
| <ul> <li>identify the basic stress and vibration equations (mechanical only)</li> </ul>  |            |            |            |           |
| <ul> <li>determine shear and moment forces in a diagram (mechanical only)</li> </ul>     |            |            |            |           |
| <ul> <li>identify temperature and sensor ranges (electrical only)</li> </ul>             |            |            |            |           |
| <ul> <li>determine current loads and wire sizes (electrical only)</li> </ul>             |            |            |            |           |
| <ul> <li>determine environmental limitations of connectors (electrical only)</li> </ul>  |            |            |            |           |
| <ul> <li>analyze loads applied to structures and mechanical devices</li> </ul>           |            |            |            |           |
| calculate moment of inertia of structural members  |            |            |            |           |
| use graphical and mathematical analysis to identify physical limitations                 |            |            |            |           |
| determine efficiency in a mechanical system  |            |            |            |           |
| determine efficiency in an electrical system   |            |            |            |           |
| document physical research process   |            |            |            |           |
| 4. Research required material properties   | <b>□</b> 1 | <b>□1</b>  | <b>□1</b>  | <b>□1</b> |
| review research strategies identified in the problem statement                           |            |            |            |           |
| obtain/contact resources for researching physical limitations of                         |            |            | ∐ 2<br>□ 2 |           |
| piece/part/process   | 3          | ∐3         | ∐ 3        | ∐3        |
| identify material properties   |            |            |            |           |
| <ul> <li>select a material and standard structural shape to fit design</li> </ul>        |            |            |            |           |
| specifications and environmental conditions  |            |            |            |           |
| <ul> <li>review research, testing, and conclusions with worksite professional</li> </ul> |            |            |            |           |
| document material properties research as required  |            |            |            |           |
| 5. Research manufacturing/assembly process and limitations                               | +          |            |            |           |
| review research strategies identified in the problem statement                           |            |            | ∐ <b>1</b> |           |
| obtain/contact resources for researching physical limitations of                         | <u> </u> 2 | <u> </u> 2 | <u></u>    | <b>∐2</b> |
| piece/part/process   | 3          | ∐3         | ∐ 3        | 3         |
| <ul> <li>identify manufacturing processes used to fabricate and assemble part</li> </ul> |            |            |            |           |
| determine product handling during manufacturing  |            |            |            |           |
| identify features to be added to ensure proper assembly orientation                      |            |            |            |           |
| identify available parts and assemblies  |            |            |            |           |
| <ul> <li>document manufacturing process research</li> </ul>                              |            |            |            |           |
|  |            |            |            |           |
|  |            |            |            |           |
|  |            |            |            |           |
|  |            |            |            |           |
|  |            |            |            |           |
|  |            |            |            |           |

| Occupational Competencies      |  | Ratings                  |            |            |                    |
|--------------------------------|--|--------------------------|------------|------------|--------------------|
|                                |  |                          | Evalu      |            |                    |
| Compatency and Poting Critoria |  | Minimum Rating of 2 EACH |            |            |                    |
| Competency and Rating Criteria |  | Check Rating Mid Mid     |            |            |                    |
|                                |  | Initial                  | Year 1     | Year 2     | Final              |
| 6.                             | Design prototype with team   | □ 1                      | □ 1        | □ 1        | □ 1                |
|                                | review the problem statement identified  | □ 2                      | □ 2        | □ 2        | □ 2                |
|                                | <ul> <li>define the work piece/part/process engineering specifications based on<br/>preliminary research and testing</li> </ul>                      | □ 3                      | □ 3        | □ 3        | □ 3                |
|                                | <ul> <li>select mechanical and/or electrical elements by type and size</li> </ul>  |                          |            |            |                    |
|                                | select prototype materials   |                          |            |            |                    |
|                                | <ul> <li>determine form, fit, function, and relationship of components and<br/>assembly</li> </ul>   |                          |            |            |                    |
|                                | <ul> <li>integrate design for manufacturing and assembly</li> </ul>  |                          |            |            |                    |
|                                | complete engineering calculations for prototype  |                          |            |            |                    |
|                                | set initial tolerances based on preliminary research factors   |                          |            |            |                    |
|                                | estimate cost factors  |                          |            |            |                    |
| 7.                             | Prepare prototype technical drawings   | 1                        | <b>□</b> 1 | <b>□</b> 1 | <b>□1</b>          |
|                                | <ul> <li>draw appropriate views of standard components</li> </ul>  | ☐ <b>2</b>               | ☐ <b>2</b> | ☐ <b>2</b> | □ <del>1</del> □ 2 |
|                                | • position the components in relationship to other components  | ☐3                       |            |            | 3                  |
|                                | • select references  |                          |            |            |                    |
|                                | <ul> <li>dimension and fully constrain the drawing</li> </ul>  |                          |            |            |                    |
|                                | create pattern drawings for parts  |                          |            |            |                    |
|                                | transfer parts into an assembly  |                          |            |            |                    |
|                                | simulate fit or motion to analyze problems, issues, or processes   |                          |            |            |                    |
|                                | <ul> <li>edit features such as depth, direction, planes, attributes</li> <li>resolve failed features (redefine, reroute, reorder, delete)</li> </ul> |                          |            |            |                    |
|                                | <ul> <li>create and edit assemblies (insert, align, mate)</li> </ul>   |                          |            |            |                    |
|                                | <ul> <li>create features in assemblies using mate features</li> </ul>  |                          |            |            |                    |
|                                | <ul> <li>assess fastener selection based on strength, cost, material, appearance,<br/>and ease of assembly during installation</li> </ul>            |                          |            |            |                    |
|                                | detail drawing to request parts fabrication  |                          |            |            |                    |
|                                | <ul> <li>compare measurements with original specifications for form and</li> </ul>   |                          |            |            |                    |
|                                | function designated in engineering problem statement   |                          |            |            |                    |
|                                | revise drawing   |                          |            |            |                    |
| 8.                             | Prepare technical drawing prototype  | 1                        | <b>□</b> 1 | <b>□</b> 1 | <b>□</b> 1         |
|                                | request parts fabrication  |                          |            |            |                    |
|                                | <ul> <li>order commercial materials and/or parts needed for prototype</li> </ul>   | <br>☐ 3                  |            |            | □ 3                |
|                                | build models/prototypes  |                          |            |            | ]                  |
|                                | • operate fabrication tools and machines (i.e., drill press, grinders, engine  |                          |            |            |                    |
|                                | lathe, soldering irons, etc.)  |                          |            |            |                    |
|                                | <ul> <li>assemble part(s) and components as specified in prototype drawing</li> <li>verify assembly as indicated in prototype drawings</li> </ul>    |                          |            |            |                    |
|                                | <ul> <li>verify assembly as indicated in prototype drawings</li> <li>verify assembly of prototype with worksite professional</li> </ul>              |                          |            |            |                    |
|                                | , 2222, 2. p. 2. 2. 3, p. 2. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.  |                          |            |            |                    |
|                                |  |                          |            |            |                    |
|                                |  |                          |            |            |                    |

| Occupational Competencies  |                   | Rati                                  | ngs               |                   |  |
|--|-------------------|---------------------------------------|-------------------|-------------------|--|
| Competency and Rating Criteria   |                   | Evaluation                            |                   |                   |  |
|  |                   | Minimum Rating of 2 EACH Check Rating |                   |                   |  |
|  |                   | Mid Mid                               |                   |                   |  |
|  | Initial           | Year 1                                | Year 2            | Final             |  |
| <ul> <li>9. Test and revise prototype</li> <li>determine testing required based on engineering problem statement</li> <li>create documents of testing procedures and scenarios</li> <li>set up prototype</li> <li>test apparatus</li> <li>operate test controlling equipment</li> <li>record prototype test results</li> <li>set up and conduct tests of complete units and components</li> <li>test fit or motion</li> <li>test different scenarios to multiple variables</li> <li>test the feasibility of product/design</li> <li>test operational conditions</li> <li>test extreme conditions</li> <li>record test procedures and testing information</li> <li>record test results data</li> <li>organize testing data</li> </ul> | ☐ 1<br>☐ 2<br>☐ 3 | □ 1<br>□ 2<br>□ 3                     | □ 1<br>□ 2<br>□ 3 | ☐ 1<br>☐ 2<br>☐ 3 |  |
| Obtain prototype testing data  calculate required capacities for work piece/part/process to obtain specified performance  analyze data and study performance  verify reliability and/or validity of the data  manipulate data into tables, graphs, spreadsheets  organize data into written and visual formats  compare test results with design or rated specifications and test objectives  recommend changes in product or test methods  adjust work piece/part/process/equipment to meet specifications  review prototype testing with engineering team  refer back to engineering problem statement  present final project recommendations  revise engineering plan or drawings  document prototype testing results             | □ 1<br>□ 2<br>□ 3 | □ 1<br>□ 2<br>□ 3                     | □ 1<br>□ 2<br>□ 3 | □ 1<br>□ 2<br>□ 3 |  |

| Occupational Competencies   |                          | Ratings  |        |       |  |
|---|--------------------------|----------|--------|-------|--|
|   | Evaluation               |          |        |       |  |
|   | Minimum Rating of 2 EACH |          |        |       |  |
| Competency and Rating Criteria  | Check Rating             |          |        |       |  |
|   | Initial                  | Mid      | Mid    | Final |  |
|   |                          | Year 1   | Year 2 |       |  |
| 11. Apply quality concepts to project   | □ 1                      | □ 1      | □ 1    | □ 1   |  |
| monitor customer requirements and specifications documents                              | □ 2                      | □ 2      | ☐ 2    | □ 2   |  |
| throughout process  | □ 3                      | □ 3      | □ 3    | □ 3   |  |
| <ul> <li>follow written standards and procedures</li> </ul>                             |                          |          |        |       |  |
| <ul> <li>communicate progress at each step of process</li> </ul>                        |                          |          |        |       |  |
| <ul> <li>justify decisions with data</li> </ul>   |                          |          |        |       |  |
| <ul> <li>inspect quality of prototype and manufactured work</li> </ul>                  |                          |          |        |       |  |
| pieces/parts/processes  |                          |          |        |       |  |
| <ul> <li>document failures and errors</li> </ul>  |                          |          |        |       |  |
| identify failures and errors  |                          |          |        |       |  |
| <ul> <li>recommend corrective actions</li> </ul>  |                          |          |        |       |  |
| <ul> <li>complete basic statistical process control charts</li> </ul>                   |                          |          |        |       |  |
| <ul> <li>document all research, design, testing, and production activities</li> </ul>   |                          |          |        |       |  |
| <ul> <li>follow the process for change control of design, process, and final</li> </ul> |                          |          |        |       |  |
| product   |                          |          |        |       |  |
| <ul> <li>track versions of drawings, parts, etc. (version control)</li> </ul>           |                          |          |        |       |  |
|   |                          |          |        |       |  |
| Competency Substitute (if you replaced a competency above, note the                     | □ 1                      | □ 1      | □ 1    | □ 1   |  |
| competency and rating)  | <b>2</b>                 | <b>2</b> | ☐ 2    | □ 2   |  |
|   | ☐ 3                      | ☐ 3      | ☐ 3    | ☐ 3   |  |
|   |                          |          |        |       |  |
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| Comments:   |                          |          |        |       |  |
| Comments.   |                          |          |        |       |  |
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