MANUFACTURING ENGINEERING TECHNICIAN
(Time-Based)

APPENDIX A
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This training outline represents minimum standards for work processes and related instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom instruction.

Potential Job Titles: Central Quality Engineering Technician, Assembly/Testing/Final Inspection Engineering Technician, Machining Engineering Technician, Product Engineering Technician

WORK PROCESSES

All apprentices must complete the following Core Work Skills Processes:

Core Work Skills 4000 Hours -To Be Completed By All Apprentices

	Approximate Hours
A. Safety and Workplace Orientation	125

1. Demonstrate knowledge of general workplace procedures, policies, etc.
2. Describe workplace structure, workflow, and relation of trade to the workflow.
3. Learn and follow workplace safety policies.
4. Learn emergency procedures and implement (if necessary).

B. Central Quality Engineering	875

1. Support quality improvement technicians as they respond to: Production line calls; interact with Assembly/Testing/Final Inspection (ATF) quality and product engineering technicians; measure suspect parts; screen parts; support Emergency Quality Responses (EQR).
2. Become familiar with prints, standards, Non-Conforming Material Reports

(NCMR), waivers, deviations, and EQR procedures.
3. Support customer-specific inspections, write up findings, escalate issues, participate in daily quality meetings.
4. Shadow Certified Quality Auditors (CQA) as they respond to: Original Equipment Manufacturer (OEM) quality calls, use diagnostic systems and databases to diagnose fault codes/complaints, place emergency part orders, and receive OEM quality rejected parts.
5. Shadow Quality Systems Technicians as they conduct Marine Witness Tests (if applicable), conduct Repeatability and Reliability (R&R) studies, and perform various audits.
6. Shadow Reliability Technicians as they: track and report Early Life Failures (or equivalent depending on industry), supplier-caused OEM defects, track major quality/repair issues.
7. Support product quality auditors as they perform teardown & rebuild quality audits, conduct failure analyses.
8. Become familiar with hand tools, torque wrenches, feeler gauges, impact guns, product disassembly and reassembly.
9. Shadow Metrology Technicians as they conduct measurements using: calipers, micrometers, optical comparators, height gauges, gauge blocks, and dial bore gauges.
10. Shadow Measurement Technicians as they conduct measurements using: profilometers, roundness gauges, super micrometers, Coordinate Measuring Machines (CMM), and other precision measurement equipment.

C. Assembly/Testing/Final Inspection 1000

1. Shadow engineers, technicians, and fabrication shop workers.
2. Become familiar with work station content, flow, workstation time studies, and overcycle data.
3. Understand National Institute of Occupational Safety & Health (NIOSH) and ergonomic standards when designing racks.
4. Learn basics of AutoCAD layout and rack designs.
5. Determine line balance and manpower needs based on required efficiencies.
6. Participate in quality improvement activities.
7. Shadow electrical troubleshooting.
8. Receive introduction to electrical safety requirements.
9. Receive introduction to assembly processes, equipment and maintenance/ troubleshooting/repair needs.
10. Receive introduction to specific safety requirements and equipment safety considerations.
11. Become familiar with tool fixtures and tool installations.
12. Develop understanding of product movement systems on shopfloor.

D. Machining 1000

1. Become familiar with quality database calculations.
2. Partner with line engineers/technicians to track line quality defect(s) and discrepant material per employer procedure.
3. Support creation of quality alerts.
4. Develop understanding of control plans and operator level quality documents.
5. Become familiar with process Failure Mode and Effects Analysis (FMEA).
6. Learn to use statistical software (e.g., Minitab) for capability analysis.
7. Support a gage R&R study and calculation.
8. Participate in customer-facing discussions with line Engineer/Technician.
9. Participate in root cause analysis (such as A3)/Production Preparation Process (3P) analysis on everyday problems.
10. Learn tool requirement and tool change procedures.
11. Partner with Engineers and Tool Coordinators to become familiar with all types of tooling: mills, drills, taps, reamers, grinding wheels, lapping tape and stones, tool holders, etc.
12. Learn material procurement processes.
13. Become familiar with tool test processes and procedures.
14. Become familiar with the tool re-grind process.
15. Learn tool measurement techniques using micrometers, comparators, dial indicators, etc.
16. Demonstrate understanding of Lock Out/Tag Out (LO/TO) procedure; Obtain status to perform LO/TO on selected equipment.
17. Utilize part prints, process sheets, and tool drawings to demonstrate an an understanding of operational sequences and connection between operator tasks, process documentation, and inspection/control plans.
18. Learn and perform hands-on metrology/parts inspection.
19. Demonstrate understanding of Computer Numerical Control (CNC) programs.
20. Partner with line Engineer and Technicians to troubleshoot machining processes regarding machine and quality.
21. Understand lift table data and how it is used to help create CNC machining programs.

E. Product Engineering 1000

1. Shadow operations engineers as they respond to: production line calls, interact with Quality and Supplier Quality Improvement (SQI) technicians and engineers.
2. Become familiar with prints, standards, Non-Conforming Material Reports (NCMR), waivers, deviations, and EQR procedures.
3. Shadow problem solving engineers as they: evaluate failed components/parts, develop investigation plans and design reviews, and report out in product quality forums.

4. Become familiar with component/product failure analysis, 7-Step Problem Solving, Factor Tree Analysis, and design reviews.
5. Shadow systems performance integration engineers as they: plan tests, set up data acquisition, complete test routes, and analyze data.
6. Become familiar with: calibrations, software, test planning, instrumentation.
7. Shadow after treatment integration engineers and on-board diagnostic engineers as they: evaluate fault codes, develop investigation plans, develop calibrations, and develop diagnostics.
8. Shadow engineering build technicians as they: review test requests, build test products, install instrumentation, and conduct repairs and modifications.
9. Shadow Applied Mechanics & Instrumentation (AMI) Technicians as they review: Test requests, select measurement methods, install gauges and instrumentation, and wire instrumentation to data acquisition equipment.
10. Become familiar with strain gauges, pressure transducers, load cells, thermocouples, etc.
11. Shadow Applied Mechanics & Instrumentation Engineers as they: calibrate instrumentation, conduct tests, gather & analyze data, draw conclusions, and make recommendations.
12. Become familiar with data acquisition equipment, test procedures, and analysis techniques.
13. Shadow product test Technicians as they: operate test rigs, swap components, monitor testing, and collect data.
14. Shadow test Engineers and Technicians as they: work with customers to define deliverables, develop preliminary concepts. Construct test rigs, and develop measurement systems.
15. Shadow Materials Technicians and Metallurgists as they: prepare metallurgical samples (if applicable), measure macro- and micro-hardness, review structure, and use advanced analysis equipment.
16. Become familiar with lab safety, sectioning, micro-preparation, polishing, hardness testing, metallographic analysis, and advanced analysis.
17. Shadow Materials Technicians and Chemists as they: prepare samples, run tests, and draw conclusions.
18. Become familiar with: viscometers, titration, spectrometers, and advanced analysis equipment.

Specialized Work Skills –
Each Apprentice will complete 1 Specialized Work Process

F. Central Quality Technician	4000
G. Metrology Technician	4000
H. Industrial Engineer Technician	4000
I. Quality Engineer Technician	4000

J. Manufacturing Engineer Technician	4000
K. Controls Engineer Technician	4000
L. Mechanical Systems Engineer	4000
M. Systems Performance Integration Technician	4000
N. Engine Test Technician (if applicable)	4000
O. Applied Mechanics & Instrumentation Technician	4000
P. Rig Test Technician (if applicable)	4000
Q. Materials Technician	4000
R. Machining Quality Technician	4000
S. Tooling Technician	4000
T. Process Technician -Blocks & Heads (if applicable)	4000
U. Process Technician – Cams (if applicable)	4000
Approximate Total Hours	8000

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to http://www.labor.state.ny.us/workerprotection/publicwork/PDFs/Article8FAQS.pdf

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APPENDIX B

RELATED INSTRUCTION

Safety and Health

General Workplace Safety
First Aid & CPR (minimum 6.5 hours)
Personal Protective Equipment (PPE)
Right-to-Know/Safety Data Sheets (SDS)
Asbestos Awareness (if present – see Attachment to Appendix B)
Lockout/Tagout (LO/TO)
Sexual Harassment Prevention – must comply with Section 201-g of the Labor Law
Occupational Safety and Health Administration (OSHA) 10-Hour General Industry
OSHA 30-Hour General Industry (at option of sponsor)

Trade Theory, Science, and Mechanics

College Algebra and Trigonometry
Blueprint Reading
AutoCAD
Elementary Statistics
Physics
Metrology (including Geometric Dimensioning & Tolerancing (GD&T))
Machining Theory
Manufacturing Processes
Hydraulic/Pneumatic Engineering
Fundamentals of Electricity
Statistics for Technology
Metallurgy
Materials Mechanics
Energy Systems Mechanics
CNC
Intro to Solid Modeling (if applicable)
Advanced Solid Modeling (if applicable)
Chemistry (if applicable)
Programming Concepts
Electric Motors
Industrial Automation
Programmable Logic Controllers (PLCs)
Root Cause Analysis
Capability Analysis

Continuous Improvement
Lean Manufacturing
Project Management
Ergonomics Training
Materials Testing

Additional Courses as Necessary

A Minimum of 144 hours of Related Instruction is Required for Each Apprentice for Each of Four Years.