# Manufacturing Career Cluster

## 1. Evaluate the nature and scope of the Manufacturing Career Cluster and the role of manufacturing in society and in the economy.

MN 1.1: Identify the role and major functions of manufacturing businesses.
*Sample Indicators:*

- *Explain the importance of manufacturing to society.*
- *Identify the mission, major internal functions and structure of manufacturing businesses.*
- *Identify the customers, suppliers and stakeholders of manufacturing businesses, their roles and how they relate.*
- *Explain the major competitive challenges faced by manufacturing businesses.*
- *Identify and describe types of manufacturing systems.*
- *Analyze current trends in manufacturing systems.*

MN 1.2: Describe how manufacturing businesses manage performance.
*Sample Indicators:*

- *Explain how financial performance is measured.*
- *Explain how market performance is gauged.*
- *Explain how service and internal operations performance is determined.*
- *Explain how compliance and performance related to health, safety and environment are evaluated.*

MN 1.3: Describe how changes outside the manufacturing business impact the manufacturing business.
*Sample Indicators:*

- *Explain the impact of economic changes.*
- *Explain the impact of social changes.*
- *Explain the impact of technology changes.*

MN 1.4: Explain the role of risk management in reducing risks and improving performance in manufacturing businesses.
*Sample Indicators:*

- *Explain the objectives of risk-management programs.*
- *Explain the major types of loss exposure for manufacturing businesses.*
- *Explain the approaches for managing organizational risks.*

MN 1.5: Identify the roles and functions of government in regulating and supporting manufacturing businesses.
*Sample Indicators:*

- *Explain the roles in regulating domestic operations.*
- *Explain the roles in regulating international operations.*

- *Explain the roles in managing the infrastructures of manufacturing businesses.*
- *Explain the roles in health, safety and environmental management.*

## 2. Analyze and summarize how manufacturing businesses improve performance.

MN 2.1: Describe how manufacturing businesses manage customer relationships.
*Sample Indicators:*

- *Identify needs and requirements of internal and external customers.*
- *Describe customer satisfaction and fulfillment of customer requirements.*
- *Explain how manufacturing businesses respond to customer problems and complaints.*

MN 2.2: Describe how planning and budgeting are used to accomplish organizational goals and objectives.
*Sample Indicators:*

- *Explain how work plans and budgets are used to allocate people and resources.*
- *Identify reports used to track performance and resources and explain how they are used.*
- *Explain how plans and budgets are revised to meet goals and objectives.*

MN 2.3: Explain how planning is used to improve overall business performance.
*Sample Indicators:*

- *Identify and describe the most critical performance problems that manufacturing businesses typically face.*
- *Describe how improvements are identified.*

## 3. Comply with federal, state and local regulations to ensure worker safety and health and environmental work practices.

MN 3.1: Assess workplace conditions according to specified safety and health requirements.
*Sample Indicators:*

- *Identify the types of risk of injury/illness at work.*
- *Identify those who are susceptible to risk of injury/illness at work.*
- *Describe ways to positively impact occupational safety and health.*

MN 3.2: Following appropriate safety procedures, demonstrate methods to correct common hazards.
*Sample Indicators:*

- *Identify and describe common hazards in the workplace.*
- *Identify and describe major sources of information about hazards in the workplace (e.g., MSDS, work procedures, exposure control plans, training materials, labels and signage).*
- *Identify sources of combustible/flammable materials, fire and emergencies to establish a fire safe environment.*
- *Interpret safety signs and symbols.*

MN 3.3: Demonstrate safe workplace practices that promote personal and group health.
*Sample Indicators:*

- *Identify procedures necessary for maintaining a safe work area.*
- *Identify methods to correct common hazards.*
- *Identify methods for disposing of hazardous materials.*
- *Demonstrate principles of safe physical movement to avoid slips, trips and spills.*
- *Inspect and use personal protective equipment (PPE).*

## 4. Describe career opportunities and means to achieve those opportunities in each of the Manufacturing Career Pathways.

MN 4.1: Locate career opportunities in manufacturing that appeal to personal career goals.
*Sample Indicators:*

- *Locate and interpret career information for at least one Career Pathway.*
- *Identify job requirements for Career Pathways.*
- *Identify educational and credentialing requirements for Career Clusters and Career Pathways.*

MN 4.2: Match personal interests and aptitudes to manufacturing careers.
*Sample Indicators:*

- *Identify personal interests and aptitudes.*
- *Compare personal interests and aptitudes with job requirements and characteristics of career selected.*

MN 4.3: Identify pathways with common knowledge and skills that provide a worker with the potential for mobility.
*Sample Indicators:*

- *Produce a crosswalk of related career knowledge and skills.*
- *Identify examples of businesses that provide the various jobs in this Career Cluster.*

MN 4.4: Maintain personal certification and licensure requirements.
*Sample Indicators:*

- *Ensure that documentation is available to appropriate personnel.*
- *Identify training requirements needed for certifications.*
- *Obtain all necessary training to obtain certification/licensure.*

## 5. Describe government policies and industry standards that apply to manufacturing.

MN 5.1: Identify the major federal and state regulatory areas.
*Sample Indicators:*

- *Identify specific health and safety laws and regulations that impact manufacturing and the major topics they address.*

- *Identify specific environmental management laws and regulations and the major topics they address.*

MN 5.2: Explain how government agencies ensure compliance with environmental regulations and promote improved performance.
*Sample Indicators:*

- *Provide examples of the major regulations and types of data used by government to measure and monitor performance.*
- *Provide examples of how manufacturing organizations ensure their compliance.*
- *Provide examples of consequences that manufacturing organizations suffer when they fail to comply.*

MN 5.3: Demonstrate workplace activities that comply with safety, health and environmental policies and procedures.
*Sample Indicators:*

- *Promote and maintain knowledge of organizational safety, health and environmental management policies and procedures.*
- *Follow organizational policies and procedures.*
- *Educate and orient other workers.*
- *Maintain a safe work area.*
- *Identify, describe and report workplace hazards.*
- *Perform and participate in regular audits and inspections.*
- *Provide and maintain documentation needed for compliance.*
- *Conduct and participate in accident/incident investigations.*

MN 5.4: Demonstrate knowledge of rules and laws designed to promote safety and health and their rationale.
*Sample Indicators:*

- *Identify key rights of employees related to occupational safety and health.*
- *Identify the responsibilities of employers related to occupational safety.*
- *Explain the role of government agencies in providing a safe workplace.*

## 6. Describe workplace knowledge and skills common to manufacturing.

MN 6.1: Demonstrate the planning and layout processes (e.g., designing, print reading, measuring) used in manufacturing.
*Sample Indicators:*

- *Read prints and use the information to play, lay out and produce parts or products.*

MN 6.2: Summarize how materials can be processed using tools and machines.
*Sample Indicators:*

- *Use tools and the processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product.*

MN 6.3: Describe various types of assembling processes (e.g., mechanical fastening, mechanical force, joining, fusion bonding, adhesive bonding) used in manufacturing.
*Sample Indicators:*

- *Apply appropriate fastening or joining procedure to the design and production of a manufactured part or product.*

MN 6.4: Explain finishing processes (e.g., types of finishing materials, surface preparation, methods of application) used in manufacturing.
*Sample Indicators:*

- *Select a finishing process for a product appropriate to the job it must perform, the environment in which it functions and its aesthetic appeal.*

MN 6.5: Explain the processes of inspection and quality control used in manufacturing.
*Sample Indicators:*

- *Perform continuous on line inspections to ensure that parts or products meet design specifications.*
- *Explain the importance of Lean Manufacturing and Six Sigma in achieving error-free production of goods and materials.*

## Health, Safety & Environmental Assurance Career Pathway (MN-HSE)

### 1. Demonstrate the safe use of manufacturing equipment.

MN-HSE 1.1: Train others to use equipment following safe production practices.
*Sample Indicators:*

- *Give new operators a complete orientation of equipment.*
- *Make sure that all important information regarding equipment safety is communicated clearly and effectively.*
- *Make sure that maintenance workers obtain certification to train others in technical skills and knowledge where applicable.*
- *Make suggestions regarding training materials and content to appropriate parties.*
- *Use evaluations and feedback to improve training materials and methods.*
- *Make sure trainees have the correct tools to do the job during training.*
- *Conduct post-training evaluation to assure that workers can operate equipment safely.*
- *Use training and facilitation techniques appropriate for the audience.*
- *Document the quality and effectiveness of training.*

MN-HSE 1.2: Suggest processes and procedures to support safety and effectiveness in the work environment.
*Sample Indicators:*

- *Consult health and safety representatives to develop suggestions.*
- *Solicit operator feedback for use in creating a safer, more effective work environment.*
- *Make sure that suggestions for training improvement are documented and sent to the appropriate parties.*

MN-HSE 1.3: Monitor equipment and operator according to workplace safety and compliance with both company and national regulations.
*Sample Indicators:*

- *Perform monitoring responsibilities regularly.*
- *Report out-of-compliance or unsafe conditions immediately.*
- *Take corrective action on out-of-compliance or unsafe conditions.*
- *Check equipment to ensure it is operating according to specifications.*
- *Check tools for compliance with specifications.*
- *Forward accident and injury data to appropriate personnel for inclusion in OSHA recordables.*
- *Gather information on equipment use from operators to reveal existing or potential problems.*
- *Adjust equipment and processes as required.*
- *Document all monitoring data accurately.*

MN-HSE 1.4: Maintain, install and repair equipment following required safety, health and environmental requirements.
*Sample Indicators:*

- *Make regular safety communications to all employees.*
- *Review job safety analyses according to company policy.*
- *Follow hazardous materials procedures and policies such as Material Safety Data Sheet (MSDS) and "right to know."*
- *Perform environmental testing of workplace on a regular basis as required by company policy or regulation.*
- *Audit equipment to ensure there are no bypasses of safety guards.*
- *Verify that regulatory and company safety procedures are followed including lock-out/tag-out, confined space and ergonomics.*
- *Follow good housekeeping procedures.*
- *Verify that safety and personal protective equipment (PPE) is available, performs correctly and has current certification.*

## 2. Develop safety plans for production processes that meet health, safety and environmental standards.

MN-HSE 2.1: Conduct health, safety and/or environmental inspections.

*Sample Indicators:*

- *Make sure that audit records and documentation are complete and available.*
- *Use established procedures to conduct audits.*
- *Complete documentation related to audit.*
- *Use appropriate forums and format to report audit.*
- *Arrange for experts in situations needing additional credibility on an as-needed basis.*
- *Verify that audit was effective at identifying compliance and non-compliance issues.*

MN-HSE 2.2: Suggest processes and procedures to support safety and effectiveness in the work environment.

*Sample Indicators:*

- *Complete inspection reports accurately.*
- *Verify that corrective action reports or logs exist.*
- *Submit documentation to correct parties according to schedule.*
- *Verify that documentation includes all relevant information.*

MN-HSE 2.3: Conduct area health, safety and/or environmental inspections.

*Sample Indicators:*

- *Make sure that area inspection documentation is complete and available.*
- *Use procedures established to conduct area inspections.*
- *Use an appropriate forum and format to report area inspection documentation.*
- *Verify that inspections are thorough, timely and cover all relevant aspects of health, safety and/or environmental concerns.*
- *Verify that inspection includes visual inspections, as well as information gathered directly from workers.*
- *Arrange for relevant experts in situations needing additional credibility on an as needed basis.*

MN-HSE 2.4: Submit inspection and audit findings to correct parties.

*Sample Indicators:*

- *Verify that record of transmittal of inspection and audit findings is complete, accurate and includes all necessary signatures.*
- *Verify that inspection and audit findings are on file.*
- *Post inspection and audit findings appropriately to ensure accessibility to all relevant parties.*

MN-HSE 2.5: Perform environmental and safety inspections following local, federal and company regulations.

*Sample Indicators:*

- *Identify, report and monitor potential hazards in the workplace.*
- *Complete inspections according to company schedule and procedures.*
- *Review health, safety and environmental documentation and policies thoroughly and regularly.*

MN-HSE 2.6: Perform environmental and safety inspections following local, federal and company regulations.
*Sample Indicators:*

- *Identify, report and monitor potential hazards in the workplace.*
- *Complete inspections according to company schedule and procedures.*
- *Review health, safety and environmental documentation and policies thoroughly and regularly.*

### 3. Demonstrate a safety inspection process to assure a healthy and safe manufacturing environment.

MN-HSE 3.1: Document regulatory compliance using accepted protocols.
*Sample Indicators:*

- *Use approved schedules and specifications to complete regulatory compliance activities.*
- *Verify that compliance documentation meets all regulatory, legal and company standards.*
- *Verify that the current list of applicable regulations is accessible to all parties as required.*
- *Verify that compliance documentation is on file and accessible to all relevant parties.*
- *Maintain a system for filing the sign-off sheets for compliance.*

MN-HSE 3.2: Communicate about company health, safety and environmental policies and procedures to a variety of audiences.
*Sample Indicators:*

- *Make health, safety and environmental policies appropriately visible in the workplace.*
- *Use multiple methods to communicate policies and procedures.*
- *Maintain records of worker notification of policies and procedures on file.*
- *Deliver communication to correct parties in a timely manner.*
- *Obtain feedback from workers to determine effectiveness of communications.*
- *Use worker feedback to modify communication methods.*

MN-HSE 3.3: Follow the steps to stop an unsafe work practice.
*Sample Indicators:*

- *Modify manufacturing process to attain adequate levels of safety.*
- *Correct unsafe behavior immediately and communicate to correct parties.*
- *Use appropriate forum and format to document notice of unsafe practices.*
- *Use preventive maintenance or departmental safety audits to record corrective action for unsafe work practices.*
- *Update safety policies on a regular basis.*
- *Determine if observations and review of safety records show reduction in targeted injuries or unsafe behaviors.*
- *Give priority to avoiding unsafe practices when planning new manufacturing processes.*

MN-HSE 3.4: Report violations to appropriate authorities.
*Sample Indicators:*

- *Keep violation reports, including disciplinary action where appropriate, on file.*
- *Distribute violation reports to the responsible party.*
- *Follow the legal, regulatory and company policy to communicate violations to the proper authorities.*
- *Use the chain of command to ensure that corrective action is taken.*
- *Use the appropriate channels to report health, safety and environmental concerns.*

MN-HSE 3.5: Prepare for health, safety and environmental emergencies.
*Sample Indicators:*

- *Develop employee and fire emergency plans before emergencies occur.*
- *Implement employee and fire emergency plans during an emergency.*
- *Verify that emergency equipment is available and in working order.*
- *Take necessary action to ensure that employees are properly trained in emergency procedures.*
- *Use company policies and procedures to complete emergency drills.*

MN-HSE 3.6: Recommend solutions that will eliminate unsafe or environmentally damaging practices.
*Sample Indicators:*

- *Make sure all relevant parties are included in the development of safety solutions.*
- *Schedule follow-up meetings that include all appropriate parties to discuss solutions.*
- *Test and revise proposed solution(s) as necessary.*
- *Document suggestions and forward to correct parties.*

## 4. Evaluate a system of health, safety and/or environmental programs, projects, policies or procedures to determine compliance.

MN-HSE 4.1: Analyze root causes or problems and prioritize problems that need to be addressed first.
*Sample Indicators:*

- *Identify, document and communicate priorities clearly.*
- *Use appropriate data to prioritize goals and problems.*
- *Use specific situations to base selection of appropriate data analysis methods.*
- *Complete data analysis documentation accurately.*
- *Use input from workers and management to determine priorities.*

MN-HSE 4.2: Analyze health, safety and/or environmental data.
*Sample Indicators:*

- *Verify that analysis contains sufficient detail to meet applicable standards.*
- *Complete documentation of analysis accurately.*
- *Make raw data available for inspection.*

- *Compare company's health, safety and/or environmental assurance trends against industry health, safety and/or environmental trends.*
- *Forward analysis to correct parties.*
- *Select appropriate analysis methods and use them properly.*
- *Use appropriate and accurate metrics and/or develop them for use in the analysis.*
- *Use charts, graphs, or tables to communicate data in written conclusions and plans.*

MN-HSE 4.3: Select projects that address priorities identified to improve health, safety and/or environmental assurance.
*Sample Indicators:*

- *Design projects to support and reinforce established company goals.*
- *Take necessary action to involve all relevant parties in the development of the project.*
- *Use scheduling methods to ensure timely development.*
- *Verify that project plans are complete, detailed and include the resource requirements.*

MN-HSE 4.4: Describe policies and procedures for health, safety and/or environmental issues.
*Sample Indicators:*

- *Attend workshops, conferences and other career development sessions.*
- *Take action to ensure that involvement in a professional society relevant to job activities is ongoing.*
- *Take action to ensure that up-to-date resources on health, safety and/or environmental assurance are accessible to all relevant parties.*

MN-HSE 4.4: Benchmark health, safety and environmental or sustainability practices.
*Sample Indicators:*

- *Gather appropriate information from recognized industry leaders.*
- *Arrange for independent evaluations of worksite health, safety and/or environmental assurance practices.*
- *Use benchmarking information as a basis for making recommendations.*
- *Conduct and document analysis comparing current practice against benchmark data.*
- *Use a variety of means to gather information regarding excellent health, safety and/or environmental assurance practices.*

## 5. Evaluate continuous improvement protocols and techniques in health, safety and/or environmental practices.

MN-HSE 5.1: Advocate workplace safety in accordance with safety programs.
*Sample Indicators:*

- *Make workplace safety posters and other relevant information visible.*
- *Identify, model, recognize and publicize manufacturing practices for health, safety and/or environmental assurance.*

- *Make sure that workers responsible for health, safety and/or environmental assurance are regularly present in manufacturing workplace to encourage good health, safety and/or environmental assurance practices.*

MN-HSE 5.2: Suggest health, safety and/or environmental assurance programs to management and other workers.
*Sample Indicators:*

- *Keep materials supporting health, safety and/or environmental assurance programs on file.*
- *Document suggestions supporting health, safety and/or environmental assurance.*
- *Forward suggestions supporting health, safety and/or environmental assurance to all relevant parties.*
- *Make suggestions based on an accurate assessment of employee needs and interests, requirements in the workplace and business objectives.*
- *Discuss data and statistical analysis with decision-makers.*
- *Hold meetings to advocate for health, safety and/or environmental assurance programs with all relevant parties.*
- *Use various methods to market benefits of high quality suggestions supporting health, safety and/or environmental assurance programs.*

MN-HSE 5.3: Evaluate health, safety and/or environmental assurance programs.
*Sample Indicators:*

- *Continuously maintain, evaluate and report recordable incidents of injury and other incidences of health, safety and/or environmental assurance.*
- *Maintain a log of health, safety and/or environmental assurance information.*
- *Communicate evaluations to correct parties in a timely manner.*
- *Use evaluations to improve the outcomes of health, safety and/or environmental assurance programs.*
- *Keep self-assessment studies on health, safety and/or environmental assurance programs on file.*
- *Compare health, safety and/or environmental assurance statistics with industry benchmarks or standards.*

## 6. Conduct job safety and health analysis for manufacturing jobs, equipment and processes.

MN-HSE 6.1: Consult with outside sources about health, safety and/or environmental assurance aspects of jobs.
*Sample Indicators:*

- *Maintain an accurate list of relevant outside sources.*
- *Make postings of current emergency contact information accessible to all relevant parties.*
- *Maintain a contact log.*

MN-HSE 6.2: Develop job safety analysis for health, safety and environmental assurance programs.
*Sample Indicators:*

- *Hold meetings to conduct job safety analysis with all relevant parties.*
- *Generate suggestions for job safety improvements.*
- *Document and analyze relevant data.*
- *Hold one-on-one and small group meetings with workers to identify job safety issues.*
- *Make observations at worksites on a regular basis to gather information for job safety analysis.*

MN-HSE 6.3: Employ a variety of methods to gather information from employees about occupational hazards.
*Sample Indicators:*

- *Observe employees on a regular basis for safe work behaviors and practices.*
- *Maintain records of employee interviews regarding occupational hazards.*
- *Publish and distribute safety reports and statistics to relevant parties.*
- *Provide a method for employees to report safety concerns to relevant parties.*

MN-HSE 6.4: Suggest ways to eliminate hazards.
*Sample Indicators:*

- *Keep suggestions for eliminating the hazard on file.*
- *Complete safety-related work orders in a timely manner.*
- *Communicate suggestions to correct parties.*
- *Make suggestions that are relevant and appropriate.*

MN-HSE 6.5: Verify job safety analysis against experience on a regular basis.
*Sample Indicators:*

- *Evaluate job safety analysis with relevant injury and worksite data.*
- *Interview employees to gain their input.*

MN-HSE 6.6: Analyze an unsustainable manufacturing process and identify corrections.
*Sample Indicators:*

- *Explain how health, safe and environmental assurance are core components in sustainable manufacturing systems.*

## 7. Develop the components of a training program based on environmental health and safety regulations.

MN-HSE 7.1: Determine priorities for health, safety and/or environmental training needs.
*Sample Indicators:*

- *Conduct analysis of health, safety and/or environmental tasks at the job level.*
- *Analyze health, safety and/or environmental records to identify training needs.*
- *Document results of training assessments.*

- *Use the analysis to develop training plans with clear objectives.*
- *Solicit worker input regarding training needs.*

MN-HSE 7.2: Prepare health, safety and/or environmental training materials.
*Sample Indicators:*

- *Use appropriate resources to ensure that content included in training materials meets industry, government and company standards.*
- *Work with appropriate personnel to ensure that the training materials include the correct content to meet the training needs.*
- *Develop and implement a system to ensure that training materials are updated continuously.*
- *Work with appropriate personnel and outside sources as needed to make sure that training materials are clear, worker-friendly and appropriate for the audience.*
- *Develop and implement a system to ensure that training materials are available and accessible to all relevant parties.*

MN-HSE 7.3: Conduct health, safety and/or environmental training for employees.
*Sample Indicators:*

- *Document employee records to show that training has been delivered.*
- *Develop a training schedule that facilitates participation of employees.*
- *Develop evaluations that indicate workers' understanding of the training materials.*
- *Develop a system for verifying that appropriate workers receive training.*
- *Show how test results and certifications indicate effective training.*

MN-HSE 7.4: Document required health, safety and/or environmental training.
*Sample Indicators:*

- *Maintain training attendance records on file.*
- *Develop and maintain a training profile for each job.*
- *Maintain accurate records of test results and certifications achieved.*
- *Make documentation available on an as-needed basis to appropriate parties.*
- *Request feedback from trainees and document feedback that is received.*
- *Maintain confidentiality of the outcomes of the health, safety and/or environmental assurance training.*

MN-HSE 7.5: Plan future health, safety and/or environmental training.
*Sample Indicators:*

- *Make sure that appropriate content is included in training plans.*
- *Design training for the specific needs of individuals.*
- *Ask appropriate workers for input related to the content of the training.*
- *Design training plan to include effective evaluation and follow-up process.*
- *Include worker feedback when developing future training.*

MN-HSE 7.6: Train other employees in safe practices and emergency procedures.
*Sample Indicators:*

- *Verify that orientation meets all relevant laws, policies and regulations.*
- *Deliver safety instruction and updates on a regular schedule.*
- *Observe training to ensure it allows employees to raise safety concerns, ask questions and receive additional training.*

## Logistics and Inventory Control Career Pathway (MN-LOG)

### 1. Demonstrate positive customer service skills in regard to logistics and inventory control issues.

MN-LOG 1.1: Communicate material specifications and delivery schedules in a timely and accurate manner.
*Sample Indicators:*

- *Make sure that communication reflects knowledge of material specifications.*
- *Communicate delivery schedules clearly.*
- *Make sure that communication shows knowledge of both customer and business needs.*
- *Make sure that communication is clear and relevant to material and delivery issues.*
- *Communicate in a timely and accurate manner to the correct parties.*
- *Evaluate, track and report back material and delivery issues to original communicator.*
- *Track and document material specifications and delivery schedules.*
- *Discuss and resolve on the job issues and concerns quickly.*

MN-LOG 1.2: Communicate production requirements and product specifications.
*Sample Indicators:*

- *Make sure that communication reflects knowledge of production requirements, levels and product specifications.*
- *Initiate communication cross-functionally as required to meet production requirements, product specifications, or other customer or business needs.*
- *Notify all parties of production issues and problems in a timely way.*
- *Make sure that communication to production and products is clear and relevant.*
- *Evaluate, track and report production and product issues back to original communicator.*
- *Track and document communications related to production requirements and product specifications as appropriate.*

### 2. Demonstrate positive customer service skills in regard to logistics and inventory control issues.

MN-LOG 2.1: Check accuracy of order using prescribed verification procedures.

*Sample Indicators:*

- *Document product count accurately.*
- *Verify that product matches the purchase order and description.*
- *Verify that documentation is accurate as to count and product.*
- *Review order to ensure that contract terms and conditions are met.*
- *Use company procedures to report information to correct parties.*
- *Verify that health, safety, environmental and government regulations are met.*

MN-LOG 2.2: Package and unpackage materials and products.
*Sample Indicators:*

- *Check container to verify that packing meets regulatory requirements.*
- *Check container to verify that packing has proper labeling and meets shipping and safety regulations.*
- *Store or dispose of packaging materials properly.*
- *Verify that contents of packages match receiving tickets.*
- *Verify that bill of lading matches items shipped.*
- *Use packaging and unpackaging methods that keep returns and claims for damaged and improperly packaged goods to a minimum.*
- *Verify that outgoing labels have all relevant information.*
- *Check incoming labels to ensure that they meet all requirements.*

MN-LOG 2.3: Load and unload materials and products.
*Sample Indicators:*

- *Use proper equipment and techniques safely.*
- *Store materials correctly in a proper location.*
- *Verify that correct carrier and method is used for shipment.*
- *Verify that product arrives at appropriate destination.*
- *Load or unload product safely and according to government regulations.*
- *Check containers to ensure that damage to or contamination of materials is minimal.*

MN-LOG 2.4: Schedule transportation of products and materials to meet customer needs.
*Sample Indicators:*

- *Verify that appropriate carrier or method is used to ship product.*
- *Make sure that product is shipped on time.*
- *Verify that health, safety, environmental and government regulations are met.*
- *Verify that no customer complaints are received about late partial shipments or damaged goods.*
- *Select the most cost-effective method to ship products.*

### 3. Develop a safety inspection process to assure a healthy and safe manufacturing facility.

MN-LOG 3.1: Perform environmental and safety inspections or coordinate with a certified agent/service to ensure conformance to all relevant local, federal and company regulations.
*Sample Indicators:*

- *Identify, report and monitor potential hazards in the workplace.*
- *Take corrective action to correct potential hazards.*
- *Review health, safety and environmental documentation and policies thoroughly and regularly.*
- *Ensure that inspections meet all relevant health, safety and environmental laws and regulations.*
- *Complete inspections according to company schedule and procedures.*
- *Document inspection records and store them correctly.*

MN-LOG 3.2: Perform emergency drills as part of an emergency response team.
*Sample Indicators:*

- *Confirm that first aid training and certification on emergency and first aid procedures are complete and up-to-date.*
- *Comply with company and regulatory policies and procedures to respond to emergencies.*
- *Document emergency drills and incidents according to company and regulatory procedures promptly.*

MN-LOG 3.3: Identify unsafe conditions according to safety standards and report to proper authorities.
*Sample Indicators:*

- *Identify, report and document conditions presenting a threat to health, safety and the environment.*
- *Identify corrective actions.*

MN-LOG 3.4: Take corrective action following prescribed safety procedures.
*Sample Indicators:*

- *Consult appropriate parties and take corrective actions following company procedures promptly.*
- *Track and report ongoing safety concerns until corrective action is taken.*

MN-LOG 3.5: If in a management or supervisory position, train other employees in safe practices and emergency procedures following training orientation guidelines.
*Sample Indicators:*

- *Verify that all topics and procedures are covered in orientation to facilitate employee safety.*
- *Observe orientation to ensure that it makes clear the need and processes for employees to raise safety concerns, ask questions and receive additional training.*
- *Use company requirements to document orientation.*
- *Verify that orientation meets all relevant laws, policies and regulations.*
- *Deliver safety instruction and updates on a regular schedule.*

## 4. Manage inventory using logistics and control processes and procedures.

MN-LOG 4.1: Monitor location of materials during production process using a prescribed plan.
*Sample Indicators:*

- *Verify that materials are accessible to workstations.*
- *Check that cycle counts for raw and finished goods meet established standards.*
- *Rotate raw materials and stock to minimize old and outdated inventory.*
- *Verify that materials move across the floor in an efficient and cost-effective way.*
- *Implement monitoring activities to prevent disruption of production flow.*
- *Distribute plan to correct parties in a timely way.*

MN-LOG 4.2: Monitor placement of station materials to ensure production flow.
*Sample Indicators:*

- *Check that materials and quantities needed for production are correctly placed.*
- *Verify that orders from production are being filled in a timely way.*
- *Make raw materials accessible to workstations.*
- *Rotate raw material stock to minimize old and outdated inventory.*
- *Prevent materials damage to a minimum by avoiding improper stationing or transport.*
- *Identify defective materials.*
- *Take appropriate action when defective materials are identified.*

MN-LOG 4.3: Prepare documents that detail materials movement and inventory count.
*Sample Indicators:*

- *Verify that production orders are accurate.*
- *Use the correct format to generate accurate reports for material movement and inventory count.*
- *Produce reports in a timely fashion and distribute them properly.*
- *Take accurate inventory.*

MN-LOG 4.4: Establish lot sizes and reorder points to meet production requirements.
*Sample Indicators:*

- *Check that production efficiencies are maintained.*
- *Keep obsolete finished products to minimum.*
- *Use re-order points to minimize back-orders.*
- *Check that proper storage levels are maintained.*
- *Keep order lead-time requirements reasonable.*
- *Maintain inventory levels to minimize inventory value.*
- *Maintain inventory of raw material and finished goods to meet customer demands.*

MN-LOG 4.5: Conduct the on-site inventory to ensure productivity, safety, accuracy and teamwork.
*Sample Indicators:*

- *Take inventory to ensure minimum interference to production within required timeframe.*

- *Make sure that inventory corrections are accurate and kept to a minimal.*
- *Carry out inventory activities safely.*
- *Keep inventory movement to a minimum during inventory count.*
- *Maintain cooperation while conducting inventory.*
- *Use correct unit of measure to record inventory results.*
- *Follow asset protection and business control procedures.*
- *Make recommendations to minimize unsustainable energy use and minimize negative environmental impacts.*

MN-LOG 4.6: Report discrepancies in inventory audit.
*Sample Indicators:*

- *Use company format to present inventory audit.*
- *Distribute audit reports in a timely way to the proper parties.*
- *Communicate all inaccuracies to proper parties.*

MN-LOG 4.7: Identify causes of discrepancies in inventory audits.
*Sample Indicators:*

- *Make sure that investigations into inventory inaccuracies are complete, timely and include indication of root cause.*
- *Maintain collaborative and supportive interactions between material handlers and inventory control.*
- *Follow company policy in the event of inventory shortage.*
- *Report inaccuracies to the proper parties.*

MN-LOG 4.8: Adjust logistic processes and inventory in response to engineering changes.
*Sample Indicators:*

- *Follow company procedures when making change notices.*
- *Provide documentation of change notices and their implementation.*
- *Communicate change notices clearly to proper parties.*
- *Complete follow-up on paperwork properly.*
- *Make sure that documentation approving the logistics change is in hand prior to implementation.*
- *Review storage and retrieval systems to determine if upgrades and replacement are warranted.*

## Maintenance, Installation & Repair Career Pathway (MN-MIR)

### 1. Demonstrate maintenance skills and proficient operation of equipment to maximize manufacturing performance.

MN-MIR 1.1: Observe equipment operation during normal operating cycle to identify potential problems.

*Sample Indicators:*

- *Perform observations of equipment regularly.*
- *Report all unusual behaviors or unsafe conditions immediately to appropriate personnel.*
- *Document all aspects of equipment operations.*
- *Make sure that all safety requirements are in place during observations.*
- *Observe equipment and process operations a number of times for consistency.*
- *Analyze equipment and process data regularly.*

MN-MIR 1.2: Maintain up-to-date knowledge of all documentation related to equipment.
*Sample Indicators:*

- *Make all relevant materials easily available.*
- *Use machine identifiers, equipment lists and process data to locate relevant information.*
- *Use all relevant databases in a timely manner.*
- *Retrieve relevant information to the requirements of the work to be performed from documents quickly.*
- *Use only information that is up-to-date.*
- *Discuss interpretations and questions on materials, specifications and diagnostics.*

MN-MIR 1.3: Maintain information about equipment use and reliability.
*Sample Indicators:*

- *Accurately maintain data on equipment life.*
- *Keep documentation up-to-date.*
- *Accurately document tool change data.*
- *Ensure that contact information on tool vendor is readily available.*
- *Gather information to identify the proper tool for maintenance and repair tasks.*

MN-MIR 1.4: Maintain all relevant equipment operation and repair certifications.
*Sample Indicators:*

- *Properly plan certifications and schedule them in advance.*
- *Make sure that only qualified personnel perform certifications.*
- *Document certifications properly and report them to the correct parties.*
- *Follow all applicable laws and regulations when performing equipment inspections and documenting them.*
- *Keep records current and accurate.*
- *Verify that level of detail of certification documentation is appropriate.*
- *Forward information related to tool and equipment obsolescence to certify the repair, rebuild, or replacement.*

MN-MIR 1.5: Prepare maintenance and repair logs for shift-to-shift communication.
*Sample Indicators:*

- *Complete documentation and make it accessible to all appropriate parties.*

- *Submit repair report and preventive maintenance reschedule on time.*
- *Clearly communicate all important information and status reports to the next shift.*

MN-MIR 1.6: Set repair and maintenance priorities and schedule.
*Sample Indicators:*

- *Make sure all parties agree on priorities, scheduling conflicts and tasks associated with repair and maintenance prior to shutdown.*
- *Take staffing requirements into account.*
- *Give operators appropriate lead-time when notifying them that maintenance is scheduled.*
- *Coordinate with other departments to ensure disruptions to the production line are minimized.*
- *Respond to reports of critical problems in a timely way.*

MN-MIR 1.7: Suggest ways to prevent future equipment malfunctions.
*Sample Indicators:*

- *Make suggestions based on appropriate and accurate data or observations made during repairs.*
- *Include information on operator responsibility for predictive and preventive maintenance in a training program.*
- *Document suggestions properly and include all supportive materials.*
- *Conduct a cost-benefit analysis that shows when to replace equipment based on energy savings and reduced environmental problems.*

## 2. Demonstrate the safe use of manufacturing equipment to ensure a safe and healthy environment.

MN-MIR 2.1: Suggest processes and procedures to support safety and effectiveness in the work environment on a regular basis.
*Sample Indicators:*

- *Consult health and safety representatives for suggestions.*
- *Solicit operator feedback to evaluate training and create a safer, more effective work environment.*
- *Make sure suggestions for training improvement are documented and sent to the appropriate parties.*
- *Make suggestions that address safety, quality and productivity issues.*

MN-MIR 2.2: Monitor equipment and operator performance according to both company and national workplace safety regulations.
*Sample Indicators:*

- *Verify that monitoring is being performed regularly.*
- *Report out-of-compliance or unsafe conditions immediately.*
- *Take corrective action when out-of-compliance or unsafe conditions exist.*

- *Check equipment to ensure it is operating according to specifications and that tools are checked for compliance with specifications.*
- *Forward accident and injury data to appropriate personnel for inclusion in OSHA recordables.*
- *Gather information on equipment use from operators to reveal existing or potential problems.*
- *Adjust equipment and processes as required.*
- *Accurately document all monitored data.*

MN-MIR 2.3: Perform emergency drills as part of an emergency response team.
*Sample Indicators:*

- *Confirm that first aid training and certification on emergency and first aid procedures are complete and up-to-date.*
- *Comply with company and regulatory policies and procedures to respond to emergencies.*
- *Document emergency drills and incidents according to company and regulator procedures promptly.*

MN-MIR 2.4: Implement corrective action following safety protocols.
*Sample Indicators:*

- *Identify corrective actions.*
- *Promptly consult appropriate parties about corrective actions and immediately take corrective actions following company procedures.*
- *Track and report ongoing safety concerns until corrective action is taken.*

MN-MIR 2.5: Conduct safety, environmental and health audits as it relates to maintenance, installation and repair.
*Sample Indicators:*

- *Make regular safety communications to all employees.*
- *Review job safety analyses regularly according to company policy.*
- *Explain the ramifications of failure to accurately follow hazardous materials procedures and policies such as Material Safety Data Sheet (MSDS) and "right to know."*
- *Confirm that environmental testing of workplace is performed on a regular basis as required by company policy or regulation.*
- *Confirm that equipment is audited to ensure there are no bypasses of safety guards.*
- *Verify that regulatory and company safety procedures are followed including lock-out/tag-out, confined space and ergonomics.*
- *Evaluate good housekeeping procedures.*
- *Verify that safety, environmental, health and personal protective equipment is available, performs correctly and has current certification.*

## 3. Diagnose equipment problems and effectively repair manufacturing equipment.

MN-MIR 3.1: Gather equipment information and history that can assist in identifying and diagnosing problems.
*Sample Indicators:*

- *Consult operator and operator logs to determine the symptoms of the problem.*
- *Check reports on equipment, repair and diagnostics for previous problems.*
- *Check equipment to identify problems.*
- *Gather the most appropriate information need to rapidly diagnose the problem.*
- *Consult appropriate and accurate sources of information including prints, OEM manuals, process diagrams and engineering department calibrations.*

MN-MIR 3.2: Isolate system and component failure following diagnostic procedures.
*Sample Indicators:*

- *Draw on available information, past experience, operator feedback and knowledge of equipment to identify possible causes of failure.*
- *Use visual inspection, observation of equipment during operations and disassembly of equipment to systematically gather information about the nature and possible causes of failure.*
- *Perform and repeat diagnostic tests as necessary to determine the symptoms of the problem.*
- *Make diagnosis in a timely and effective manner.*
- *Use manufacturer's performance specifications when evaluating equipment performance.*
- *Initiate procedure for isolating problems correctly and complete follow through properly.*

MN-MIR 3.3: Identify root cause of problem using diagnostic procedures.
*Sample Indicators:*

- *Use appropriate root cause identification process to determine contributing factors.*
- *Perform the correct tests and inspections on failed component(s).*
- *Analyzed data gathered through diagnostic procedures to develop a hypothesis regarding possible root causes.*
- *Repeat analysis until problem is solved.*

MN-MIR 3.4: Develop corrective action plan to fix the problem.
*Sample Indicators:*

- *Correctly specify all repairs and modifications required to address underlying causes.*
- *Use the action plan to address the need for timely repair.*
- *Include proper repair procedures, proper tools and parts and estimated time required for repair in the plan.*
- *Inform and involve the right people needed for the repair.*
- *Make sure that plan reflects production needs.*
- *Make sure that plan accounts for variables in schedule, staffing and availability of parts.*

MN-MIR 3.5: Execute corrective action plan.
*Sample Indicators:*

- *Use applicable safety procedures.*
- *Wear proper personal protective equipment (PPE).*
- *Follow existing repair procedures in accordance with OEM manuals or company procedures.*
- *Use correct disassembly, repair/replacement and reassembly procedures.*
- *Safety check equipment and perform a test run prior to return to production.*
- *Make sure that post-repair tests confirm that equipment performs to requirements.*
- *Complete repairs within specified time frames.*
- *Devote appropriate staffing and parts to effectively execute the plan.*

MN-MIR 3.6: Document diagnosis, case history plan and repair outcome according to company protocols.
*Sample Indicators:*

- *Perform documentation and verification according to company and department policies and procedures.*
- *Input documents and appropriate files into database before filing them or distributing to correct parties.*
- *Conduct post-repair review to determine if customer is satisfied.*
- *Adjust preventive maintenance schedule to reflect repairs made.*
- *Notify equipment manufacturer of any reliability and maintainability issues.*

## 4. Investigate and employ techniques to maximize manufacturing equipment performance.

MN-MIR 4.1: Coordinate preparation for the installation, customization, or upgrading of equipment.
*Sample Indicators:*

- *Provide appropriate input on equipment, environmental impact and material needs.*
- *Include the time, equipment and personnel required to do the job in the plan.*
- *Determine proper customization, upgrade needs and capacity limits.*
- *Obtain all appropriate approvals.*
- *Make sure that plan provides for the availability and use of proper materials and relevant vendor information.*
- *Make sure that plan anticipates the need for future modifications and likelihood of mechanical or operator errors.*
- *Make sure that plan addresses issues related to ergonomics, safety requirements and environmental impact.*

MN-MIR 4.2: Obtain machine information from vendors related to proper installation, customization, or upgrade.
*Sample Indicators:*

- *Determine availability of in-house personnel and outside contractors.*

- *Contact appropriate vendor personnel to determine facility, parts, equipment and materials needs prior to installation.*
- *Verify materials and parts against vendor specifications prior to initiating installation, customization, or upgrading equipment.*
- *Obtain needed information from vendors including safety and quality considerations.*
- *Ensure that accurate blueprints, specifications and documentation are available.*
- *Review maintenance manuals, check them for completeness and modify them as necessary.*

MN-MIR 4.3: Install, customize, or upgrade equipment.
*Sample Indicators:*

- *Follow all safety procedures.*
- *Organize tools, equipment and personnel efficiently to do the job.*
- *Follow blueprint and plan of action to customize or upgrade equipment.*
- *Perform follow-up to ensure completeness of installation.*
- *Complete equipment installation, customization, or upgrade to specification and schedule.*

MN-MIR 4.4: Equip team with information and resources needed to complete task.
*Sample Indicators:*

- *Schedule the proper workers to ensure effectiveness, efficiency and safety.*
- *Ensure that personnel are trained on the proper procedures and equipment maintenance.*
- *Involve vendors appropriately.*

MN-MIR 4.5: Move or remove equipment following manufacturing protocols.
*Sample Indicators:*

- *Schedule the proper workers to ensure effectiveness, efficiency and safety.*
- *Ensure that personnel are trained on the proper procedures and equipment maintenance.*
- *Involve vendors appropriately.*
- *Move or remove equipment completely, safely and according to company and vendor procedures.*
- *Verify that equipment works properly following its move.*

MN-MIR 4.6: Test the equipment to ensure proper function after installation, customization, or upgrading.
*Sample Indicators:*

- *Select proper testing procedures and methods.*
- *Administer test procedures and methods properly.*
- *Perform test safely.*
- *Interpret test results.*
- *Notify all appropriate parties that equipment is functioning properly.*
- *Make sure that equipment tests indicate that equipment performs to specification and meets safety standards.*

- *Document test results.*

## 5. Implement a preventative maintenance schedule to maintain manufacturing equipment, tools and workstations.

MN-MIR 5.1: Conduct a pre-job consultation with the person/people who requested the maintenance or repair.
*Sample Indicators:*

- *Verify that preventive maintenance is performed to schedule and documented completely in a timely manner.*
- *Use the right procedures and forms to communicate repair needs to the correct parties.*
- *Follow-up to verify that necessary repair work was completed.*
- *Predict the results of failing to implement all elements of the preventive maintenance schedule.*
- *Follow all safety regulations when doing repairs.*

MN-MIR 5.2: Verify supplies are available to perform preventative maintenance and routine repair.
*Sample Indicators:*

- *Have necessary supplies available to perform preventive maintenance.*

MN-MIR 5.3: Monitor equipment indicators to ensure it is operating correctly.
*Sample Indicators:*

- *Compare equipment performance to optimal equipment operations on a regular schedule.*
- *Investigate and correct abnormal equipment conditions in a timely manner.*
- *Monitor equipment to ensure that the corrective action solved the problem.*
- *Keep equipment repair history complete, up-to-date and accurate.*

MN-MIR 5.4: Document training of maintenance activities according to company maintenance regulations.
*Sample Indicators:*

- *Conduct training in an effective and appropriate manner.*
- *Document and make available preventive maintenance training materials.*
- *Keep training records updated and readily available.*
- *Examine the relevancy of training for use of equipment, tools, materials and processes at the workstation.*
- *Provide cross-training when appropriate.*
- *Verify that training and training documentation meet all company and regulatory requirements.*

MN-MIR 5.5: Maintain production schedules by completing daily housekeeping activities.
*Sample Indicators:*

- *Store tools and materials safely in proper locations.*
- *Identify and report unsafe conditions promptly.*

- *Keep workstations clean and clear of safety hazards.*
- *Verify that scheduled housekeeping inspections are passed.*
- *Organize workstations to maximize efficiency.*
- *Verify that safety equipment is present and in proper working order.*

## 6. Implement a preventative maintenance schedule to maintain manufacturing equipment, tools and workstations.

MN-MIR 6.1: Develop the maintenance schedule.
*Sample Indicators:*

- *Schedule routine jobs that need to be completed in a timely way.*
- *Make sure that schedule is sufficiently flexible to include plans for fall-back if tasks take longer and to add fill-in work if tasks are shorter than expected.*
- *Use company procedures for production needs, output and critical equipment to schedule priorities.*
- *Verify that preventive maintenance requirements for all equipment are included in the schedule.*
- *Distribute scheduled task lists appropriately.*
- *Make sure that the schedule provides adequate time for preventive maintenance.*
- *Make parts required for maintenance available when needed.*

MN-MIR 6.2: Identify special maintenance and repair needs.
*Sample Indicators:*

- *Ask operators appropriate questions to determine needs.*
- *Review tool and equipment histories to find evidence of intermittent or chronic problems.*
- *Refer to job safety analysis sheets as appropriate.*
- *Observe operators to verify that they are setting up and operating according to the job safety analysis.*
- *Review repair histories to see if correct repairs were done in the past.*
- *Review repair histories to determine current repair needs.*
- *Identify worn or malfunctioning equipment accurately and in a timely way to prevent breakdowns.*

MN-MIR 6.3: Verify availability of workers and other resources based on schedules and inventory records.
*Sample Indicators:*

- *Locate special tools and parts.*
- *Access existing preventive maintenance protocols from the preventive maintenance sheets.*
- *Make decisions on staffing requirements based on the tasks that need to be performed.*
- *Make sure that retooled parts meet specifications.*
- *Make sure that follow-up occurs to ensure that adequate supplies are maintained.*

MN-MIR 6.4: Perform predictive and preventive maintenance procedures.
*Sample Indicators:*

- *Follow procedures when handling and disposing hazardous materials.*
- *Follow safety procedures and wear/use proper personal protective equipment (PPE).*
- *Follow preventive maintenance sheets completely.*
- *Assign maintenance to trained workers to ensure that the job is performed safely and efficiently.*
- *Gather required parts, tools and equipment prior to starting the maintenance.*
- *Use required parts, tools and equipment to perform work safely and efficiently.*
- *Use company or department procedure to document and verify maintenance job.*
- *Use policy and procedures to maintain documentation.*
- *Direct documentation to the correct parties for processing.*
- *Perform maintenance on time.*
- *Perform housekeeping when job is finished.*
- *Use repair histories to revise preventive maintenance plan.*

MN-MIR 6.5: Check that equipment is working to specifications prior to releasing the equipment to the operator.
*Sample Indicators:*

- *Complete safety checklist thoroughly.*
- *Document results of safety checklist.*
- *Test run equipment to ensure that it is operating properly and safely.*
- *Take corrective measures if equipment is not operational.*
- *Communicate readiness of equipment to come back onto production to correct parties before departing the site.*
- *Use the preventive maintenance sheet to inspect and verify the appropriate items.*

## Manufacturing Production Process Development Career Pathway (MN-PPD)

### 1. Produce quality products that meet manufacturing standards and exceed customer satisfaction.

MN-PPD 1.1: Conduct in-depth investigation to identify customer needs.
*Sample Indicators:*

- *Explain the impact of the customer's intended use of a product on every phase of the manufacturing process.*
- *Meet needs of both internal and external customers.*
- *Maintain liaison with customer contacts.*
- *Review, maintain and communicate customer needs and specifications.*
- *Identify issues that prevent proactive handling of customer needs.*

MN-PPD 1.2: Verify that needed resources (capable machinery, required skill specification with number of persons and capacity of the machinery) are available for the production process.
*Sample Indicators:*

- *Use work orders when handling raw materials, while setting up tools and equipment and when scheduling workers to maximize productivity.*
- *Properly report any discrepancies related to raw materials, tools/equipment and worker's abilities/availability.*
- *Identify consequences of not reporting discrepancies in production.*

MN-PPD 1.3: Evaluate workers' ability to manage critical elements of the production process.
*Sample Indicators:*

- *Evaluate workers' skills when setting up, programming and operating equipment required for production.*
- *Make proper repairs and adjustments to equipment prior to putting into service.*
- *Verify that the first piece or product meets both product specifications and production capacities.*
- *Examine how set-up procedures are documented for repeatability.*
- *Identify possible consequences resulting from failure to meet production standards.*

MN-PPD 1.4: Monitor fabrication of the product using process control data.
*Sample Indicators:*

- *Use process control data to ensure that the manufacturing process complies with standards.*
- *Make the manufacturing process cycle time meet customer and business needs.*
- *Identify possible consequences resulting from failure to perform operations safely.*
- *Verify that the product meets customer specifications.*
- *Complete and maintain product and process documentation, then forward to proper parties.*
- *Verify that production operations comply with all health, safety and environmental policies and procedures.*
- *Track and document communications related to production requirements and product specifications as appropriate.*

MN-PPD 1.5: Inspect the product to verify that it meets specifications.
*Sample Indicators:*

- *Verify the calibration of the testing equipment.*
- *Follow the established sampling plan and inspection policies/procedures.*
- *Predict consequences of failure to identify promptly any product and production process that do not meet specifications.*
- *Complete inspection documents accurately and forward them to proper parties.*
- *Following appropriate testing/production tools and procedures.*
- *Make adjustments needed to keep the production process within specifications.*
- *Make necessary adjustment in the manufacturing process in a timely manner.*

MN-PPD 1.6: Document product and process to assure formal compliance with customer requirements.
*Sample Indicators:*

- *Write compliance documents legibly in the appropriate format and store them in a safe, secure place.*
- *Complete compliance documentation, obtain sign off and forward to the proper parties.*
- *Distinguish between products that are labeled appropriately and products that are not appropriately labeled for compliance.*
- *Verify that final test results meet customer requirements.*
- *Take action to minimize negative customer feedback on quality issues.*

MN-PPD 1.7: Check for specified quantities and proper documentation when preparing a final product for shipping or distribution.
*Sample Indicators:*

- *Package materials to meet packaging and shipping specifications (including proper labeling).*
- *Complete package documentation and customer shipping instructions to accompany the product to the next destination.*
- *Communicate product availability to the proper parties in a timely manner.*
- *Check relevant information such as quantity, destination and packaging instructions against the work order.*
- *Verify that product is correctly stored or staged for shipping.*
- *Explain the significance of following all laws and regulations related to labeling, packaging and transport.*
- *Verify that material handling procedures are followed to prevent product damage.*
- *Track and document material specifications and delivery schedules.*

MN-PPD 1.8: Monitor customer satisfaction.
*Sample Indicators:*

- *Use appropriate data to measure customer satisfaction.*
- *Implement surveys and other customer data techniques in a timely manner.*
- *Report returned goods to appropriate parties for review.*
- *Review field failure and product life data in a timely manner.*

## 2. Research, design and implement alternative manufacturing processes to manage production of new and/or improved products.

MN-PPD 2.1: Research new manufacturing processes.
*Sample Indicators:*

- *Review current processes completely to determine any changes that are needed to meet customer requirements.*
- *Provide research to correct parties to confirm manufacturability.*

- *Confirm resource requirements accurately.*
- *Review project materials and processes thoroughly to establish cost estimates.*
- *Hold customer meetings to confirm customer specifications when appropriate.*

MN-PPD 2.2: Create standard operating procedures (SOPs) for new process.
*Sample Indicators:*

- *Identify new tooling and materials.*
- *Specify new training where required.*
- *Document new SOPs according to company procedure.*
- *Make sure that the correct parties review all new SOPs.*
- *Verify that SOPs meet customer specifications including cost effectiveness.*

MN-PPD 2.3: Develop new tooling and fixtures.
*Sample Indicators:*

- *Fabricate new tooling and fixtures according to design specifications.*
- *Properly document new tooling and fixtures development process with new material suggestions noted.*
- *Verify that new tooling and fixtures increase efficiency and cost effectiveness of the process.*
- *Verify that new tooling and fixtures result in improvement of product quality and a decrease in nonconformance.*
- *Verify that new tooling and fixtures result in an improved work environment for workers, increasing safety while reducing injuries and/or stress.*

MN-PPD 2.4: Set up and program equipment for new processes.
*Sample Indicators:*

- *Verify that new equipment or process works to specification and runs efficiently.*
- *Program equipment to maximize output and quality.*
- *Make sure that equipment program is concise and understandable by others.*
- *Set up equipment or process in a timely way.*
- *Continue test runs until product specifications and efficiency levels are met.*
- *Download equipment program and store correctly.*

MN-PPD 2.5: Schedule and test new processes.
*Sample Indicators:*

- *Verify that schedules for testing new processes are complete and detailed.*
- *Follow standard procedures when making a testing schedule.*
- *Conduct review on the new process to determine readiness for implementation.*
- *Verify that testing is specific and done on a timely basis.*
- *Include data on usefulness and efficiency with documentation of test results.*
- *Obtain proper approvals to implement the changes in process determined by the test results.*
- *Use new or updated processes according to specifications.*

- *Analyze data to identify potential problems.*

MN-PPD 2.6: Monitor production performance data for new processes.
*Sample Indicators:*

- *Use up-to-date charts and available statistics to properly document monitoring.*
- *Use the proper test equipment to monitor production performance.*
- *Perform the appropriate tests based on customer or manufacturer specifications or company policy.*
- *Communicate problems effectively to proper parties.*
- *Use appropriate measurements.*
- *Use results of capability studies to adjust product or process.*

MN-PPD 2.7: Prepare documentation on new process according to business requirements.
*Sample Indicators:*

- *Make sure that documentation is complete, accurate and legible.*
- *Use company procedures to complete documentation in a timely way.*
- *File documentation properly.*
- *Solicit input from workers to ensure that documentation is useful.*

### 3. Monitor, promote and maintain a safe and productive workplace using techniques and solutions that ensure safe production of products.

MN-PPD 3.1: Perform environmental and safety inspections or coordinate with a certified agent/service to ensure conformance to all relevant local, federal and company regulations.
*Sample Indicators:*

- *Identify, report and monitor potential hazards in the workplace.*
- *Take corrective action to correct potential hazards.*
- *Review health, safety and environmental documentation and policies thoroughly and regularly.*
- *Ensure that inspections meet all relevant health, safety and environmental laws and regulations.*
- *Completed inspections according to company schedule and procedures.*
- *Document inspection records and store them correctly.*

MN-PPD 3.2: Participate in emergency response teams.
*Sample Indicators:*

- *Confirm that first aid training and certification on emergency and first aid procedures are complete and up-to-date.*
- *Comply with company and regulatory policies and procedures to respond to emergencies.*
- *Document emergency drills and incidents according to company and regulatory procedures.*

MN-PPD 3.3: Identify unsafe conditions according to safety standards and report to proper authorities.
*Sample Indicators:*

- *Identify, report and document conditions presenting a threat to health, safety and the environment.*
- *Track and report ongoing safety concerns until corrective action is taken.*

MN-PPD 3.4: Take corrective action following prescribed safety procedures.
*Sample Indicators:*

- *Identify corrective actions.*
- *Consult appropriate parties/documents about corrective actions and take corrective actions following company procedures promptly.*

MN-PPD 3.5: Complete training on safe practices and emergency procedures in a safety orientation.
*Sample Indicators:*

- *Verify that all safety topics and procedures are covered in orientation.*
- *Use company requirements to document orientation.*
- *Verify that orientation meets all relevant laws, policies and regulations.*
- *Complete safety instruction and updates on a regular schedule.*

## 4. Implement continuous improvement processes in order to maintain quality within manufacturing production.

MN-PPD 4.1: Perform periodic internal quality audit activities.
*Sample Indicators:*

- *Complete all audit forms correctly in a timely manner.*
- *Forward forms to the correct parties.*
- *Verify that audit data is relevant and correct.*
- *Make sure that conformances to quality standards are properly assessed and documented.*
- *Include observation of operation in audit when appropriate to ensure performance meets specifications.*
- *Follow company and other required schedules and procedures to perform audit.*

MN-PPD 4.2: Monitor calibration of data collection equipment.
*Sample Indicators:*

- *Follow specifications to implement calibration schedule.*
- *Review documents and use thorough observation to check instrument certification during use.*
- *Recalibrate instruments that are out of calibration or refer them to the appropriate parties for recalibration or repairs immediately.*

MN-PPD 4.3: Suggest process improvements on a regular basis.
*Sample Indicators:*

- *Use observations and data analysis to generate potential improvements.*

- *Verify that suggestions communicate measurable and data-driven benefits to the company, its customers and its employees.*
- *Use proper procedures and documentation to make suggestions.*
- *Make sure that all suggestions show that all data was reviewed prior to making recommendation.*

MN-PPD 4.4: Inspect materials at all stages of a process to determine quality or condition.
*Sample Indicators:*

- *Follow schedule and procedures to complete sampling and inspection.*
- *Select and use inspection tools and procedures correctly.*
- *Inspect materials against specifications.*
- *Identify materials that do not meet specification.*
- *Take corrective action on out-of-specification material.*
- *Document inspection results properly.*
- *Report inspection results to correct parties.*
- *Use appropriate quality analysis and statistical techniques to analyze performance.*

MN-PPD 4.5: Document the results of quality tests according to business requirements.
*Sample Indicators:*

- *Check data forms to ensure that they are complete and accurate.*
- *Make sure that information is evaluated and interpreted correctly.*
- *Forward data to correct parties.*
- *Select and use appropriate analytical tools.*
- *Use proper format to record product and process outcomes within the specified timeframe.*

MN-PPD 4.6: Restore or maintain quality by making process adjustments.
*Sample Indicators:*

- *Make sure that appropriate corrective actions are identified and approvals received when needed.*
- *Make adjustments for corrections to eliminate deviations and bring the process back into control.*
- *Make adjustments in a timely manner.*
- *Document adjustments properly.*

## 5. Develop procedures to create products that meet customer needs.

MN-PPD 5.1: Audit production process.
*Sample Indicators:*

- *Collect all relevant data for the audit in a timely way.*
- *Use past production data and current production goals to evaluate audit data.*
- *Perform audits according to the proper schedule.*

- *Communicate discrepancies to the proper parties in a timely way.*
- *Make sure that audit report is complete including all supporting data and analyses.*
- *Submit audit report according to company procedure.*
- *Verify that problems are identified.*

MN-PPD 5.2: Propose changes to improve products and processes.
*Sample Indicators:*

- *Make suggestions for improvement in a timely way.*
- *Verify that product quality improves.*
- *Verify that production time decreases.*
- *Follow-up on proposals containing supporting materials for justifications with correct parties.*
- *Use company procedures to make proposals.*
- *Evaluate suggestions for effectiveness.*
- *Verify that suggestions meet quality and safety standards.*
- *Document proposals properly.*
- *Implement proposed changes.*

MN-PPD 5.3: Develop production improvement goals.
*Sample Indicators:*

- *Set realistic and attainable goals.*
- *Make sure that goals meet technical standards.*
- *Write goals that are specific, simple, understandable and measurable.*
- *Verify that goals are consistent with business objectives.*
- *Document goals according to company procedures.*
- *Communicate goals to correct parties in a timely way.*

MN-PPD 5.4: Inspect product for deviations from customer and product standard(s).
*Sample Indicators:*

- *Compare product to the correct customer and company standards.*
- *Perform inspections according to company procedures in a timely way.*
- *Verify that inspections completely and accurately identify deviation from specifications.*
- *Document inspections properly according to customer specifications and company procedures.*
- *Conduct inspections continuously to ensure that standards are maintained throughout the process.*
- *Handle out-of-compliance product correctly according to company procedure.*

MN-PPD 5.5: Correct product or process problems.
*Sample Indicators:*

- *Make corrections immediately upon identification of a problem.*
- *Make corrections according to company procedures.*
- *Identify underlying or root cause of problem.*

- *Address underlying or root cause of problem.*
- *Test corrective actions to determine if the problem is solved.*
- *Document problems and corrections properly.*
- *Communicate problems and corrections effectively to correct parties.*
- *Handle out-of-compliance product according to company procedure.*
- *Perform any rework or remediation needed to bring product into specifications in a timely way.*

MN-PPD 5.6: Develop new work procedures according to production needs.
*Sample Indicators:*

- *Discuss new work procedures or instructions with all stakeholders to ensure support for improvements.*
- *Verify that all stakeholders understand their role in process improvement changes.*

## Production Career Pathway (MN-PRO)

### 1. Diagnose production process problems and take corrective action to meet production quality standards.

MN-PRO 1.1: Communicate quality problems following the appropriate reporting process.
*Sample Indicators:*

- *Review quality problems with production operators.*
- *Communicate quality problems promptly to appropriate parties.*
- *Use established processes to document quality problems.*
- *Summarize defect trends and report them to appropriate parties.*

MN-PRO 1.2: Suggest or perform corrective actions to correct quality problems.
*Sample Indicators:*

- *Make minor quality issues/adjustments immediately.*
- *Document quality issues or adjustments properly.*
- *Make sure that recommendations for action are clear, concise and supported by data.*
- *Make recommendations in a timely way to appropriate parties.*
- *Document follow-up activities and indicate that corrective action was taken.*
- *Document product quality following corrective action.*

MN-PRO 1.3: Determine appropriate action for sub-standard product.
*Sample Indicators:*

- *Execute quality control procedures to catch sub-standard products promptly within the defined quality systems.*
- *Document decisions regarding sub-standard products for future retrieval.*
- *Process sub-standard products according to company policy.*
- *Distribute documentation required for customers to appropriate parties.*

MN-PRO 1.4: Identify trends using records of process outcomes.
*Sample Indicators:*

- *Maintain records on quality process to appropriate standards.*
- *Chart outcomes of quality processes according to appropriate methods and standards.*
- *Check data on quality processes for accuracy.*
- *Analyze quality process performance data to identify trends.*
- *Report quality process performance data to appropriate parties in a timely way.*

MN-PRO 1.5: Implement closed-loop corrective action to provide for ongoing production feedback.
*Sample Indicators:*

- *Document evidence of corrective action in a timely manner.*
- *Report change resulting from the corrective action to appropriate parties in the correct format.*
- *Use spot checks to verify implementation of the corrective action.*
- *Store reports properly for the required amount of time.*
- *Perform ongoing audits to optimize the outcomes of the corrective actions.*
- *Examine previous documentation on similar process issues to identify possible solutions.*

MN-PRO 1.6: Research energy consumption reduction in manufacturing.
*Sample Indicators:*

- *Conduct analyses to reduce pollution or costly energy consumption.*
- *Identify and recommend improvements to reduce waste and pollution for a given production process.*

## 2. Manage safe and healthy production working conditions and environmental risks.

MN-PRO 2.1: Perform environmental and safety inspections following local, federal and company regulations.
*Sample Indicators:*

- *Identify, report and monitor potential hazards in the workplace.*
- *Take corrective action to correct potential hazards.*
- *Review health, safety and environmental documentation and policies thoroughly and regularly.*
- *Ensure that inspections meet all relevant health, safety and environmental laws and regulations.*
- *Complete inspections according to company schedule and procedures.*
- *Document inspection records and store them correctly.*

MN-PRO 2.2: Perform emergency drills as part of an emergency response team.
*Sample Indicators:*

- *Confirm that first aid training and certification on emergency and first aid procedures are complete and up-to-date.*
- *Comply with company and regulatory policies and procedures to respond to emergencies.*

- *Document emergency drills and incidents according to company and regulatory procedures promptly.*

MN-PRO 2.3: Identify unsafe conditions according to safety standards.
*Sample Indicators:*

- *Identify, report and document conditions presenting a threat to health, safety and the environment.*
- *Identify corrective actions.*

MN-PRO 2.4: Implement corrective actions to follow safety protocols.
*Sample Indicators:*

- *Consult appropriate parties about corrective actions and take corrective actions following company procedures promptly.*
- *Track and report ongoing safety concerns until corrective action is taken.*

MN-PRO 2.5: Monitor daily housekeeping activities.
*Sample Indicators:*

- *Store tools and materials safely in proper locations.*
- *Keep workstations clean and clear of safety hazards.*
- *Verify that scheduled housekeeping inspections are passed.*
- *Verify that safety equipment is present and in proper working order.*

### 3. Make continuous improvement recommendations based on results of production process audits and inspections.

MN-PRO 3.1: Perform periodic internal quality audits using company audit procedures.
*Sample Indicators:*

- *Perform audits in accordance with company and other required schedules and procedures.*
- *Complete all audit forms correctly in a timely manner and forward to the correct parties.*
- *Verify that audit data is relevant and correct.*
- *Verify that conformances to quality standards are properly assessed and documented.*
- *Include observation of operations to ensure performances meet specifications when appropriate.*

MN-PRO 3.2: Check calibration of gauges and other data collection equipment.
*Sample Indicators:*

- *Implement calibration schedule according to specifications.*
- *Make thorough careful observations and review documentation to check instrument certification.*
- *Recalibrate out-of-calibration instruments immediately or refer them to the appropriate parties for recalibration or repairs.*

MN-PRO 3.3: Recommend process improvements based upon audits and inspections.
*Sample Indicators:*

- *Use observation and data analysis to generate potential improvements.*
- *Communicate suggestions that are measurable and have data-driven benefits to the company, its customers and its employees.*
- *Use proper procedures and documentation to make suggestions.*
- *Assure that all data is reviewed prior to making suggestions.*

MN-PRO 3.4: Inspect materials at all stages of process to determine quality or condition.
*Sample Indicators:*

- *Sample and inspect in accordance with the schedule and procedures.*
- *Select correct inspection tools and procedures and use them correctly.*
- *Inspect materials against correct specifications.*
- *Identify materials not meeting specifications.*
- *Take corrective action on out-of specification material.*
- *Document inspection results properly and report them to the correct parties in a timely manner.*

MN-PRO 3.5: Document the results of quality testing using reliable data.
*Sample Indicators:*

- *Check data forms for completeness and accuracy.*
- *Evaluate and interpret information correctly.*
- *Forward data to correct parties.*
- *Select and use the appropriate analytical tools.*

MN-PRO 3.6: Adjust processes to restore or maintain quality, based on data from audit or inspection reports.
*Sample Indicators:*

- *Identify appropriate correction actions and make sure that approvals are received when needed.*
- *Make adjustments to eliminate deviations and bring the process back into control.*
- *Make adjustments and document them in a timely manner.*

## 4. Coordinate work teams when producing products to enhance production process and performance.

MN-PRO 4.1: Provide training to other employees based on training needs.
*Sample Indicators:*

- *Provide cross training as appropriate.*
- *Assess training needs on a regular basis.*
- *Identify new requirements and training issues.*

- *Use varied approaches to achieve training goals.*
- *Document training outcomes.*

MN-PRO 4.2: Develop team goals to enhance performance.
*Sample Indicators:*

- *Make goals specific, measurable and achievable.*
- *Align team goals to customer and business needs.*
- *Focus team goals to meet team objectives.*
- *Document team goals and share information with all parties.*

MN-PRO 4.3: Make job assignments to avail the use of the best personnel in key assignments.
*Sample Indicators:*

- *Make job assignments to match the skills needed for the work to be done and to maximize the use of available skills.*
- *Make job assignments to ensure that business and customer needs are met.*
- *Confirm that workers are notified of assignments effectively.*

MN-PRO 4.4: Coordinate work flow with team members and other work groups.
*Sample Indicators:*

- *Make sure that production schedules are met effectively.*
- *Notify team members of schedule requirements in a timely way.*
- *Make sure that production work flow runs efficiently.*
- *Take necessary action to minimize downtime.*
- *Explain the significance of relationships with others in facilitating work flow.*
- *Verify that workers actively participate in meetings and problem-solving groups.*

MN-PRO 4.5: Communicate material specifications, production requirements, product specifications and delivery issues in a timely and accurate manner.
*Sample Indicators:*

- *Initiate communication to meet product requirements, product specifications, or other customer or business needs cross-functionally as required.*
- *Evaluate, track and report production and product issues to original communicator.*
- *Communicate delivery schedules clearly and address any issues.*
- *Track and document material specifications and delivery schedules.*

## 5. Demonstrate the safe use of manufacturing equipment.

MN-PRO 5.1: Train others to use equipment following safe production practices.
*Sample Indicators:*

- *Give new operators a complete orientation of equipment.*

- *Make sure that all important information regarding equipment safety is communicated clearly and effectively.*
- *Make sure that maintenance workers obtain certification to train others in technical skills and knowledge where applicable.*
- *Make suggestions regarding training materials and content to appropriate parties.*
- *Use evaluations and feedback to improve training materials and methods.*
- *Make sure trainees have the correct tools to do the job during training.*
- *Conduct post-training evaluation to assure that workers can operate equipment safely.*
- *Use training and facilitation techniques appropriate for the audience.*
- *Document the quality and effectiveness of training appropriately.*

MN-PRO 5.2: Recommend processes and procedures to support safety and effectiveness in the work environment.
*Sample Indicators:*

- *Consult health and safety representatives to develop suggestions.*
- *Solicit operator feedback for use in creating a safer, more effective work environment.*
- *Make sure suggestions for training improvement are documented and sent to the appropriate parties.*
- *Make sure that content of suggestions addresses safety, quality and productivity issues.*

MN-PRO 5.3: Maintain, install and repair equipment following required safety and health requirements.
*Sample Indicators:*

- *Make regular safety communications to all employees.*
- *Review job safety analyses regularly according to company policy.*
- *Follow hazardous materials procedures and policies such as Material Safety Data Sheet (MSDS) and "right to know" accurately.*
- *Perform environmental testing of workplace on a regular basis as required by company policy or regulation.*
- *Audit equipment to ensure there are no bypasses of safety guards.*
- *Verify that regulatory and company safety procedures are followed including lock-out/tag-out, confined space and ergonomics.*
- *Follow good housekeeping procedures.*
- *Verify that safety and personal protective equipment (PPE) is available, performs correctly and has current certification.*

MN-PRO 5.4: Monitor equipment and operator according to workplace safety and compliance with both company and national regulations.
*Sample Indicators:*

- *Perform monitoring responsibilities regularly.*
- *Report out-of-compliance or unsafe conditions immediately.*
- *Take corrective action on out-of-compliance or unsafe conditions.*

- *Check equipment to ensure it is operating according to specifications.*
- *Check tools for compliance with specifications.*
- *Forward accident and injury data to appropriate personnel for inclusion in OSHA recordables.*
- *Gather information on equipment use from operators to reveal existing or potential problems.*
- *Adjust equipment and processes as required.*
- *Document all monitoring data accurately.*

MN-PRO 5.5: Perform preventive maintenance and routine repair by contacting appropriate people and securing needed supplies.
*Sample Indicators:*

- *Verify that preventive maintenance schedule or equipment is in place and updated as appropriate.*
- *Verify that preventive maintenance is performed to schedule and documented in a timely manner.*
- *Verify that necessary repair work is checked through follow-up.*

## Quality Assurance Career Pathway (MN-QA)

### 1. Evaluate production operations for product and process quality.

MN-QA 1.1: Monitor materials for quality at specified points throughout the production process.
*Sample Indicators:*

- *Prepare detailed quality instructions for each operation.*
- *Record accurate information about material quality at each operation.*
- *Communicate quality information to all appropriate parties.*
- *Maintain accurate records of material movement necessary to ensure quality and traceability.*

MN-QA 1.2: Test product sample for quality at each state of production.
*Sample Indicators:*

- *Monitor sample results to ensure they comply with specifications.*
- *Report samples that do not conform to specification.*
- *Keep records of quality results as required by procedures or work instructions.*
- *Label and document samples that do not conform to standards.*
- *Indicate the samples that have been checked at each state.*

MN-QA 1.3: Test the final product to determine if it meets quality specifications.
*Sample Indicators:*

- *Make accurate records of inspections and tests readily available.*
- *Communicate approval and rejection results on a timely basis to appropriate parties.*
- *Make sure that all product specifications have been followed.*
- *Perform product audits according to defined plan.*
- *Review follow-up data to ensure customer satisfaction with finished product.*

- *Obtain final documentation from all departments to effectively check product against specifications.*

MN-QA 1.4: Document quality results at each state of production process.
*Sample Indicators:*

- *Fill out proper records correctly for each stage of production.*
- *Verify that approval and rejections are in place as required on appropriate documentation.*
- *Verify that quality data meets specifications.*
- *Communicate final quality results to appropriate parties.*
- *Make sure that documentation is clear and complete.*

## 2. Recommend and implement continuous improvement in manufacturing processes.

MN-QA 2.1: Identify potential quality improvements using analysis of data.
*Sample Indicators:*
*Apply quality tools properly to determine the source of potential quality problems.*
** Reassess process capability continuously.*
** Validate process and product measurement systems.*
** Adjust process and product measurement systems as required.*
** Report quality data to appropriate parties in a timely manner.*

MN-QA 2.2: Monitor process capability at various stages of the production process.
*Sample Indicators:*

- *Verify that processes meet manufacturer and other quality specifications.*
- *Verify that process meet company or customer capability requirements.*
- *Verify that process meets on-time delivery needs of the customer.*
- *Use approved procedures to report analyzed process capability data.*
- *Use results of capability studies to adjust product or process.*
- *Report results of capability studies to appropriate parties.*
- *Report environmental data and suggest improvements.*

MN-QA 2.3: Monitor customer satisfaction using various forms of customer feedback.
*Sample Indicators:*

- *Use appropriate data to measure customer satisfaction.*
- *Implement surveys and other customer data techniques in a timely manner.*
- *Report returned goods to appropriate parties for review.*
- *Include appropriate vendor certifications with customer documentation.*
- *Document on-time delivery data appropriately.*
- *Review field failures and product life data in a timely manner.*

MN-QA 2.4: Measure and record product and process outcomes.
*Sample Indicators:*

- *Use the proper format to record product and process outcomes within the approved timeframe.*
- *Use appropriate quality analysis and statistical technique to analyze performance.*
- *Report outcomes to all appropriate parties.*

MN-QA 2.5: Participate in designing new work procedures based on identified needs or recommendations.
*Sample Indicators:*

- *Translate recommendations for continuous improvement into new work instructions.*
- *Use the appropriate format to publish work instructions.*
- *Use the standard procedures to distribute work instructions.*
- *Discuss new work procedures or instructions with all stakeholders to ensure support for improvements.*

MN-QA 2.6: Implement approved recommendations.
*Sample Indicators:*

- *Make sure that recommendations for continuous improvement are clear, concise and based on data trends and patterns.*
- *Make recommendations in a way that draws support for process improvement.*
- *Provide information to ensure that all stakeholders understand their role in process improvement changes.*
- *Use documented and accepted process improvements to translate into revised work processes and procedures.*

MN-QA 2.7: Check that the final product meets customer and business needs.
*Sample Indicators:*

- *Verify that final test results meet customer requirements.*
- *Determine if product was produced within company time and cost parameters.*
- *Take action to minimize negative customer feedback on quality issues.*

### 3. Coordinate work teams to create a product that meets quality assurance standards.

MN-QA 3.1: Provide training to other employees.
*Sample Indicators:*

- *Provide cross training as appropriate.*
- *Assess training needs on a regular basis.*
- *Identify new requirements and training issues.*
- *Use varied approaches to achieve training goals.*
- *Document training outcomes.*

MN-QA 3.2: Develop team goals to enhance performance.
*Sample Indicators:*

- *Make goals specific, measurable and achievable.*
- *Align team goals to customer and business needs.*
- *Focus team goals to meet team objectives.*
- *Document team goals and share information with all parties.*

MN-QA 3.3: Assign personnel to specific jobs based upon individual strengths and experience.
*Sample Indicators:*

- *Make job assignments to match the skills needed for the work to be done and to maximize the use of available skills.*
- *Make job assignments to ensure that business and customer needs are met.*
- *Confirm that workers are notified of assignments effectively.*

MN-QA 3.4: Coordinate work flow with team members and other work groups.
*Sample Indicators:*

- *Make sure that production schedules are met effectively.*
- *Notify team members of schedule requirements in a timely way.*
- *Make sure that production work flow runs efficiently.*
- *Take necessary action to minimize downtime.*
- *Explain the significance of relationships with others in facilitating work flow.*
- *Verify that workers actively participate in meetings and problem-solving groups.*

MN-QA 3.5: Communicate production requirements, material and product specifications and delivery requirements.
*Sample Indicators:*

- *Track and document material specifications and delivery schedules.*
- *Notify all parties of production issues and problems in a timely way.*
- *Evaluate, track and report production and product issues back to original communicator.*

## 4. Employ project management processes using data and tools to deliver quality, value-added products.

MN-QA 4.1: Conduct in-depth investigation to identify customer needs.
*Sample Indicators:*

- *Meet those needs that differ between internal and external customers, as well as those needs that both share.*
- *Maintain contact with customer about the product aspects and its specifications to ensure thorough understanding of needs.*
- *Review, maintain and communicate customer needs and specifications.*
- *Address issues preventing customer needs from being met proactively.*

MN-QA 4.2: Verify that needed resources are available for the production process.
*Sample Indicators:*

- *Use work orders when handling raw materials, while setting up of tools and equipment and when scheduling workers to maximize productivity.*
- *Report any discrepancies related to raw materials, tools/equipment and workers abilities/availability properly.*
- *Identify consequences of not reporting discrepancies in production.*

MN-QA 4.3: Set up equipment for the production process.
*Sample Indicators:*

- *Make needed repairs and adjustments to equipment prior to putting into service.*
- *Verify that set-up meets process specifications of both internal and external customers.*
- *Verify that the first piece or production meets both product specifications and production capacities.*
- *Document set-up procedures to ensure repeatability.*
- *Identify possible consequences resulting from failure to meet ergonomic and other relevant health, safety and environmental standards.*

MN-QA 4.4: Monitor fabrication of the product using process control data.
*Sample Indicators:*

- *Use process control data to indicate that the manufacturing process complies with standards.*
- *Make the manufacturing process cycle time meet customer and business needs.*
- *Identify possible consequences resulting from failure to perform operations safely.*
- *Verify that the product meets customer specifications.*
- *Complete, maintain and forward product and process documentation to proper parties.*
- *Verify that production operations comply with all health, safety and environmental policies and procedures.*

MN-QA 4.5: Inspect the product to verify that it meets specifications.
*Sample Indicators:*

- *Verify the calibration of the testing equipment.*
- *Follow the established sampling plan and inspection policies/procedures.*
- *Identify product and production process that do not meet specifications.*
- *Complete inspection documents accurately and forward them to proper parties.*
- *Follow appropriate testing/production tools and procedures.*
- *Identify and communicate adjustments needed to bring the production process back into specification.*
- *Make necessary adjustment in the manufacturing process in a timely manner.*

MN-QA 4.6: Document product and process to assure formal compliance with customer requirements.
*Sample Indicators:*

- *Write compliance documents legibly in the appropriate format and store them in a safe, secure place.*
- *Complete compliance documentation, obtain "sign off," and forward to the proper parties.*
- *Label products for compliance and non-compliance appropriately.*

MN-QA 4.7: Check for specified quantities and proper documentation when preparing a final product for distribution.
*Sample Indicators:*

- *Package materials to meet packaging and shipping specifications (including proper labeling).*
- *Complete package documentation and customer shipping instructions to accompany the product to the next destination.*
- *Communicate product availability to the proper parties in a timely manner.*
- *Check relevant information such as quantity, destination and packaging instructions against the work order.*
- *Verify that product is correctly stored or staged for shipping.*
- *Explain the significance of following all laws and regulations related to labeling, packaging and transport.*
- *Verify that material handling procedures are followed to prevent product damage.*

## 5. Perform safety inspections and training to ensure a safe and healthy workplace.

MN-QA 5.1: Perform environmental and safety inspections following local, federal and company regulations.
*Sample Indicators:*

- *Identify, report and monitor potential hazards in the workplace.*
- *Take corrective action to correct potential hazards.*
- *Review health, safety and environmental documentation and policies thoroughly and regularly.*
- *Ensure that inspections meet all relevant health, safety and environmental laws and regulations.*
- *Complete inspections according to company schedule and procedures.*
- *Document inspection records and store them correctly.*

MN-QA 5.2: Perform emergency drills as part of an emergency response team.
*Sample Indicators:*

- *Confirm that first aid training and certification on emergency and first aid procedures are complete and up-to-date.*
- *Comply with company and regulatory policies and procedures to respond to emergencies.*
- *Document emergency drills and incidents according to company and regulatory procedures promptly.*

MN-QA 5.3: Identify unsafe conditions according to safety standards.
*Sample Indicators:*

- *Identify, report and document conditions presenting a threat to health, safety and the environment.*
- *Identify corrective actions.*

MN-QA 5.4: Take corrective action following safety protocols
*Sample Indicators:*

- *Consult appropriate parties about corrective actions and take corrective actions following company procedures promptly.*
- *Track and report ongoing safety concerns until corrective action is taken.*

MN-QA 5.5: Train other employees in safe practices and emergency procedures following training orientation guidelines.
*Sample Indicators:*

- *Verify that all topics and procedures are covered in orientation to facilitate employee safety.*
- *Observe orientation to ensure that it makes clear the need and processes for employees to raise safety concerns, ask questions and receive additional training.*
- *Use company requirements to document orientation.*
- *Verify that orientation meets all relevant laws, policies and regulations.*
- *Deliver safety instruction and updates on a regular schedule.*

## 6. Implement continuous improvement processes to maintain quality products.

MN-QA 6.1: Perform periodic internal quality audit activities.
*Sample Indicators:*

- *Complete all audit forms correctly in a timely manner.*
- *Forward forms to the correct parties.*
- *Verify that audit data is relevant and correct.*
- *Make sure that conformances to quality standards are properly assessed and documented.*
- *Include observation of operation in audit when appropriate to ensure performance meets specifications.*
- *Follow company and other required schedules and procedures to perform audit.*

MN-QA 6.2: Monitor calibration of gauges and other data collection equipment.
*Sample Indicators:*

- *Follow specifications to implement calibration schedule.*
- *Review documents and use thorough observation to check instrument certification.*
- *Recalibrate instruments that are out of calibration or refer them to the appropriate parties for recalibration or repairs immediately.*

MN-QA 6.3: Suggest process improvements on a regular basis.
*Sample Indicators:*

- *Use observations and data analysis to generate potential improvements.*
- *Verify that suggestions communicate measurable and data-driven benefits to the company, its customers and its employees.*
- *Use proper procedures and documentation to make suggestions.*
- *Make sure that all suggestions show that all data was reviewed prior to making a recommendation.*

MN-QA 6.4: Inspect materials at all stages of process to determine quality or condition.
*Sample Indicators:*

- *Follow schedule and procedures to complete sampling and inspection.*
- *Select and use inspection tools and procedures correctly.*
- *Inspect materials against correct specifications.*
- *Identify materials that do not meet specification.*
- *Take corrective action on out-of-specification material.*
- *Document inspection results.*
- *Report inspection results to correct parties.*

MN-QA 6.5: Document the results of quality tests.
*Sample Indicators:*

- *Check data forms to ensure that they are complete and accurate.*
- *Make sure that information is evaluated and interpreted correctly.*
- *Forward data to correct parties.*
- *Select and use correct analytical tools.*

MN-QA 6.6: Adjust the process or product to restore or maintain quality.
*Sample Indicators:*

- *Make sure that appropriate corrective actions are identified and approvals received when needed.*
- *Make adjustments to eliminate deviations and bring the process back into control.*
- *Make adjustments in a timely manner.*
- *Document adjustments properly.*

## 7. Identify inspection processes that ensure products meet quality specifications.

MN-QA 7.1: Inspect materials against quality specifications.
*Sample Indicators:*

- *Identify materials required for productions correctly.*
- *Reject non-conforming material.*
- *Document inspection results.*

- *Make sure that documentation records clearly indicate inspection and verification results.*

MN-QA 7.2: Report material quality deviations to production.
*Sample Indicators:*
- *Report quality deviations to the correct parties in a timely fashion.*
- *Describe quality deviations accurately.*
- *Use the prescribed format to report quality deviations.*

MN-QA 7.3: Release materials that meet specifications to production.
*Sample Indicators:*
- *Use production plan to implement release procedure.*
- *Identify and label materials properly.*
- *Verify that all approvals are obtained before releasing materials.*
- *Document release approvals properly.*
- *Store materials not ready for release or redirect them for other use.*

MN-QA 7.4: Maintain supplier relationships to ensure quality of materials.
*Sample Indicators:*
- *Maintain positive business relationships with suppliers.*
- *Maintain proper level of security and confidentiality in relationships with suppliers.*
- *Make delivery of materials just in time to meet production needs.*
- *Report information regarding cost and price to relevant parties.*
- *Provide suppliers with detailed material specifications, procedures and processes to correct deviations.*