REVISED

NATIONAL

GUIDELINES FOR

APPRENTICESHIP STANDARDS

DEVELOPED BY

THE NATIONAL INSTITUTE FOR METALWORKING SKILLS, INC.

10565 Fairfax Boulevard, Suite 203

Fairfax, Virginia 22030

FOR ALL OCCUPATIONS LISTED IN THESE STANDARDS

DEVELOPED IN COOPERATION WITH THE
U.S. DEPARTMENT OF LABOR
OFFICE OF APPRENTICESHIP

APPROVED AND CERTIFIED BY THE
U.S. DEPARTMENT OF LABOR
OFFICE OF APPRENTICESHIP

BY: /s/
JOHN V. LADD, ADMINISTRATOR
OFFICE OF APPRENTICESHIP

CERTIFICATION DATE: November 4, 2011

CERTIFICATION NUMBER: C-2005-02

FOREWORD

These National Institute for Metalworking Skills (NIMS) Standards of Apprenticeship represent a fundamental change and a dramatic improvement in conducting and delivering apprenticeship training in the nation's metalworking industry. NIMS approach has transitioned the traditional time-based apprenticeship training structure into a fast paced, innovative competency-based training system.

The competency-based approach provides the opportunity for the apprentice to move through the system at their own pace, benchmark the achievement of each set of Core Competencies, and build a portfolio of skills and credentials validating the acquired skilled levels. This will provide a measured return-on-investment in training, and add value to competency-based training by awarding nationally recognized interim credentials with a "Certificate of Training" from the U.S. Department of Labor, Employment & Training Administration's, Office of Apprenticeship. For the apprentice, this means a more flexible approach to training, an environment to validate the levels of achievement, recognition within the industry and a clear and defined pathway to college credits and an Associate of Arts Degree through a local community college. NIMS has also developed an articulation agreement with Marshall University to assist students in acquiring an Associate of Arts Degree.

In addition, companies may tailor an occupation to meet their own specific business requirements and local needs by adding company specific competencies to the Core Competency requirements. By most reports, companies who use this approach have found their apprentices more motivated and their products and services improved. The purpose of these National Guidelines for Apprenticeship Standards (National Guideline Standards) is to provide policy and guidance to local Sponsors in developing these Standards for Apprenticeship for local approval and registration. These National Guideline Standards developed by NIMS are certified by the U.S. Department of Labor, Office of Apprenticeship as substantially conforming to the requirements of Title 29, CFR parts 29 and 30. State Apprenticeship Agencies recognized by the Office of Apprenticeship to register local programs, and/or local laws and regulations, may impose additional requirements that must be addressed in the local apprenticeship standards.

Local Standards of Apprenticeship must be developed and registered by each Sponsor that undertakes to carry out an apprenticeship training program. The local Standards of Apprenticeship will be the Sponsor's written plan outlining all terms and conditions for the recruitment, selection, employment, training, and supervision of apprentices as subscribed to by the Sponsor, and must meet all the requirements of the Registration Agency.

The establishment of local apprenticeship programs under these National Guideline Standards will provide the Sponsor with a skilled and versatile work force at each of its locations by providing apprentices the opportunity to become journeyworkers through an organized and properly supervised program of training, practical experience and related instruction.

NATIONAL INSTITUTE FOR METALWORKING SKILLS (NIMS)

The NIMS is responsible for the development of these National Guideline Standards of Apprenticeship and having them certified by the United States Department of Labor, Office of Apprenticeship for use by companies implementing the NIMS Competency-based Apprenticeship System.

The Executive Director of NIMS, to the extent authorized, is the advisor for these National Guideline Standards and, as such shall establish rules and regulations governing its procedures as may be required.

RESPONSIBILITIES:

The National Institute for Metalworking Skills will be responsible for:

A. All communications with the U.S. Department of Labor, Office of Apprenticeship regarding these National Guideline Standards.

B. Encouraging the metalworking industry to establish and register apprenticeship programs in accordance with these National Guideline Standards.

C. Appointing metalworking industry members to the NIMS Apprenticeship Committee. The NIMS Apprenticeship Committee will include the Executive Director of the NIMS and five Apprenticeship Committee members approved by the NIMS Board of Directors. The NIMS Apprenticeship Committee will, in the future, identify, and revise to stay current with new technology, all required Core Competencies and the corresponding NIMS Credentials that must be attained to successfully complete a NIMS Competency-based Apprenticeship Program.

D. Making an annual report to the NIMS Board of Directors on the progress made with the implementation of the NIMS Competency-based Apprenticeship System.

DEVELOPMENT OF AFFIRMATIVE ACTION PLAN AND SELECTION PROCEDURES

Equal employment opportunity is required of every registered apprenticeship program. Such requirements apply to the recruitment, selection, employment, and training of apprentices throughout their apprenticeship.

Those programs with five or more apprentices, or where there is a likelihood of five or more apprentices, must have a written Affirmative Action Plan and Selection Procedures that is approved by the Registration Agency as part of the Standards of Apprenticeship.

A sample Affirmative Action Plan and a sample Selection Procedures are attached.

Representatives of the Registration Agency are available to assist the local Sponsor in developing its Standards of Apprenticeship, Affirmative Action Plan and Selection Procedures using the sample provided. Once developed, the Standards of Apprenticeship, as well as the Affirmative Action Plan and Selection Procedures must be submitted to the Registration Agency for approval and registration.

OFFICIAL ADOPTION OF NATIONAL GUIDELINES FOR APPRENTICESHIP STANDARDS:

The National Institute for Metalworking Skills, Inc. hereby officially adopts these National Guidelines for Apprenticeship Standards on this 20th Day of July, 2011.

SIGNATURE OF SPONSOR

STEPHEN C. MANDES

PRINTED NAME

EXECUTIVE DIRECTOR

TITLE

The National Institute for Metalworking Skills, Inc.

SPONSORING ORGANIZATION

(SAMPLE)

STANDARDS OF APPRENTICESHIP

DEVELOPED BY

(NAME OF SPONSOR)

FOR ALL OCCUPATIONS LISTED IN THESE STANDARDS

APPROVED BY

(REGISTRATION AGENCY)

These model National Guidelines for Apprenticeship Standards are an example of how to develop apprenticeship standards that will comply with 29 CFR parts 29 and 30 when tailored to a sponsor's apprenticeship program. These model Standards do not create new legal requirements or change current legal requirements. The legal requirements related to apprenticeship that apply to registered apprenticeship programs are contained in 29 U.S.C. 50 and 29 CFR parts 29 and 30. Every effort has been made to ensure that the information in the model Apprenticeship Standards is accurate and up to date.

TABLE OF CONTENTS

		Page
Foreword		iii
Definitions		v
SECTION I	Program Administration	1
SECTION II	Equal Opportunity Pledge	1
SECTION III	Affirmative Action Plan	2
SECTION IV	Qualifications for Apprenticeship	2
SECTION V	Selection of Apprentices	2
SECTION VI	Apprenticeship Agreement	3
SECTION VII	Ratio of Apprentices to Journeyworkers	3
SECTION VIII	Term of Apprenticeship	3
SECTION IX	Probationary Period	4
SECTION X	Hours of Work	4
SECTION XI	Apprentice Wage Progression	4
SECTION XII	Credit for Previous Experience	5
SECTION XIII	Work Experience	5
SECTION XIV	Related Instruction	6
SECTION XV	Safety and Health Training	7
SECTION XVI	Supervision of Apprentices	7
SECTION XVII	Records and Examinations	7
SECTION XVIII	Maintenance of Records	8
SECTION XIX	Certificate of Completion of Apprenticeship	8
SECTION XX	Notice to Registration Agency	9
SECTION XXI	Cancellation and Deregistration	9
SECTION XXII	Amendments and Modifications	9
SECTION XXIII	Adjusting Differences/Complaint Procedure	10
SECTION XXIV	Transfer of an Apprentice and Training Obligation	11
SECTION XXV	Responsibilities of the Apprentice	11
SECTION XXVI	Technical Assistance	12
SECTION XXVII	Signature Page Adopting Apprenticeship Standards	14
Appendix A	Sample Work Process Schedule, Related Instruction Outline and Apprenticeship Assessment Process	
Appendix B	AER Sponsor Manual and Sample Apprenticeship Agreement	
Appendix C	Template Affirmative Action Plan	
Appendix D	Qualifications and Selection Procedures	
Appendix E	Certification of Completion of Core Competencies and NIMS Credentials	

FOREWORD

These **(INSERT SPONSOR'S NAME)** Standards of Apprenticeship represent a fundamental change and a dramatic improvement in conducting and delivering apprenticeship training in the nation's metalworking industry. The National Institute for Metalworking Skills, Inc., (NIMS) approach has transitioned the traditional time-based apprenticeship training structure into a fast paced, innovative competency-based training system.

The competency-based approach provides the opportunity for the apprentice to move through the system at their own pace, benchmark the achievement of each set of Core Competencies, and build a portfolio of skills and credentials validating the acquired skilled levels. This will provide a measured return-on-investment in training, and add value to competency-based training by awarding nationally recognized interim credentials with a "Certificate of Training" from the U.S. Department of Labor, Employment & Training Administration's, Office of Apprenticeship. For the apprentice, this means a more flexible approach to training, an environment to validate the levels of achievement, recognition within the industry and a clear and defined pathway to college credits and an Associate of Arts Degree through a local community college. NIMS has also developed an articulation agreement with Marshall University to assist students in acquiring an Associate of Arts Degree.

In addition, companies may tailor an occupation to meet their own specific business requirements and local needs by adding company specific competencies to the Core Competency requirements. By most reports, companies who use this approach have found their apprentices more motivated and their products and services improved.

NIMS is accredited by the American National Standards Institute (ANSI) as a developer of American National Standards. The skill standards used in developing the Core (required) Competencies are industry written and industry validated. The assessments used to measure the attainment of the competencies are derived from the skill standards and are also industry designed and industry validated.

These Standards of Apprenticeship result from a highly deliberative process. That process commenced with the delineation of recommended Core Competencies by an Expert Panel drawn broadly from the metalworking industry and representing a wide range of occupations. The recommended competencies were subsequently validated through eight regional industry meetings held throughout the U.S. Finally, the competencies were field tested with pilot operations at metalworking companies.

These Standards of Apprenticeship were developed in accordance with the basic standards recommended by the U.S. Department of Labor, Office of Apprenticeship, as a basis from which an Apprenticeship Sponsor may work to establish a NIMS Competency-based Apprenticeship Program.

It is understood that the responsibilities of NIMS under this program are the delineation of the Core Competencies and the provision of the assessment tools that are used in the attainment of the NIMS credentials. Successful completion of the assessments is wholly dependent on the ability of the apprentice and there is no guarantee, expressed or implied, that assures satisfactory performance against the assessments.

DEFINITIONS

APPRENTICE: Any individual employed by the employer meeting the qualifications described in the Standards of Apprenticeship who has signed an Apprenticeship Agreement with the local Sponsor providing for training and related instruction under these Standards, and who is registered with the Registration Agency.

APPRENTICE ELECTRONIC REGISTRATION (AER): Is an electronic tool that allows for instantaneous transmission of apprentice data for more efficient registration of apprentices and provides Program Sponsors with a faster turnaround on their submissions and access to their apprenticeship program data.

APPRENTICESHIP AGREEMENT: The written agreement between the apprentice and the Sponsor setting forth the responsibilities and obligations of all parties to the Apprenticeship Agreement with respect to the Apprentice's employment and training under these Standards. Each Apprenticeship Agreement must be registered with the Registration Agency.

CERTIFICATE OF COMPLETION OF APPRENTICESHIP: The Certificate of Completion of Apprenticeship issued by the Registration Agency to those registered apprentices certified and documented as successfully completing all required Core Competencies and NIMS Credentials outlined in these Standards of Apprenticeship.

COMPETENCY-BASED OCCUPATION: Means the attainment of manual, mechanical or technical skills and knowledge, as specified by an occupation standard and demonstrated by an appropriate written and hands-on proficiency measurement.

COMPANY SPECIFIC COMPETENCIES: Competencies identified by an individual Sponsor that is necessary to meet the Sponsor's specific business needs and are in addition to the required Core Competencies for a NIMS Certified occupation. All company specific competencies and required Core Competencies and the corresponding NIMS Credentials must be attained to successfully complete a NIMS Competency Based Apprenticeship Program registered by the individual Sponsor.

CORE COMPETENCIES: Competencies identified by the NIMS Expert Panel, validated across the metalworking industry, and field tested through a national pilot effort, the apprentice must attain all required Core Competencies and the corresponding NIMS Credentials to complete a NIMS Competency-based Apprenticeship Program.

ELECTRONIC MEDIA: Media that utilize electronics or electromechanical energy for the end user (audience) to access the content; and includes, but is not limited to, electronic storage media, transmission media, the Internet, extranet, lease lines, dial-up lines, private networks, and the physical movement of removable/transportable electronic media and/or interactive distance learning.

EMPLOYER: Means any person or organization employing an apprentice whether or not such person or organization is a party to an Apprenticeship Agreement with the apprentice.

INTERIM CREDENTIAL: Interim Credential means a credential issued by the Registration Agency, upon request of the appropriate sponsor, as certification of competency attainment by an apprentice. *(if applicable)*

JOURNEYWORKER: A worker who has attained a level of skill, abilities and competencies recognized within an industry as having mastered the skills and competencies required for the occupation. (Use of the term may also refer to a mentor, technician, specialist or other skilled worker who has documented sufficient skills and knowledge of an occupation, either through formal apprenticeship or through practical on-the-job experience and formal training.)

NIMS: The National Institute for Metalworking Skills.

NIMS APPRENTICESHIP COMMITTEE: Includes the Executive Director of the National Institute for Metalworking Skills and five Apprenticeship Committee members approved by the NIMS Board of Directors. The NIMS Apprenticeship Committee will, in the future, identify, and revise to stay current with new technology, all required Core Competencies and the corresponding NIMS Credentials that must be attained to successfully complete a NIMS Competency-based Apprenticeship Program.

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM: NIMS has entered into an agreement with the United States Department of Labor to develop a competency-based apprenticeship system for the nation's metalworking industry. Key to the new system is the integration of standards-based credentialing assessments with traditional on-the-job learning.

NIMS CREDENTIAL: The recognition of successfully meeting the skill requirements for a specific competency as defined by the NIMS Skill Standards.

NIMS SKILL STANDARDS: Industry skill standards are benchmarks for performance and define the competencies for workers in the metalworking industry. Skill standards describe the common duties and the knowledge, skills, abilities, and related attributes needed to perform the duties well.

O*NET-SOC CODE: The Occupational Information Network (O*NET) codes and titles are based on the new Standard Occupational Classification (SOC) system mandated by the federal Office of Management and Budget for use in collecting statistical information on occupations. The O*NET classification uses an 8-digit O*NET-SOC code. Use of the SOC classification as a basis for the O*NET codes ensures that O*NET information can be readily linked to labor market information such as occupational employment and wage data at the national, State, and local levels.

ON-THE-JOB LEARNING (OJL): Tasks learned on the job in which the apprentice must become proficient before a completion certificate is awarded. The learning must be through structured, supervised work experience.

PROGRAM SPONSOR: The Sponsor in whose name the Standards of Apprenticeship will be registered, and will have the full responsibility for administration and operation of the apprenticeship program.

PROVISIONAL REGISTRATION: Means the 1-year initial provisional approval of newly registered programs that meet the required standards for program registration, after which program approval may be made permanent, continued as provisional, or rescinded following a review by the Registration Agency, as provided for in the criteria describe in §29.3 (g) and (h).

REGISTERED APPRENTICESHIP PARTNERS INFORMATION DATA SYSTEM (RAPIDS): The Federal system which provides for the automated collection, retention, updating, retrieval and summarization of information related to apprentices and apprenticeship programs.

REGISTRATION AGENCY: Means the U.S. Department of Labor, Office of Apprenticeship or a recognized State Apprenticeship Agency that has responsibility for registering apprenticeship programs and apprentices; providing technical assistance; conducting reviews for compliance with Title 29, CFR parts 29 and 30 and quality assurance assessments.

RELATED INSTRUCTION: An organized and systematic form of instruction designed to provide the apprentice with the knowledge of the theoretical and technical subjects related to the apprentice's occupation. Such instruction may be given in a classroom, through occupational or industrial courses, or by correspondence courses of equivalent value, electronic media, or other forms of self-study approved by the Registration Agency.

STANDARDS OF APPRENTICESHIP: This entire document including all appendices and attachments hereto, and any future modifications or additions approved by the Registration Agency.

SUPERVISOR OF APPRENTICE(S): An individual designated by the program sponsor to supervise or have charge and direction of an apprentice.

TRANSFER: A shift of apprenticeship agreement from one program to another or from one employer within a program to another employer within that same program, where there is agreement between the apprentice and the affected apprenticeship committee or program sponsor.

SECTION I. - PROGRAM ADMINISTRATION (SAMPLE)

The NIMS is responsible for the development of these National Guideline Standards and having them certified by the U.S. Department of Labor, Office of Apprenticeship for use by companies implementing the NIMS Competency-based Apprenticeship System.

The Executive Director of NIMS, to the extent authorized, is the advisor for the National Guideline Standards and, as such shall establish rules and regulations governing its procedures as may be required.

RESPONSIBILITIES:

The NIMS will be responsible for:

A. All communications with the U.S. Department of Labor, Office of Apprenticeship regarding these National Guideline Standards.

B. Encouraging the metalworking industry to establish and register apprenticeship programs in accordance with these National Guideline Standards.

C. Appointing metalworking industry members to the NIMS Apprenticeship Committee. The NIMS Apprenticeship Committee will include the Executive Director of the NIMS and five Apprenticeship Committee members approved by the NIMS Board of Directors. The NIMS Apprenticeship Committee will, in the future, identify, and revise to stay current with new technology, all required Core Competencies and the corresponding NIMS Credentials that must be attained to successfully complete a NIMS Competency-based Apprenticeship Program.

D. Making an annual report to the NIMS Board of Directors on progress made with the implementation of the NIMS Competency-based Apprenticeship System.

SECTION II. - EQUAL OPPORTUNITY PLEDGE - Title 29 CFR 29.5(b)(21) and 30.3(b)

The recruitment, selection, employment, and training of apprentices during their apprenticeship, shall be without discrimination because of race, color, religion, national origin, or sex. The Sponsor will take affirmative action to provide equal opportunity in apprenticeship and will operate the apprenticeship program as required under Title 29 of the Code of Federal Regulations (CFR), part 30.

SECTION III. - AFFIRMATIVE ACTION PLAN – Title 29 CFR 29.5(b)(21) and 30.4

If the Sponsor employs five or more apprentices, the Sponsor will adopt an Affirmative Action Plan and Selection Procedures as required under Title 29, CFR part 30. It will be attached as Appendix C.

SECTION IV.- QUALIFICATIONS FOR APPRENTICESHIP – Title 29 CFR 29.5(b)(10)

Applicants will meet the following minimum qualifications:

A. AGE

Apprentices must not be less than 16 years of age and the Sponsor may establish qualifications regarding minimum age limits in respect to any applicable State Laws or Regulations.

B. EDUCATION

A high school diploma or GED equivalency is required. Applicant must provide an official transcript for high school and post high school education and training. All GED records must be submitted, if applicable.

Applicants must submit a DD-214 to verify military training and/or experience if they are a veteran and wish to receive consideration for such training/experience.

C. PHYSICAL

Applicants will be physically capable of performing the essential functions of the apprenticeship program, with or without a reasonable accommodation, and without posing a direct threat to the health and safety of the individual or others. Applicants may be subject to a physical examination, or screened for current illegal use of drugs, or both upon acceptance into the program and prior to being employed.

D. NIMS CREDENTIALS

Preference will be given to applicants with NIMS Credentials.

SECTION V. - SELECTION OF APPRENTICES – Title 29 CFR 30.5

Selection into the apprenticeship program will be in accordance with the selection procedures made a part of these Standards (Appendix D).

SECTION VI. - APPRENTICESHIP AGREEMENT – Title 29 CFR 29.3(d) and (e) and 29.5(b)(11)

After an applicant for apprenticeship has been selected, but before employment as an apprentice or enrollment in related instruction, the apprentice will be covered by a written Apprenticeship Agreement (Appendix B) signed by the Sponsor and the apprentice and approved by and registered with the Registration Agency. Such agreement will contain a statement making the terms and conditions of these standards a part of the agreement as though expressly written therein. A copy of each Apprenticeship Agreement will be furnished to the apprentice, the Sponsor, and the Registration Agency, and the employer. An additional copy will be provided to the Veteran's State Approving Agency for those veteran apprentices desiring access to any benefits to which they are entitled. Prior to signing the Apprenticeship Agreement, each selected applicant will be given an opportunity to read and review these Standards, the Sponsor's written rules and policies, and the Apprenticeship Agreement.

The Registration Agency will be advised within forty-five (45) days of the execution of each Apprenticeship Agreement and will be given all the information required for registering the apprentice.

SECTION VII. - RATIO OF APPRENTICES TO JOURNEYWORKERS- Title 29 CFR 29.5(b)(7)

A numeric ratio of apprentices to journeyworkers consistent with proper supervision, training, safety, and continuity of employment throughout the apprenticeship, the ratio of apprentices to journeyworkers will be **(INSERT NUMBER)** apprentices to **(INSERT NUMBER)** journeyworkers. The ratio language must be specific and clearly described as to its application on the job site, workforce, department or plant.

SECTION VIII. - TERM OF APPRENTICESHIP -Title 29 CFR 29.5(b)(2)

The term of apprenticeship for NIMS Certified occupations will be defined in the Core Competencies requirements set forth in the structured on-the-job learning (OJL), supplemented by the required hours of related instruction, that will lead to successful completion of the required Core Competencies and NIMS Credentials as stated in the Core Competency Requirements (Appendix A).

Full credit will be given for OJL evaluated as satisfactory and previous acquisition of the required competencies and corresponding NIMS Credentials.

This is a competency-based apprenticeship program and is not constrained by time. The term of apprenticeship will provide sufficient on-the-job learning (OJL) to enable the apprentice to attain the required competencies for each registered occupation.

SECTION IX. - PROBATIONARY PERIOD – Title 29 CFR 29.5(b)(8), (b)(20)

All applicants selected for apprenticeship will serve a probationary period. The probationary period cannot exceed twenty-five (25) percent of the length of the program, or one-year (1), whichever is shorter. All applicants selected for apprenticeship will serve a probationary period of not less than the six (6) months of OJL.

During the probationary period either the apprentice or the Sponsor may terminate the Apprenticeship Agreement, without stated cause, by notifying the other party in writing. The records for each probationary apprentice will be reviewed prior to the end of the probationary period. Records may consist of periodic reports regarding progress made in attaining the required competencies and corresponding NIMS Credentials, job performance, both the OJL and related instruction, and any disciplinary action taken during the probationary period.

Any probationary apprentice evaluated as satisfactory after a review of the probationary period will be given full credit for the probationary period and continue in the program.

After the probationary period the Apprenticeship Agreement may be canceled at the request of the apprentice, or may be suspended or canceled by the Sponsor for reasonable cause after documented due notice to the apprentice and a reasonable opportunity for corrective action. In such cases, the Sponsor will provide written notice to the apprentice and to the Registration Agency of the final action taken.

SECTION X. - HOURS OF WORK

Apprentices will generally work the same hours as journeyworkers, except that no apprentice will be allowed to work overtime if it interferes with attendance in related instruction classes.

The time required for an apprentice to attain the required competencies and NIMS Credentials may vary because of unforeseen circumstances or an individual's speed of learning. Apprentices who do not complete the required competencies and NIMS Credentials scheduled for a given Performance Review Cycle will have their OJL extended until the required competencies and NIMS Credentials are attained.

SECTION XI. - APPRENTICE WAGE PROGRESSION – Title 29 CFR 29.5(b)(5)

Apprentices will be paid a progressive schedule of wages and fringe benefits during their apprenticeship based on the attainment of required competencies and NIMS Credentials, and the subsequent improved job performance. Before an apprentice is advanced to the next wage step or to journeyworker status, the Sponsor will evaluate all progress to determine whether advancement has been earned by satisfactory performance in their on-the-job learning (OJL) and in related instruction. In determining

whether satisfactory progress has been made, the Sponsor will be guided by the competency, NIMS Credential, job performance, and related instruction records and reports.

The progressive wage schedule and fringe benefits will be an increasing percentage of the journeyworker wage rate. The percentages that will be applied to the applicable journeyworker rate are shown on the attached Appendix A. In no case will the starting wages of apprentices be less than that required by any minimum wage law which may be applicable.

SECTION XII. - CREDIT FOR PREVIOUS EXPERIENCE – Title 29 CFR 29.5(b)(12) and 30.4(c)(8)

The Sponsor may grant credit toward the term of apprenticeship to new apprentices who demonstrate previous acquisition of skills or knowledge equivalent to the required competencies and corresponding NIMS Credentials that would be attained under these Standards.

Apprentice applicants seeking credit for previous experience gained outside the supervision of the Sponsor must submit the request at the time of application and furnish such NIMS Credentials, records, affidavits, and other documentation to substantiate the claim. Applicants requesting such credit who are selected into the apprenticeship program will start at the beginning wage rate. The request for credit will be evaluated and a determination made by the Sponsor during the probationary period when actual on-the-job and related instruction performance can be examined. Prior to completion of the probationary period, the amount of credit to be awarded will be determined after review of the apprentice's previous work and training/education record, and the evaluation of the apprentice's performance and demonstrated skill and knowledge during the probationary period guided by the competency, NIMS Credential, job performance, and related instruction records and reports.

An apprentice granted credit will be advanced to the wage rate corresponding to the designated performance level for the period to which such credit accrues. The Registration Agency will be advised of any credit granted and the wage rate to which the apprentice is advanced. The granting of advanced standing will be uniformly applied to all apprentices.

Preference will be given to applicants with NIMS Credentials.

SECTION XIII. - WORK EXPERIENCE – Title 29 CFR 29.5(b)(3) and 30.8

During the apprenticeship, the apprentice will receive the OJL and related instruction that will lead to the successful completion of the Core Competencies and NIMS Credentials, as stated in the Core Competency Requirements (Appendix A), to develop

the level of job performance and proficiency of a skilled journeyworker. The OJL will include the Core Competencies and the company specific competencies tailored to each individual company's business needs. The OJL will be under the direction and guidance of the supervisor of apprentice(s).

SECTION XIV. - RELATED INSTRUCTION – Title 29 CFR 29.5(b)(4)

During each segment of structured OJL, each apprentice is required to participate in coursework related to the job that will lead to successful completion of the required Core Competencies and NIMS Credentials as stated in the Core Competency Requirements (Appendix A). For each NIMS Certified occupation, the recommended term of apprenticeship will include no less than 144 hours of related instruction for each year of the apprenticeship. Apprentices agree to take such courses as the Sponsor deems advisable. The Sponsor will secure the instructional aids and equipment it deems necessary to provide quality instruction. In cities, towns or areas having no vocational school or other schools that can furnish related instruction; the apprentice may be required to take an alternate form of instruction that meets the approval of the Sponsor and Registration Agency.

Apprentices will not be paid for hours spent attending related instruction classes.

Any apprentice who is absent from related instruction classes, unless officially excused, will satisfactorily complete all course work missed before being advanced to the next wage rate corresponding to the designated performance level for that period. In cases of failure of an apprentice to fulfill the obligations regarding related instruction, OJL, and/or the required competencies and corresponding NIMS Credentials, without due cause, the Sponsor will take appropriate disciplinary action and may terminate the Apprenticeship Agreement after due notice to the apprentice and opportunity for corrective action.

To the extent possible, related instruction will be closely correlated with the practical experience and training received on the job and the required Core Competencies and NIMS Credentials as stated in the Core Competency Requirements (Appendix A). Alignment of the related instruction with the required Core Competencies can be best achieved by referring to the NIMS Curriculum Guides. The Sponsor will monitor and document the apprentice's progress in related instruction classes.

The Sponsor will secure competent instructors who have the knowledge, experience, and ability to teach and deliver hands-on learning aligned with the Core Competency Requirements. The progress of the apprentices and the effectiveness of the instructors will be evaluated by reviewing the competency, NIMS Credential, job performance, and related instruction records and reports, and the success of individual instructors will be carefully examined and monitored. The Sponsor may require instructors to attain the required NIMS Credentials that will demonstrate a level of competency and proficiency as defined in the Core Competency Requirements (Appendix A).

SECTION XV. - SAFETY AND HEALTH TRAINING – Title 29 CFR 29.5(b)(9)

All apprentices will receive instruction in safe and healthful work practices both on-the job and in related instruction that are in compliance with the Occupational Safety and Health Standards promulgated by the Secretary of Labor under 29 U.S.C. 651 et seq., as amended, dated December 29, 1970, and subsequent amendments to that law, or State Standards that have been found to be at least as effective as the Federal Standards.

Apprentices will be taught that accident prevention is very largely a matter of education, vigilance, and cooperation and that they should strive at all times to conduct themselves in their work to ensure their own safety and that of their fellow workers.

SECTION XVI. - SUPERVISION OF APPRENTICES – Title 29 CFR 29.5(b)(14)

The Sponsor will be responsible for the apprentice's OJL and related instruction. Apprentices will be under the general supervision of the Sponsor and under the direct supervision of the journeyworker to whom they are assigned. The supervisor of apprentice(s) designated by the employer will be responsible for the apprentice's work assignments, ensuring the apprentice is working under the supervision of a skilled journeyworker, job performance is monitored and evaluated, and progress reports are completed and submitted to the Sponsor.

No apprentice will be allowed to work without direct journeyworker supervision.

SECTION XVII. - RECORDS AND EXAMINATIONS – Title 29 CFR 29.5(b)(6)

Each apprentice will be responsible for maintaining an Apprenticeship Record of his/her OJL in regard to the attainment of the Core Competencies and corresponding NIMS Credentials, and company specific competencies tailored to each company's individual business needs.

Each apprentice will be responsible for maintaining an Apprenticeship Related Instruction Record and for having this record verified by his/her supervisor at the end of each week. The apprentice will authorize the release of records from the related instruction provider to the Sponsor. The Apprenticeship Record and all data, written records of progress evaluations, corrective and final actions pertaining to the apprenticeship, will be maintained by and be the property of the Sponsor. This record will be included in each apprentice's record file maintained by the Sponsor.

Before each period of advancement, or at any other time when conditions warrant, the Sponsor will evaluate the apprentice's record to determine whether he/she has made satisfactory progress. If an apprentice's related instruction or on-the-job progress is

found to be unsatisfactory, and/or the required Core Competencies and corresponding NIMS Credentials are not being attained, the Sponsor may determine whether the apprentice will continue in a probationary status, and require the apprentice to repeat the appropriate competency or series of competencies before advancing to the wage rate corresponding to the designated performance level for the period. In such cases, the Sponsor will initiate a performance improvement plan with the apprentice.

Should it be found that the apprentice does not have the ability or desire to continue the training to become a journeyworker, the Sponsor will, after the apprentice has been given adequate assistance and opportunity for corrective action, terminate the Apprenticeship Agreement.

SECTION XVIII. - MAINTENANCE OF RECORDS – Title 29 CFR 29.5(b)(23) and 30.8

The Sponsor will maintain for a period of five (5) years from the date of last action, all records relating to apprentice applications (whether selected or not), the employment and training of apprentices, and any other information relevant to the operation of the program. This includes, but is not limited to, records on the recruitment, application and selection of apprentices, and records on the apprentice's job assignments, promotions, demotions, layoffs, terminations, rate of pay, or other forms of compensation, hours of work and training, evaluations, and other relevant data. The records will permit identification of minority and female (minority and non-minority) participants. These records will be made available upon request to the Registration Agency.

SECTION XIX. - CERTIFICATE OF COMPLETION OF APPRENTICESHIP – Title 29 CFR 29.5(b)(15)

Upon satisfactory completion of the requirements of the apprenticeship program as established in these Standards, the Sponsor will so certify in writing to the Registration Agency and request that a Certificate of Completion of Apprenticeship be awarded to the completing apprentice(s). Such requests will be accompanied by the appropriate documentation for both the OJL, related instruction, and the attainment of the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements (Appendix A), and any additional documentation as may be required by the Registration Agency. The Sponsor will require the apprentice(s) to attain the required NIMS Credentials and to demonstrate a level of competency and proficiency equivalent to a journeyworker level employee. This level of competency and proficiency will be recognized by awarding a NIMS Certificate of Completion of all Core Competencies and the corresponding NIMS Credentials for the NIMS Certified Occupation. (Appendix F)

SECTION XX. - NOTICE TO REGISTRATION AGENCY – Title 29 CFR 29.5(b)(18)

The Registration Agency will be notified within forty-five (45) days of all new apprentices to be registered, credit granted, suspensions for any reason, reinstatements, extensions, modifications, completions, cancellations, and terminations of Apprenticeship Agreements and causes.

SECTION XXI. - CANCELLATION AND DEREGISTRATION – Title 29 CFR 29.5(b)(18) and 29.8(a)(2)

These Standards will, upon adoption by the Sponsor be submitted to the Registration Agency for approval. Such approval will be acquired before the implementation of a NIMS Competency-based Apprenticeship Program.

(INSERT NAME OF LOCAL SPONSOR) reserves the right to discontinue at any time the apprenticeship program set forth herein. The U.S. Department of Labor, Office of Apprenticeship and State Registration Agencies with registered NIMS Competency-based Apprenticeship Programs will be notified promptly in writing of any decision to cancel the program.

Deregistration of these Standards may be initiated by the Registration Agency for failure of the sponsor to abide by the provisions herein. Such deregistration will be in accordance with the Registration Agency's regulations and procedures.

Within fifteen (15) days of cancellation of the apprenticeship program (whether voluntary or involuntary), the *Sponsor* will notify each apprentice of the cancellation and the effect of same. This notification will conform to the requirements of Title 29, CFR Part 29.8.

SECTION XXII. - AMENDMENTS OR MODIFICATIONS – Title 29 CFR 29.5(b)(18)

These Standards may be amended or modified at any time by the Sponsor provided that no amendment or modification adopted will alter any Apprenticeship Agreement in force at the time without the consent of all parties. Such amendment or modification will be submitted to the Registration Agency for approval and registration prior to being placed in effect. A copy of each amendment or modification adopted will be furnished to each apprentice to whom the amendment or modification applies.

SECTION XXIII. - ADJUSTING DIFFERENCES/COMPLAINT PROCEDURE - Title 29 CFR 29.5(b)(22), 29.7(k) and 30.11

The Sponsor will have full authority to supervise the enforcement of these standards. The Sponsor assumes all responsibility for the implementation of the NIMS National Guideline Standards and the decisions of the Sponsor will be final and binding on the sponsor and the apprentice, unless otherwise noted below.

In conveying the NIMS National Guideline Standards, the role of the NIMS is limited to the delineation of the Core Competencies and the assessment tools required earning NIMS credentials as evidence of the attainment of the core competencies. NIMS, therefore, is not a party to the apprenticeship agreement between the Sponsor and the apprentice and as such does not have a role in the complaint process.

If an applicant or an apprentice believes an issue exists that adversely affects his/her participation in the apprenticeship program or violates the provisions of the Apprenticeship Agreement or Standards of Apprenticeship registered by the Apprenticeship Sponsor, relief may be sought through one or more of the following avenues, based on the nature of the issue:

Title 29 CFR 29.7(k)

The Sponsor will hear and resolve all complaints of violations concerning the Apprenticeship Agreement and the Registered Apprenticeship Standards, for which written notification is received within fifteen (15) days of violations. The Sponsor will make such rulings as it deems necessary in each individual case and within thirty (30) days of receiving the written notification. Either party to the Apprenticeship Agreement may consult with the Registration Agency for an interpretation of any provision of these Standards over which differences occur. The name and address of the appropriate authority to receive, process and make disposition of complaints is: **(Sponsor should insert applicable information here).**

Title 29 CFR 30.11

Any apprentice or applicant for apprenticeship who believes that he/she has been discriminated against on the basis of race, color, religion, national origin, or sex, with regard to apprenticeship or that the equal opportunity standards with respect to his/her selection have not been followed in the operation of an apprenticeship program, may personally or through an authorized representative, file a complaint with the Registration Agency, or, at the apprentice or applicant's election, with the private review body established by the program sponsor (if applicable).

The complaint will be in writing and will be signed by the complainant. It must include the name, address, and telephone number of the person allegedly discriminated against, the program sponsor involved, and a brief description of the circumstances of the failure to apply equal opportunity standards.

The complaint must be filed not later than one hundred eighty (180) days from the date of the alleged discrimination or specified failure to follow the equal opportunity standards, and in the case of complaints filed directly with the review body designated by the program sponsor to review such complaints, any referral of such complaint by the complainant to the Registration Agency must occur within the time limitation stated above or thirty (30) days from the final decision of such review body, whichever is later. The time may be extended by the Registration Agency for good cause shown.

Complaints of harassment in the apprenticeship program may be filed and processed under Title 29, CFR part 30, and the procedures as set forth above.

The Sponsor will provide written notice of its complaint procedure to all applicants for apprenticeship and all apprentices.

SECTION XXIV. - TRANSFER OF AN APPRENTICE AND TRAINING OBLIGATION – Title 29 CFR 29.5(13)

The transfer of an apprentice between apprenticeship programs and within an apprenticeship program must be based on agreement between the apprentice and the affected apprenticeship committee or program sponsors, and must comply with the following requirements:

i. The transferring apprentice must be provided a transcript of related instruction and on-the-job learning by the committee or program sponsor;
ii. Transfer must be to the same occupation; and
iii. A new apprenticeship agreement must be executed when the transfer occurs between the program sponsors.

If the Sponsor is unable to fulfill its training obligation due to lack of work or failure to conform to these Standards, efforts will be made by the Sponsor to transfer an apprentice, with his/her consent, to another Sponsor to provide the opportunity for continuous employment and to complete the required OJL experience in all aspects of the occupation.

SECTION XXV. - RESPONSIBILITIES OF THE APPRENTICE (EXAMPLE ONLY)

Apprentices, having read these Standards as formulated by the Sponsor and signed an Apprenticeship Agreement with the Sponsor, agree to all the terms and conditions contained therein and agree to abide by the Sponsor's rules and policies, including any

amendments, complete all OJL and related instruction, and to attain the required Core Competencies and corresponding NIMS Credentials, and company specific competencies as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker level employee completing a registered NIMS Certified Occupation. ***(INSERT FIELD AS APPROPRIATE)***
In signing the Apprenticeship Agreement, apprentices assume the following responsibilities and obligations under the apprenticeship program:

A. Perform diligently and faithfully the work of the occupation and other pertinent duties assigned by the Sponsor in accordance with the provisions of these Standards.

B. Respect the property of the Sponsor and abide by the working rules and regulations of the Sponsor.

C. Attend and satisfactorily complete all required related instruction in subjects related to the occupation as provided under these Standards.

D. Maintain and make available such records of work experience and training received on the job and in related instruction as may be required by the Sponsor.

E. Develop and practice safe working habits and work in such a manner as to assure his/her personal safety and that of other workers.

F. Work for the employer to whom the apprentice is assigned for the completion of apprenticeship, unless reassigned to another employer or the Apprenticeship Agreement is terminated by the Sponsor.

G. The apprentice will be provided with a copy of the written rules and policies and will sign an acknowledgment receipt of same. This procedure will be followed whenever revisions or modifications are made to the rules and policies.

SECTION XXVI. – TECHNICAL ASSISTANCE

Technical Assistance such as that from the U.S. Department of Labor, Office of Apprenticeship, State Apprenticeship Agencies, the National Institute for Metalworking Skills, technical colleges, community colleges, and career and technology centers, vocational schools maybe requested to advise the Sponsor.

Sponsors may receive technical assistance from the NIMS regarding the hands-on and theoretical assessment tools and the procedures for using those assessments. Current prints for the NIMS hands-on assessments for each NIMS Certified Occupation can be found on the NIMS web site at: http://www.nims-skills.org.

The Sponsor is encouraged to invite representatives from industry, education, business, private and/or public agencies to provide consultation and advice for the successful operation of their training program.

SECTION XXVII. - OFFICIAL ADOPTION OF STANDARDS OF APPRENTICESHIP:

The **(*NAME OF SPONSOR*)** hereby adopts these Standards of Apprenticeship on this _____Day of _____ ***(Insert Year).***

_____
SIGNATURE OF SPONSOR

STEPHEN C. MANDES
PRINTED NAME

EXECUTIVE DIRECTOR
TITLE

The National Institute for Metalworking Skills, Inc
SPONSORING ORGANIZATION

APPENDIX A

This Appendix is attached to and a part of these Standards for the following identified occupations.

APPENDIX	OCCUPATION
Appendix A.1	NIMS Certified Machinist
Appendix A.2	NIMS Certified CNC Set-up Programmer – Milling and Turning
Appendix A.3	NIMS Certified Mold Maker
Appendix A.4	NIMS Certified Tool & Die Maker
Appendix A.5	NIMS Certified CNC Set-up Programmer - Milling
Appendix A.6	NIMS Certified CNC Set-up Programmer - Turning
Appendix A.7	NIMS Certified Stamping Press Set-up Operator
Appendix A.8	NIMS Certified Machine Builder
Appendix A.9	NIMS Certified CNC Operator - Turning
Appendix A.10	NIMS Certified CNC Operator - Milling
Appendix A.11	NIMS Certified CNC Operator – Milling and Turning
Appendix A.12	NIMS Certified CNC Machinist

APPENDIX A.1

WORK PROCESS SCHEDULE
NIMS CERTIFIED MACHINIST
O*NET-SOC CODE: 51-4041.00
RAPIDS CODE: 0296CB

This Appendix is attached to and a part of these Standards for the above identified occupation.

1. TERM OF APPRENTICESHIP

The term of training for a NIMS Certified Machinist will include approximately four years of structured on-the-job learning (OJL), supplemented by the required hours of related instruction, that will lead to successful completion of the required Core Competencies and corresponding NIMS Credentials as stated in the Core Competency Requirements (Appendix A).

Full credit will be given for OJL evaluated as satisfactory and previous acquisition of the required competencies and corresponding NIMS Credentials.

This is a competency-based apprenticeship program and is not constrained by time. The term of apprenticeship will provide sufficient OJL to enable the apprentice to attain the required competencies for each registered occupation.

2. RATIO OF APPRENTICES TO JOURNEYWORKERS

Consistent with proper supervision, training, safety, and continuity of employment throughout the apprenticeship, the ratio of apprentices to journeyworkers will be one (1) apprentice to one (1) journeyworker. This ratio should provide the number of NIMS Certified Machinist necessary for the future needs of the metalworking industry.

3. APPRENTICE PROGRESSIVE WAGE SCHEDULE

Apprentices shall be paid a progressively increasing schedule of wages and fringe benefits based on a percentage of the current journeyworker wage rate.

FOUR-YEAR APPROXIMATE TERM:

PERFORMANCE REVIEW CYCLE		% OF JOURNEYWORKER WAGE AND FRINGE BENEFITS
Entry Level Performance Review	=	50% Journeyworker Wage Rate and Fringe Benefits
End of Probationary Period Review	=	60% Journeyworker Wage Rate and Fringe Benefits
First-Year Performance Review	=	70% Journeyworker Wage Rate and Fringe Benefits
Second-Year Performance Review	=	80% Journeyworker Wage Rate and Fringe Benefits
Third-Year Performance Review	=	90% Journeyworker Wage Rate and Fringe Benefits
Completion/Journeyworker Review	=	100% Journeyworker Wage Rate and Fringe Benefits

4. SCHEDULE OF WORK EXPERIENCE

The Core Competency Requirements will provide the focus for the OJL and Related Instruction requirements for the Standards for the NIMS Certified Machinist.

These Standards of Apprenticeship result from a deliberative process that included a national validation of the competencies and field testing through a national pilot effort. The goal of the NIMS is to develop and implement apprenticeship programs that are aligned with industry defined Core Competencies, and company specific competencies that are used to tailor the apprenticeship program to each company's individual business needs.

The Sponsor may modify the company specific competencies to meet local needs prior to submitting these Standards to the appropriate Registration Agency for approval.

5. SCHEDULE OF RELATED INSTRUCTION

Apprenticeship Sponsors may utilize a wide range of Related Instruction resources and providers, including classroom and laboratory activities offered by the National Tooling and Machining Association, technical colleges, community colleges, career and technology centers, online training programs, correspondence programs, and company specific programs. It is not the intent of this project to change the delivery method of any Related Instruction program. The NIMS Certified Machinist Curriculum Guide is provided as a resource so that the Related Instruction program can be aligned with the Core Competencies and the corresponding NIMS Credentials.

See the attached Related Instruction Outline for details.

APPENDIX A.1

CORE COMPETENCY REQUIREMENTS
NIMS CERTIFIED MACHINIST

NIMS CERTIFIED MACHINIST
CORE COMPETENCY
REQUIREMENTS

APPRENTICE CORE COMPETENCIES		NIMS CREDENTIALS
1.	Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment	Measurement, Materials, and Safety Level I
2.	Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Process Control	
6.	Process Adjustment – Single Part Production	
7.	Participation in Processes Improvement	
8.	Manual Operations: Layout	Job Planning, Benchwork, and Layout Level I
9.	Manual Operations: Benchwork	
10.	Sawing	
11.	Job Process Planning	
12.	Drilling Operations	Drill Press Skills Level I
13.	Turning Operations: Turning Between Centers	Turning Between Centers Level I
14.	Turning Operations: Turning Between Centers	Turning Between Centers Level II
15.	Turning Operations: Chucking	Chucking Level I
16.	Turning Operations: Chucking	Chucking Level II
17.	Milling: Square Up a Block	Milling Level I
18.	Manual Milling: Vertical and Horizontal	
19.	Manual Milling: Vertical and Horizontal	Milling Level II
20.	Surface Grinding, Grinding Wheel Safety (Optional)	Grinding Level I
21.	Surface Grinding, Horizontal Spindle, Reciprocating Table (Optional)	
22.	Surface Grinding, Horizontal Spindle, Reciprocating Table (Optional)	Grinding Level II
23.	CNC Programming - Milling and / or CNC Programming - Turning	CNC Milling and / or CNC Turning Level I
24.	CNC: Write a Simple CNC Milling and / or CNC Turning Program and Review Tool Path	
25.	CNC: Operate a CNC Milling Machine and / or Operate a CNC Lathe	
26.	General Housekeeping & Maintenance	Included in all Machining Credentials
27.	Preventative Maintenance - Machine Tools	
28.	Tooling Maintenance	

***NOTE: There is not a specific sequence to the implementation of the Core Competencies. The twenty eight Core Competencies and the twelve NIMS Credentials, listed above, must be satisfactorily completed to meet the requirements of a NIMS Certified Apprentice Apprenticeship Program and earn a *Certificate of Completion*.**

Table of Contents

Core Competencies aligned with the Measurement, Materials, and Safety Credential……..…A.1-7

1. Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment.....A.1-7

2. Demonstrate Compliance with Lock-out and Tag-out Procedures and OSHA Requirements and Guidelines A.1-8

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA .....……..……..……..A.1-8

4. Part Inspection A.1-9

5. Process Control .....……..…….....….A.1-9

6. Process Adjustment—Single Part Production A.1-10

7. Participation in Process Improvement A.1-10

Related Instruction.....A.1-11

Core Competencies aligned with the Job Planning, Benchwork, and Layout Credential …….....…...A.1-12

8. Manual Operations: Layout.....A.1-12

9. Manual Operations: Benchwork A.1-12

10. Sawing A.1-13

11. Job Process Planning A.1-14

Related Instruction.....A.1-15

Core Competency aligned with the Drill Press Skills Credential A.1-16

12. Drilling Operations A.1-16

Related Instruction.....A.1-17

Core Competencies aligned with Turning Operations: Turning Between Centers Credentials…A.1-18

13. Turning Operations: Turning Between Centers, Level I Machining Skills A.1-18

14. Turning Operations: Turning Between Centers, Level II Machining Skills A.1-19

Related Instruction.....A.1-20

Core Competencies aligned with Turning Operations: Chucking..... A.1-22

15. Turning Operations: Chucking: Level I Machining Skills A.1-22

16. Turning Operations: Chucking: Level II Machining Skills A.1-22

Related Instruction..... A.1-24

Core Competency aligned with Milling: Square Up a Block A.1-26

17. Milling: Square Up a Block A.1-26

Related Instruction..... A.1-27

Core Competencies aligned with the Manual Milling Skills A.1-28

18. Manual Milling: Vertical and Horizontal, Level I Machining Skills..... A.1-28

19. Manual Milling: Vertical and Horizontal, Level II Machining Skills..... A.1-28

Related Instruction..... ….....A.1-31

Core Competencies aligned with Grinding Skills (Optional):..... A.1-31

20. Surface Grinding: Grinding Wheel Safety, Level I Machining Skills (Optional)..... A.1-31

Related Instruction.....A.1-32

21. Surface Grinding: Horizontal Spindle, Reciprocating Table, Level I Machining Skills (Optional)……A.1-33

22. Surface Grinding: Horizontal Spindle, Reciprocating Table, Level II Machining Skills (Optional)…….....A.1-34

Related Instruction..... A.1-36

23. CNC Programming - Milling and/or CMC Programming - Turning A.1-37

24. CNC: Write a Simple CNC Milling Program and Review Tool Path and/or Write a Simple CNC Turning Program and Review Tool Path A.1-39

25. CNC: Operate a CNC Milling Machine and/or Operate a CNC Lathe..... A.1-41

26. General Housekeeping and Maintenance A.1-43

27. Preventative Maintenance—Machine Tools..... A.1-43

28. Tooling Maintenance A.1-43

Core Competency

1. Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment

NIMS DUTY & PERFORMANCE STANDARD

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required. Include appropriate personal protective equipment.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned duties.

PERFORMANCE OBJECTIVES (What an apprentice must know and/or do to perform the work competently.)

Given instruction/demonstration and reading, viewing assignments, the apprentice will:

a Identify areas in plant that require hearing devices and safety glasses.

b. Identify proper clothing required on the job to include shoes, gloves, sleeve, and pant length, jewelry items, hair length, and personal cleanliness.

c. The apprentice will demonstrate OSHA lifting techniques, proper air gun usage and identification and safe chip handling techniques.

d. The apprentice will identify all pinch points on primary and supportive machine tools and the proper placements of guards.

e. The apprentice will demonstrate both emergency and standard shut down of all required equipment.

f. The apprentice will demonstrate the proper use of hand tools to include hammer, wrenches, screwdrivers, punches and pliers.

Core Competency

2. Demonstrate Compliance with Lock-out and Tag-out Procedures and OSHA Requirements and Guidelines

NIMS DUTY & PERFORMANCE STANDARD

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned responsibilities.

NOTE

Lock-out/tag-out and right-to-know will be accounted for in Industrial Safety and Environmental Protection. Material handling here means handling of shafts and overhead cranes, etc., and personal protection. The apprentice should recognize pinch points, cutting points, and control points.

Core Competency

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

NIMS DUTY & PERFORMANCE STANDARD

Duty: Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions detailing the handling and storage of hazardous materials in compliance with OSHA and EPA requirements and guidelines, demonstrate safe workplace practices in the identification, handling, and storage of hazardous materials.

Core Competency

4. Part Inspection

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop an inspection plan and inspect simple parts using precision tools and techniques. Prepare reports on the compliance of the parts.

Performance Standard: Given the necessary job process sheets for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedure(s). Complete required written inspection report and make a decision to accept or reject component parts. Provide brief verbal explanation of inspection procedures, results, and decisions.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

Verify calibrations and sizes of all measuring devices. Take measurements to an accuracy of 1/64 for fractions, .002 for decimals and ½ degree for angles. Read standard orthographic prints and understand types of lines, title block information, revision levels, abbreviations, symbols, and tolerances. Identify surface defects, burrs and any adverse conditions such as flat or torn threads, out of round conditions eccentricity, etc.

Core Competency

5. Process Control

NIMS DUTY & PERFORMANCE STANDARD

Duty: Follow a sampling plan. Inspect the samples for the required data. Enter the data on appropriate charts. Graph the data. Respond to the warning conditions indicated by the process charts.

Performance Standard: Given the necessary job process sheets for a part, verbal instructions, and the necessary charts and inspection tools, inspect parts according to the sampling plan, collecting the data required for the process control chart. Working with the supplied control and warning limits, place the data, produce new data as needed, graph the data, and take the Stop or Go actions as indicated by the results of producing the process control chart. Provide brief verbal explanation regarding the decision taken.

Core Competency

6. Process Adjustment—Single Part Production

NIMS DUTY & PERFORMANCE STANDARD

Duty: Analyze the performance of a single-part production process. Formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustment and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a part having routine problems being processed, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Explain the corrective actions and the reasoning used to perform the diagnosis.

Core Competency

7. Participation in Process Improvement

NIMS DUTY & PERFORMANCE STANDARD

Duty: As a member of a process team, analyze the performance of a production process. With the team formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustments and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a routine production process having a problem(s), as a team member, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Carry out the cause and effect analysis by participating in the development of the appropriate Q.C. methodology with the team, i.e., fishbone diagram. Explain the Q.C. tool, the corrective actions and the reasoning connecting the root cause analysis to the remedial actions taken.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Measurement, Materials, and Safety*** credentialing exam are as follows:

Applying the Machinery's Handbook: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing thread percentage, finish symbols, and allowances are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percent.

Industrial Safety: The apprentice must become familiar with Hazmat, MSDS, basic personal protective equipment (PPE), and machine tool safety. Student assessment includes identification of a government body that regulates industrial safety – Occupational Safety and Health Administration (OSHA).

Maintenance: Student assessment includes elementary knowledge of referencing and researching maintenance procedures, hand tool maintenance and safety, and simple tool maintenance.

Process Adjustment: The exam presents basic problems of machining processes such as tapping, threading, drilling, milling, reaming, and grinding in which a process adjustment functions as the corrective action. Students must identify a basic goal of process improvement.

Quality Control Procedures: The exam will evaluate knowledge of basic concepts of SPC and sampling plans. Basic knowledge of inspection plans includes rationale, criteria for choosing the correct measuring instrument, and organization. The evaluation includes basic knowledge of inspection setups and measuring instruments.

NIMS CREDENTIAL: Level I Machining Skills, Job Planning, Benchwork, and Layout

---

Core Competency

8. Manual Operations: Layout

NIMS DUTY & PERFORMANCE STANDARD

Duty: Layout the location of hole centers and surfaces within an accuracy of +/- .015 inch.

Performance Standard: Given a surface plate, surface gage, layout height gage, combination set, scriber, layout ink, prick punch, ball peen hammer, process plan, and part print, layout hole locations, radii, and surfaces matching the specifications.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blue print reading, and understand orthographic projections in order to perform all machining tasks.

b. Given a part print, surface plate and all the required layout tools, the apprentice will select proper tools, and use correct procedure, to layout a part including the location of hole centers and surfaces within the accuracy of +/- .015 inch.

Core Competency

9. Manual Operations: Benchwork

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using aluminum or mild steel, hand drill and hand tap holes. Use hand drills, hand taps, tap wrench, files, scrapers, and coated abrasives to deburr parts. Use arbor presses to perform press fits. Use bench vises and hand tools appropriately.

Performance Standard: Given a process plan, blueprint, access to hand tools, produce a part with two holes prepared for hand tapping, a hole prepared (reamed) for the press fit of a bushing, and a stud for one of the tapped holes. Deburr the part, hand drill and hand tap the holes, press in the bushing, and install the stud.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blue print reading, and understand orthographic projections in order to perform all machining tasks.

b. Given a part print, surface plate and all the required layout tools, the apprentice will select proper tools, and use correct procedure, to layout a part including the location of hole centers and surfaces within the accuracy of +/- .015 inch.

c. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will select the correct tap drills to achieve a minimum of 75% thread in the required tapped holes, and the correct pre-drill hole for reaming operations to achieve tolerances specified on the part print.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds required to perform benchwork-machining operations.

e. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate dimensions required for a press fit, and use an arbor to perform press fit operations.

f. Given instruction/demonstration on the procedure used for hand filing, drilling and reaming, the apprentice will perform filing, drilling, and reaming operations within the specified tolerances on the part print.

g. Given instruction/demonstration on the proper tap selection and the procedure used for hand tapping, the apprentice will perform tapping operations within the specified tolerances on the part print.

Core Competency

10. Sawing

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform sawing to a layout. Choose and mount appropriate blades; weld, break, and re-weld blades as necessary.

Performance Standards: Given a part with a finished layout and access to an appropriate bandsaw and blades, finish saw the part to the layout.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of bandsaw safety procedures, and the identification of bandsaw parts and their function.

b. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary work-holding devices on the bandsaw, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the bandsaw to perform the required sawing operations.

c. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will chose the correct blade for specific sawing operations, and calculate cutting speeds and apply these calculations while performing required sawing operations on the bandsaw.

d. Given instruction/demonstration, reading assignment and the correct bandsaw blade material to perform a specific sawing operation, the apprentice will properly weld and mount the finished blade on the bandsaw.

e. Given a bandsaw, process plan, part print, part with finished layout, bandsaw blade, hand tools, bandsaw accessories, instruction/demonstration on the proper set-up and procedures used for sawing, the apprentice will perform the sawing operations on the part to within the layout specified on the part print.

11. Job Process Planning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop a process plan for a part requiring milling, drilling, turning, or grinding. Fill out an operation sheet detailing the process plan and required speeds and feeds.

Performance Standard: Given a print detailing a part requiring milling, drilling, turning, and grinding, verbal instructions, and appropriate references, formulate a set of strategies to manufacture the part and fill out an operation sheet reflecting the chosen strategies including the required speeds and feeds.

Identify all major components and functions of the machine tools, and all major hand tools, measuring tools, tools and fixtures, work materials and provide the rationale for the speeds and feeds selected.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a he apprentice will be able to choose the most appropriate location for the origin on the part, and establish a method for defining that location during set-up.

b. The apprentice will be able to select appropriate work holding devices for various work pieces.

c. The apprentice will be able to select appropriate tooling and tool holders for various operations and materials.

d. The apprentice will be able to calculate speeds and feeds for proper tool-life and surface finish.

Related Instruction

The knowledge and skills you will need to pass the ***Level I Machining Skills, Job Planning, Benchwork, and Layout*** credentialing exam are as follows:

Basic Mathematics: The exam will assess basic math knowledge from whole number computations and algebra to basic geometry. Application of formulas involving tapping, tapers, speeds and feeds and threading will be evaluated.

Applying the Machinery's Handbook: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing limits, tolerance, and parameters of a material or process are essential skills.

Basic Measurement: The exam will test interpretation of basic measuring instruments, resolution, and applicability of basic measuring tools for given situations. Students must demonstrate knowledge of the differences and similarities of semi-precision and precision measurement.

Basic Machining Theory: The apprentice must understand basic types of tooling materials, applications of tooling and processes for drilling, milling, sawing, turning, and proper procedures using hand tools. A basic understanding of fits and allowances, as well as defining surface finish and machining operation/surface finish relationships is expected.

Layout: The exam will evaluate an understanding of basic and precision layout equipment and procedures. The apprentice should have a basic knowledge of print reading and orthographic projection. Knowledge of the layout of linear, angular, and circular dimensions will be assessed.

NIMS CREDENTIAL: Level I Machining Skills, Drill Press Skills

---

Core Competency

12. Drilling Operations

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate machine tools to perform routine drilling operations.

Performance Standard: Given a semi-finished part, process plan, part print, hand precision, and cutting tools, as well as access to a drill press and its accessories, produce a part matching the process plan and the blueprint specifications. The part specified will be in the semi-finished state having been squared up and the outer surfaces completed with five center-drilled locations. Finishing the part will require the finishing of the five center-drilled locations. Each hole must have at least two secondary operations. The secondary operations will consist of reaming, spot facing, countersinking, counterboring, and counterdrilling. At least one hole must be a blind hole and one a through hole. At least one hole will be power tapped.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of drill press safety procedures, and the identification of drill press, and radial drill press parts and their function.

b. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary work-holding devices on the drill press, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the drill press to perform the required drill press operations.

c. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary tool-holding devices on the drill press, the apprentice will select, mount, set-up, and align tool-holding devices on the drill press to perform the required drill press operations.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required machining operations on the drill press.

e. Given a drill press, process plan, part print, semi-finished part, cutting tools, hand tools, drill press accessories, instruction/demonstration on the proper set-up and procedures used for drilling, tapping, reaming, spot facing, countersinking, and counterboring, the apprentice will perform these secondary operations on the semi-finished part to within the tolerances specified on the part print.

Related Instruction

The knowledge and skills you will need to pass the ***Level I Machining Skills, Drill Press Skills*** credentialing exam are as follows:

Drill Press Components: Proper operation of a drill press depends on knowledge of drill press components and their functions. Identification of the spindle, base, table, column, variable speed control and feed handle are essential for safe and effective use of this machine tool. Other essential components are the table lock, column lock, motor and base.

Process Involvement: An important part of any process improvement is an understanding of the symptoms and causes of some common problems associated with drilling operations. Understanding root causes of drill breakage, excessive wear, enlarged diameters and excessive RPM enable the apprentice to analyze the process and make the correct improvement.

Twist Drill Nomenclature and Sizing: Each twist drill is comprised of many separate features. Identifying the web and understanding web thickness enables apprentice to recognize the effects of excessive web thickness. Knowing the purpose and location of the margin facilitates proper drill diameter measurement as well as the effect of worn margin near the point of the drill. All general-purpose drills have the same identical point angle. The included point angle of a drill will vary dependent on the application and the material being machined.

Safety Practices: Proper safety procedures insure safe and productive machining. Safety includes safe lifting procedures, hair containment, jewelry removal and loose clothing containment. Drill press safety includes the proper location of the vise, storage of the chuck key and chip removal. Safety awareness should be apparent at all times evident through the correct application of speeds and feeds.

Countersinking, Counterboring, Spotfacing, and Center Drilling: Spotfacing, countersinking and counterboring are drilling procedures used to seat screws and bolts with special head configurations or to seat a fastener or washer evenly on a rough surface. Center drilling is an important procedure for accurate hole location as well as shaft preparation for turning between centers. The specific drilling operations have speeds and feeds that are proportionally slower than drilling with general-purpose twist drills

Layout and Inspection: Choosing the correct measuring instrument is primarily must also know when and where to apply semi-precision and precision layout. Selection and application of proper layout tools and setups is essential in any machining operation.

Tapping: The drill diameter used to create a hole for internal threading will dictate the thread percentage or amount of engagement between two mating threaded components. Most tap drill charts for conventional thread forms are based on 70% – 75% engagement. Pipe taps used for some pneumatic and fluid connects have tap drills based on other parameters. With the proper equipment, tapping can be performed under power if the drill press is capable of reversing the rotation.

Work Holding: The workpiece must be held securely to prevent part pullout from the work holding device. The equipment used for work holding parts is dependent upon the shape and size of the part being drilled. Proper location of the vise may prevent the vise from whipping around if the drill gets jammed in the part. Proper selection of work holding devices is critical for safe and accurate application of a drill press.

NIMS CREDENTIALS: Levels I and II Machining Skills, Turning Operations, Turning Between Centers

---

Core Competency

13. Turning Operations: Turning Between Centers, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and carry out between centers turning operations for straight turning.

Performance Standard: Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.002 inch, one UNC external thread, one UNF external thread, and require an end-for-end swap.

Core Competency

14. Turning Operations: Turning Between Centers, Level II Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform between centers turning for straight and tapered turning by offsetting the tailstock.

Performance Standard: Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds.

The part specified should have at least two straight diameters within +/-.001 inch, an appropriate taper at each end of the part, and require a reversal of the part end for end.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a) Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b) Given instruction/demonstration by a qualified individual on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning operations within the specified tolerances on a part print.

c) Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required turning operations within the specified tolerances on a blueprint.

d) Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required various turning operations on the engine lathe.

e) Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f) Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g) Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, and grooving operations within the specified tolerances on the part print.

h) Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i) Given instruction/demonstration on the proper set-up procedure used for knurling on the engine lathe, the apprentice will set-up the machine and perform knurling operations within the tolerances specified on the part print.

j) Given instruction/demonstration on Unified National Thread nomenclature, formulas and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external U.N. thread within the tolerances specified on the part print.

k) Given a blueprint, and instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting internal and external tapers on the engine lathe, the apprentice will cut a taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

l) Given a blueprint, and instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting internal and external tapers on the engine lathe, the apprentice will cut a taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills you will need to pass the ***Turning Operations: Turning Between Centers, Level I Machining Skills*** and ***Turning Operations: Turning Between Centers, Level II Machining Skills*** credentialing exams are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center runout, properly turning hard material and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to operate a lathe safely and effectively. Proper lifting techniques, learning how to find MSDS and HMIS information and some basic personal first aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is critical to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever and the proper method to change speeds and feeds is also critical knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead and different families of thread forms. Proper alignment of the threading tool, as well as the proper location of the compound rest are essential setup steps needed to turn threads with a single point tool. An apprentice must be able to calculate the proper infeed to prevent the thread from either being too deep or too shallow.

Tapping, Fits, and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of the each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: The best choice depends on the accuracy and reliability of the measuring instrument. Tolerance as well as the application will also be important factors. A apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is knowing when the part is accepted or rejected. Basic knowledge of process control techniques such as inspection sheets, Pareto charts, capability studies and X bar/R charts are effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree of accuracy of each method depends on the tolerance of the workpiece dimensions. Proper setups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

Core Competency

15. Turning Operations: Chucking: Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARDS

Duty: Set-up and carry out chucking operations for turning.

Standard: Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.005 inch, two bores within +/-.005 inch, one UNC external thread, and require at least two chuckings or other workholding set-up.

Core Competency

16. Turning Operations: Chucking: Level II Machining Skills

NIMS DUTY & PERFORMANCE STANDARDS

Duty: Set-up and perform tapered boring and turning using a taper attachment.

Standard: Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate turning machine with a taper attachment and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least two diameters within +/-.002 inch, one bore within +/-.002 inch, one external and one internal taper, and require at least two chuckings or other workholding set-up.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b. Given instruction/demonstration on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder by a qualified individual, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning, and boring operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required turning, and boring operations within the specified tolerances on a part print.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required various turning operations on the engine lathe.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f. Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g. Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, boring and grooving operations within the specified tolerances on the part print.

h. Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i. Given instruction/demonstration on Unified National Thread nomenclature, formulas and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external and internal U.N. thread within the tolerances specified on the part print.

j. Given a blueprint, and instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting tapers on the engine lathe, the apprentice will cut an external and internal and taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills you will need to pass the ***Turning Operations: Chucking, Level I Machining Skills*** and ***Turning Operations: Chucking, Level II Machining Skills*** credentialing exams are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center runout, properly turning hard material and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to effectively operate a lathe safely. Proper lifting techniques, learning how to find MSDS and HMIS information and some basic personal first aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is imperative to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever and the proper method to change speeds and feeds is imperative knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead and different families of thread forms. Proper alignment of the threading tool as well as the proper location of the compound rest are essential set-up steps needed to turn threads with a single point tool. A apprentice must be able to calculate the proper infeed to prevent the thread from either being cut too deep or too shallow.

Tapping, Fits and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: Choosing the proper measuring instrument is an important facet of proper inspection. The best choice is dependent on the accuracy and reliability of the measuring instrument. The tolerance as well as the application will determine the choice. An apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is knowing when the part is accepted or rejected. Basic knowledge of process control techniques such as inspection sheets, Pareto charts, capability studies and X bar/R charts are effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree if accuracy of each method depends on the tolerance of the workpiece dimensions. Proper setups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi-precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

NIMS CREDENTIAL: Level I Machining Skills, Milling: Square Up a Block

---

Core Competency

17. Milling: Square Up a Block

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform squaring up the six surfaces of a block to within +/- .002 inch and .002 inch over 4.5 inches squareness.

Performance Standard: Given raw material, process plan, part print, hand, precision and cutting tools, as well as access to an appropriate milling machine and its accessories produce a part matching the process plan and the part print specifications. The part will require squaring up from its raw state.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, and the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required milling operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

Related Instruction

The knowledge and skills you will need to pass Milling***: Square Up a Block, Level I Machining Skills*** credentialing exam are as follows:

Applying the Machinery's Handbook: The apprentice must be able to reference and to apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the student to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions and basic machine adjustments.

Threads and Tapping: Specific areas of knowledge include an understanding of tap drill charts and thread percentage, tapping lubricants, tap drills for pipe threads and taps used for specific operations. The apprentice must be able to troubleshoot basic tapping and threading problems.

Safety Practices: Areas of knowledge includes knowledge of basic safety, cutting tool safety and basic machine maintenance and housekeeping. Apprentices must know some elementary first aid procedures they can perform on themselves.

Milling Operations Set-up: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance includes center various details or shapes and the proper procedure for utilizing center-finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included.

NIMS CREDENTIALS: Levels I and II Machining Skills, Manual Milling Skills

---

Core Competency

18. Manual Milling: Vertical and Horizontal, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Vertical Milling

Set-up and operate vertical milling machines. Perform routine milling, and location of hole centers within +/-.005 inch.

Performance Standard: Vertical Milling

Given raw material, process plan, print, hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using

appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch and have three steps controlled by tolerances of +/-.005 inch.

Core Competency

19. Manual Milling: Vertical and Horizontal, Level II Machining Skills

NIMS DUTIES & PERFORMANCE STANDARDS

Duty: Vertical Mill - Precision Location of Holes

Set-up and perform boring for location, size, and finish.

Performance Standard: Vertical Mill - Precision Location of Holes

Produce three bores to specification. The holes will be between ¾ inch and 1-1/2 inches and their locations are to be held within +/-.001 inch and hold diameters within +/-.0005 inch. One hole is to be counterbored to a decimal depth holding +/-.002 inch and counterbore diameter within +/-.005 inch.

Duty: Milling Keyseats

Set-up and perform milling keyseats on a shaft.

Performance Standard: Milling Keyseats

Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified will require milling two keyseats whose characteristics match the ANSI B17.1 keys and keyseat standards.

Duty: Milling - Cut a Deep Slot

Set-up and perform the cutting of a deep slot.

Performance Standard: Milling - Cut a Deep Slot

Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part specified will require the milling of three deep slots two parallel to one another, the third at right angles to the first two.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, and the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required milling, drilling, and boring operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given required hand and precision tools, instruction/demonstration on the proper set-up and procedures used to perform tramming operations on the vertical milling machine, and the process used to indicate a vise, the apprentice will adjust the milling machine head perpendicular to the table within +/- .001 inch, and indicate a vise maintaining parallelism and perpendicularity measurement of .002 inch over 4.5 inches.

g. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

h. Given raw material, process plan, print, hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch and have three steps controlled by tolerances of +/-.005 inch.

i. Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce three bores to specification. The holes will be between ¾ inch and 1-1/2 inches and their locations are to be held within +/-.001 inch and hold diameters within +/-.0005 inch. One hole is to be counterbored to a decimal depth holding +/-.002 inch and counterbore diameter within +/-.005 inch.

j. Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified would require milling two keyseats whose characteristics match the ANSI B17.1 keys and keyseat standards.

k. Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part specified will require the milling of three deep slots two parallel to one another, the third at right angles to the first two.

Related Instruction

The knowledge and skills you will need to pass the ***Manual Milling: Vertical and Horizontal, Level I Machining Skills***, and ***Manual Milling: Vertical and Horizontal, Level II Machining Skills*** credentialing exams are as follows:

Applying the Machinery's Handbook: The apprentice must be able to reference and to apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the student to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions and basic machine adjustments.

Threads and Tapping: Areas of knowledge include knowledge of basic safety, cutting tool safety and basic machine maintenance and housekeeping. Apprentices must know some elementary first aid procedures they can perform on themselves.

Safety Practices: Areas of knowledge include knowledge of basic safety, cutting tool safety and basic machine maintenance and housekeeping. Apprentices must know some elementary first aid procedures they can perform on themselves.

Milling Operations Setup: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance include center various details or shapes and the proper procedure for utilizing center- finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included.

NIMS Credentials: Levels I and II Machining Skills, Grinding Skills (Optional)

Core Competency

20. Surface Grinding: Grinding Wheel Safety, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Ring test grinding wheels, perform visual safety inspection, mount and dress a grinding wheel in preparation for surface grinding.

Performance Standard: Given a selection of wheels in various conditions determine which are suitable for use, mount one on the spindle, and dress it in preparations for surface grinding. Include the understanding of the grinding wheel code.

PERFORMANCE STANDARD: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments on grinding wheel selection and the standard wheel marking system, the apprentice will determine the proper wheel selection to perform all grinding tasks from information obtained from the part print, and process plan.

b. Given instruction/demonstration and reading assignments, the apprentice will demonstrate the proper procedure used for visual safety inspection of the grinding wheel, and perform a ring testing, to determine the wheel's soundness prior to mounting.

c. Given instruction/demonstration and reading assignments, the apprentice will demonstrate the proper procedure used for balancing (where applicable), mounting, and dressing the grinding wheel on the surface grinder to perform required grinding operations.

Related Instruction

The knowledge and skills you will need concerning Grinding Wheel Safety to pass the ***Level I Machining Skills Surface Grinding*** credentialing exam are as follows:

Grinding Safety: Basic shop practices should be applied in grinding operations. Proper housekeeping and cleanup procedures are critical in safe grinding applications. Proper dress and lifting techniques are also important. Grinding wheel safety is the first step in any grinding procedure. The grinding wheel should be checked for cracks and fractures. Proper installation and wheel dressing are also important factors.

Measurement: Grinding is often considered a finishing operation after milling or rough turning. Grinding operations are usually applied in situations where high accuracy is desired. The apprentice must be able to read a micrometer or vernier micrometer (capable of measuring to .0001 inches). Proper application of dial indicators and height gages is important in measuring ground surfaces of different heights. Comprehension of surface finish specifications and measuring tool selection are essential inspection skills necessary to ensure quality.

Grinding Wheel Dressing: In order to achieve satisfactory surface finishes and to safely use a grinding wheel, the apprentice must understand and apply proper grinding wheel dressing techniques. Knowledge of the types of grinding wheels that can and cannot be dressed with a diamond dresser is essential for safe machining. Understanding the process of wheel trueing and wheel dressing and the effects of a poorly dressed grinding wheel provide the apprentice with basic troubleshooting knowledge for assessing the root cause of some grinding problems.

Types of Abrasives: Proper identification and application knowledge of the types of abrasives used in grinding operations provides an apprentice with the proper foundation for determining which type of abrasive is the most effective for a given grinding application. The apprentice should know the most common grinding abrasive as well as the hardest natural abrasive.

Pedestal Grinders: The pedestal grinder is a free-standing grinding machine used for roughing, snagging castings and sharpening high-speed lathe tool bits amongst other applications. Guard location and wheel dressing techniques differ for a pedestal grinder when compared to a surface grinder. The type of grinding wheel installed on the pedestal grinder is dependent on the application and the type of material being ground.

Work Holding: To intelligently discuss grinding problems, grinding machine problems and setups, the apprentice must be familiar with the names of the grinding machine components. The spindle nut on the grinder must be turned in the correct direction to either install or remove the grinding wheel from the spindle. Most machines will have a left-handed thread to self-tighten from the inertia of the grinding wheel. However, some older machines have the direction the nut must be rotated to tighten the same as wheel rotation.

Grinding Machine Components: To intelligently discuss grinding problems, grinding machine problems and setups, the apprentice must be familiar with the names of the grinding machine components. The spindle nut on the grinder must be turned in the correct direction to either install or remove the grinding wheel from the spindle. Most machines will have a left-handed thread to self-tighten from the inertia of the grinding wheel. However, some older machines have the direction the nut must be rotated to tighten the same as wheel rotation.

Grinding Carbide and Carbide Tooling: Carbide can be ground by two types of grinding wheel material. The best abrasive for machining carbide is diamond. However, due to expense, some carbide grinding applications will use a green silicon carbide wheel. The silicon carbide wheel is inferior to diamond. Diamond wheels, if properly trued and dressed, will yield surface finishes that surpass surface finishes produced by silicon carbide grinding wheels.

Core Competency

21. Surface Grinding: Horizontal Spindle, Reciprocating Table, Level I Machining Skills (Optional)

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate manual surface grinders. Perform routine surface grinding, location of surfaces, and squaring of surfaces. Perform wheel dressing.

Performance Standard: Given a block squared up on a mill, a process plan, part print, hand and precision tools, and choice of a grinding wheel, as well as access to a surface grinder and its accessories, dress the wheel, produce a part matching the process plan and the part print specifications using appropriate trade techniques. The part specified will

be in the semi-finished state having been squared up. Finishing the part will require the precision finishing of the six faces of the block to tolerances common to precision grinding for squareness, size, and surface finish characteristics.

Core Competency

22. Surface Grinding: Horizontal Spindle, Reciprocating Table, Level II Machining Skills (Optional)

NIMS DUTIES & PERFORMANCE STANDARDS Duty:

Finish Flats to +/-.0005

Grind a block's six faces to finished dimensions having tolerances of +/-.0005 inch and squareness of .0005 inch over 4 inches, and 32 microinch surface finish. Dress the wheel as necessary.

Performance Standard: Finish Flats to +/-.0005

Given a block squared up on a mill, hardened to 55 to 60 Rc, a process plan, part print, hand and precision tools, and choice of a grinding wheels, as well as access to a surface grinder and its accessories, dress the wheel, produce a part matching the process plan and the part print specifications using appropriate trade techniques. The part specified will be in the semi-finished state having been squared up. Finishing the part will require the precision finishing of the six faces of the block to tolerances common to precision grinding for squareness, size, and surface finish characteristics.

Duty: Finish Flats at Simple Angles and Grind Contour Radii

Set-up and perform the finish surface grinding of flat surfaces at simple angles with respect to one another. Dress the wheel as necessary.

Performance Standard: Finish Flats at Simple Angles and Grind Contour Radii

Given a block roughed out on a mill, a process plan, part print, hand and precision tools, and choice of a grinding wheels, as well as access to a surface grinder and its accessories, dress the wheel, grind the specified radii and angled surfaces to a finish matching the process plan and the part print specifications using appropriate trade techniques. The part specified will be in the semi-finished state having been roughed out. Finishing the part will require the precision finishing of the specified surfaces of the block to tolerances common to precision grinding for squareness, size, and surface finish characteristics.

Duty: Grinding Wheel Preparation and Balancing

Set up and perform the preparation and balancing of a grinding wheel 14 inches diameter or greater. Place the wheel into service.

Performance Standard: Grinding Wheel Preparation and Balancing

Given a wheel and appropriate equipment prepare the wheel to go into service. Mount the wheel. Produce a surface finish of 32 micro-inches or better on a cylinder or flat surface of CRS.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. Given instruction/demonstration and reading assignments on grinding wheel selection and the standard wheel marking system, the apprentice will determine the proper wheel selection to perform all grinding tasks from information obtained from the part print, and process plan.

b. Given instruction/demonstration and reading assignments the apprentice will demonstrate the proper procedure used for visual safety inspection of the grinding wheel, and perform a ring testing, to determine the wheels soundness prior to mounting.

c. Given instruction/demonstration and reading assignments the apprentice will demonstrate the proper procedure used for balancing a wheel (14 inches or greater), mounting, and dressing the grinding wheel on the surface grinder to perform required grinding operations.

d. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of surface grinder safety procedures, and the identification of surface grinder parts, and their function.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary work-holding devices on the surface grinder, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the surface grinder to perform the required grinding operations.

f. Given instruction/demonstration a block squared up on a mill, hardened to 55 to 60 Rc, a process plan, part print, precision tools, choice of grinding wheels and access to a surface grinder and its accessories, choose the appropriate wheel, dress a wheel, produce a part matching the process plan and the part print specifications using the appropriate techniques. Grind a block's six faces to finished dimensions having a tolerance of ± .0005 inches and a perpendicularity TIR of .0005 inches over 4 inches holding a surface finish of 32 micro inches or better.

g. Given instruction/demonstration a block squared up on a surface grinder, a process plan, part print, precision measuring tools, a choice of grinding wheels and access to a surface grinder and its accessories, set a radius dresser, dress the wheel, grind the specified radii, angled surfaces and slot to a finish matching the process plan and print specifications using appropriate grinding techniques. Use the appropriate work holding devices to grind all surfaces, angles and contours.

h. Given instruction/demonstration, the apprentice will dress and grind an internal or external radius tangent to an angle other than 90° or 0° holding tolerances correlated to the NIMS credentialing print for Machining – Level II Surface Grinding.

Related Instruction

The knowledge and skills you will need to pass the ***Surface Grinding: Horizontal Spindle, Reciprocating Table, Level I and Level II Machining Skills*** credentialing exams are as follows:

Grinding Safety: Basic shop practices should be applied in grinding operations. Proper housekeeping and cleanup procedures are imperative in safe grinding applications. Proper dress and lifting techniques are also important. Grinding wheel safety is the first step in any grinding procedure. The grinding wheel should be checked for cracks and fractures. Proper installation and wheel dressing are also important factors.

Measurement: Grinding is often considered a finishing operation after milling or rough turning. Grinding operations are usually applied in situations where high accuracy is desired. The apprentice must be able to read a micrometer or vernier micrometer (capable of measuring to .0001 inches). Proper application of dial indicators and height gages is important in measuring ground surfaces of different heights. Comprehension of surface finish specifications and measuring tool selection are essential inspection skills necessary to ensure quality.

Grinding Wheel Dressing: In order to achieve satisfactory surface finishes and to safely use a grinding wheel, the apprentice must understand and apply proper grinding wheel dressing techniques. Knowledge of the types of grinding wheels that can and cannot be dressed with a diamond dresser is essential for safe machining. Understanding the process of wheel trueing and wheel dressing and the effects of a poorly dressed grinding wheel provide the apprentice with basic troubleshooting knowledge for assessing the root cause of some grinding problems.

Types of Abrasives: Proper identification and application knowledge of the types of abrasives used in grinding operations provides a apprentice with the proper foundation for determining which type of abrasive is the most effective for a given grinding application. The apprentice should know the most common grinding abrasive as well as the hardest natural abrasive.

Pedestal Grinder: The pedestal grinder is a free standing grinding machine used for roughing, snagging castings and sharpening high-speed lathe tool bits amongst other applications. Guard location and wheel dressing techniques differ for a pedestal grinder when compared to a surface grinder. The type of grinding wheel installed on the pedestal grinder is dependent on the application and the type of material being ground.

Work Holding: Proper work holding and piece part set-up is important in any grinding operation. The apprentice must know how to hold both ferrous and non-ferrous materials. The set-up for grinding angles and radii must be solid and accurate. The apprentice must know the purpose, theory and proper set-up of magnetic parallels when grinding ferrous materials.

Grinding Machine Components: To intelligently discuss grinding problems, grinding machine problems and setups, the apprentice must be familiar with the names of the grinding machine components. The spindle nut on the grinder must be turned in the correct direction to either install or remove the grinding wheel from the spindle.

Most machines will have a left-handed thread to self-tighten from the inertia of the grinding wheel. However, some older machines have the direction the nut must be rotated to tighten the same as wheel rotation.

Grinding Carbide and Carbide Tooling: Carbide can be ground by two types of grinding wheel material. The best abrasive for machining carbide is diamond. However, due to expense, some carbide grinding applications will use a green silicon carbide wheel. The silicon carbide wheel is inferior to diamond. Diamond wheels, if properly trued and dressed, will yield surface finishes that surpass surface finishes produced by silicon carbide grinding wheels.

NIMS CREDENTIAL: Level I CNC Milling and/or CNC Turning

Core Competency

23. CNC Programming - Milling

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison, apply the principles of three dimensional coordinate planes in the development of a simple program for the production of the part on a CNC milling machine.

PERFORMANCE OBJECTIVES (What an apprentice must know and/or do to perform the work competently.)

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector), and R (radium value) methods.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc. that will be used.

CNC Programming - Turning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison: apply the principles of two-dimensional coordinate planes in the development of a simple program for the production of the part on a CNC lathe or CNC turning center.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blue print with respect to an origin.

c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector) and R (radius value) methods.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc. that will be used.

Core Competency

4. CNC: Write a Simple CNC Milling Program and Review Tool Path

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor software, write simple CNC programs using M and G codes from the Machinery's Handbook. Simple programs are single plane, cutter centerline, linear and circular interpolation, single cutter, with no canned cycles as specified on the print.

Performance Standard: Given a part print with the tool path shown, and computer with editor software, write a program, including speeds and feeds, to drive an end mill through a continuous path around three sides of a part requiring the development of a linear interpolation tool path as well as circular interpolation. Store the program on computer media.

PERFORMANCE OBJECTIVES (What an apprentice must know and/or do to perform the work competently.)

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

e. The apprentice will be able to implement circular interpolation into a program to cut straight lines between two points.

f. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work form a process plan to get guidance for sequences, steps, procedures, machining parameters, etc. that will be used.

CNC: Write a Simple CNC Turning Program and Review Tool Path

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor software write simple CNC programs using M and G codes from the Machinery's Handbook. Simple programs are single plane, cutter centerline, linear and circular interpolation, single cutter, with no canned cycles as specified on the print.

Performance Standard: Given a part print with the tool path shown, and the computer with editor software; write a program including speeds and feeds, to drive a cutting tool through a continuous path following the geometry of a part requiring the development of a linear interpolation tool path as well as circular interpolation. Store the program on computer media.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

e. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J (arc vector), and R (radius value) methods.

f. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc. that will be used.

Core Competency

25. CNC: Operate a CNC Milling Machine

NIMS DUTY & PERFORMANCE STANDARD Duty:

Operate a CNC Milling Machine

Performance Standard: Given a CNC mill, create a qualified CNC program, setup and operate the mill, change tool values as necessary, replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc. that will be used.

e. The apprentice will be able to install and qualify the required tooling for the program.

f. The apprentice will be able to mount, locate and set the origin of the workpiece on a CNC milling machine.

g. The apprentice will be able to load a program, create a DNC-link, or enter a program via control keyboard into a CNC milling machine control.

h. The apprentice will be able to safely execute a program for its first run (debugging).

CNC: Operate a CNC Lathe

NIMS DUTY & PERFORMANCE STANDARD

Duty: Operate a CNC Lathe

Performance Standard: Given a CNC lathe create a qualified CNC program, setup and operate the lathe, change tool values as necessary, replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc. that will be used.

e. The apprentice will be able to install and qualify the required tooling for the program.

f. The apprentice will be able to mount, locate, and set the origin of the workpiece on a CNC lathe.

g. The apprentice will be able to load a program, create a DNC-link, or enter a program via control keyboard into a CNC lathe control.

h. The apprentice will be able to safely execute a program for its first run (debugging).

CORE COMPETENCIES ALIGNED WITH ALL MACHINING CREDENTIALS

Core Competency

26. General Housekeeping and Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Keep the duty station clean and safe for work. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.

Performance Standard: Given maintenance, cleaning, and housekeeping checklists, as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all benchwork tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Core Competency

27. Preventative Maintenance - Machine Tools

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the general condition of an assigned machine tool. Make routine adjustments as necessary and as authorized. Report problems to supervision which are beyond the scope of authority. Carry out daily, weekly, and/ or monthly routine upkeep chores cited on checklists for a given machine tool.

Performance Standard: Given the preventive maintenance procedures and schedules for a given machine tool, as well as sufficient instruction and experience to recognize maintenance problems, carry out routine maintenance, report problems which are beyond the scope of authority, fill out the history forms for tracking maintenance.

Core Competency

28. Tooling Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the condition of tooling. Refurbish tooling where appropriate. Refer tooling for repair or regrind where appropriate.

Performance Standard: Given samples of tooling in various conditions, diagnose the tooling, take the correct steps to put the tooling back in service. The sample tooling should include turning, milling, and drilling tools. These tools should be both insert tooling as well as conventional tooling. The apprentice must demonstrate the offhand

grinding of a drill between the diameter of .125 inch and 1.000 inch. The offhand regrinding of a turning tool and the correct rotation and replacement of inserts in an insert style milling cutter body must be demonstrated. The apprentice must demonstrate the ability to recognize when a cutter should be referred to a tool and cutter grinder.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently.)

General Housekeeping and Maintenance

Given maintenance, cleaning and housekeeping checklist as well as verbal instructions, clean, maintain and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Preventative Maintenance - Machine Tools

Given a specific machine tool, the learner will locate, check and fill all applicable lubrication reservoirs, check for proper oil pressure and check that all lubrication points are functioning properly. Check the general condition of the equipment and make routine adjustments as stated in the maintenance schedule.

Tooling Maintenance

a. Diagnose tooling in various conditions and take the correct steps to put the tooling back in service.

b. Perform cutter-sharpening operations.

c. Understand insert identification nomenclature and index or change inserts.

NIMS COMPETENCY BASED APPRENTICESHIP SYSTEM
CORE COMPETENCY ASSESSMENT FORM
NIMS CERTIFIED MACHINIST

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Core Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED MACHINIST CORE COMPETENCIES

1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Process Control	
6.	Process Adjustment – Single Part Production	
7.	Participation in Processes Improvement	
8.	Manual Operations: Layout	
9.	Manual Operations: Benchwork	
10.	Sawing	
11.	Job Process Planning	
12.	Drilling Operations	
13.	Turning Operations: Turning Between Centers - Level I Machining Skills	
14.	Turning Operations: Turning Between Centers - Level II Machining Skills	
15.	Turning Operations: Chucking - Level I Machining Skills	
16.	Turning Operations: Chucking - Level II Machining Skills	
17.	Milling: Square Up a Block	
18.	Manual Milling: Vertical and Horizontal - Level I Machining Skills	
19.	Manual Milling: Vertical and Horizontal - Level II Machining Skills	
20.	Surface Grinding, Grinding Wheel Safety (Optional)	
21.	Surface Grinding, Horizontal Spindle, Reciprocating Table - Level I Machining Skills (Optional)	
22.	Surface Grinding, Horizontal Spindle, Reciprocating Table - Level II Machining Skills (Optional)	
23.	CNC Programming - Milling and / or CNC Programming - Turning - Level I Machining Skills	
24.	CNC: Write a Simple CNC Milling and / or CNC Turning Program and Review Tool Path - Level I	
25.	CNC: Operate a CNC Milling Machine and / or Operate a CNC Lathe - Level I Machining Skills	
26.	General Housekeeping & Maintenance	
27.	Preventative Maintenance - Machine Tools	
28.	Tooling Maintenance	

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY BASED APPRENTICESHIP SYSTEM
CORE COMPETENCY RECORD
NIMS CERTIFIED MACHINIST

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each NIMS Core Competency, the *Date the NIMS Core Competency was attained*, are required for the apprentice to attain each NIMS Core Competency.

NIMS CERTIFIED MACHINIST CORE COMPETENCIES

1. Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2. Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4. Part Inspection

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5. Process Control

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6. Process Adjustment – Single Part Production

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

7. Participation in Processes Improvement

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

8. Manual Operations: Layout

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

9. Manual Operations: Benchwork

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

10. Sawing

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

11. Job Process Planning

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

12. Drilling Operations

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

13. Turning Operations: Turning Between Centers - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

14. Turning Operations: Turning Between Centers - Level II Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

15. Turning Operations: Chucking - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

16. Turning Operations: Chucking - Level II Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

17. Milling: Square Up a Block

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

18. Manual Milling: Vertical and Horizontal - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

19. Manual Milling: Vertical and Horizontal - Level II Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

20. Surface Grinding, Grinding Wheel Safety (Optional)

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

21. Surface Grinding, Horizontal Spindle, Reciprocating Table - Level I Machining Skills (Optional)

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

22. Surface Grinding, Horizontal Spindle, Reciprocating Table - Level II Machining Skills (Optional)

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

23. CNC Programming - Milling and / or CNC Programming - Turning

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

24. CNC: Write a Simple CNC Milling and / or CNC Turning Program and Review Tool Path

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

25. CNC: Operate a CNC Milling Machine and / or Operate a CNC Lathe

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

26. General Housekeeping & Maintenance

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

27. Preventative Maintenance - Machine Tools

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

28. Tooling Maintenance

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

NOTE: The requirement for the NIMS Certified Machinist is to attain either the CNC Milling - Level I Machining Skills Credential, or the CNC Turning - Level I Machining Skills Credential.

NIMS COMPETENCY BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MACHINIST COMPANY SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED MACHINIST COMPANY SPECIFIC COMPETENCIES

29.		
30.		
31.		
32.		
33.		
34.		
35.		
36.		
37.		
38.		
39.		
40.		
41.		
42.		
43.		
44.		
45.		
46.		
47.		
48.		
49.		
50.		
51.		
52.		
53.		
54.		
55.		
56.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
COMPANY SPECIFIC COMPETENCY RECORD
NIMS CERTIFIED MACHINIST

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained* for the apprentice to attain each company specific competency.

29.

_____

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

30.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

31.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

32.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

33.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

34.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

35.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

36.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

37.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

38.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

39.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

40.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

41.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

42.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

43.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

44.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

45.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

46.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

47.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

48.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

49.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

50.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

51.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

52.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

53.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

54.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

55.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

56.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

NIMS CERTIFIED MACHINIST RELATED INSTRUCTION RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED MACHINIST RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED MACHINIST CREDENTIALING RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials, and Safety - Level I Machining Skills	
2.	Job Planning, Benchwork, and Layout - Level I Machining Skills	
3.	Drill Press Skills - Level I Machining Skills	
4.	Turning Between Centers - Level I Machining Skills	
5.	Turning Between Centers - Level II Machining Skills	
6.	Turning Operations: Chucking - Level I Machining Skills	
7.	Turning Operations: Chucking - Level II Machining Skills	
8.	Manual Milling Skills - Level I Machining Skills	
9.	Manual Milling Skills - Level II Machining Skills	
10.	Grinding Skills - Level I Machining Skills (Optional)	
11.	Grinding Skills - Level II Machining Skills (Optional)	
12.	CNC Milling and / or CNC Turning - Level I Machining Skills	
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED MACHINIST JOB PERFORMANCE ASSESSMENT FORM

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED MACHINIST JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR

DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified Machinist**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified Machinist**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

APPENDIX A.2

CORE COMPETENCY REQUIREMENTS

NIMS CERTIFIED CNC SET-UP PROGRAMMER – MILLING AND TURNING

WORK PROCESS SCHEDULE
NIMS CERTIFIED CNC SET-UP PROGRAMMER – MILLING AND TURNING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1100CB

This Appendix is attached to and a part of these Standards for the above identified occupation.

1. TERM OF APPRENTICESHIP

The term of training for a NIMS Certified CNC Set-up Programmer - Milling and Turning will include approximately four years of structured on-the-job learning (OJL), supplemented by the required hours of related instruction, that will lead to successful completion of the required Core Competencies and corresponding NIMS Credentials as stated in the Core Competency Requirements (Appendix A).

Full credit will be given for on-the-job learning evaluated as satisfactory and previous acquisition of the required competencies and corresponding NIMS Credentials.

This is a competency-based apprenticeship program and is not constrained by time. The term of apprenticeship will provide sufficient OJL to enable the apprentice to attain the required competencies for each registered occupation.

2. RATIO OF APPRENTICES TO JOURNEYWORKERS

Consistent with proper supervision, training, safety, and continuity of employment throughout the apprenticeship, the ratio of apprentices to journeyworkers will be one (1) apprentice to one (1) journeyworker. This ratio should provide the quantity of NIMS Certified CNC Set-up Programmers - Milling necessary for the future needs of the metalworking industry.

3. APPRENTICE PROGRESSIVE WAGE SCHEDULE

Apprentices shall be paid a progressively increasing schedule of wages and fringe benefits based on a percentage of the current journeyworker wage rate.

FOUR-YEAR APPROXIMATE TERM:

Entry Level Performance Review	= 50% Journeyworker Wage Rate and Fringe Benefits
End of Probationary Period Review	= 60% Journeyworker Wage Rate and Fringe Benefits
First-Year Performance Review	= 70% Journeyworker Wage Rate and Fringe Benefits

Second-Year Performance Review	= 80% Journeyworker Wage Rate and Fringe Benefits
Third-Year Performance Review	= 90% Journeyworker Wage Rate and Fringe Benefits
Completion/Journeyworker Review	= 100% Journeyworker Wage Rate and Fringe Benefits

4. SCHEDULE OF WORK EXPERIENCE

The following Core Competency Requirements will provide the focus for the On-the-Job Learning (OJL) and Related Instruction requirements for the NIMS Certified CNC Set-up Programmer - Milling and Turning occupation.

These Standards of Apprenticeship result from a deliberative process that included a national validation of the competencies and field testing through a national pilot effort. The goal of the National Institute for Metalworking Skills is to develop and implement apprenticeship programs that are aligned with industry defined Core Competencies, and company specific competencies that are used to tailor the apprenticeship program to each company's individual business needs.

The Sponsor may modify the company specific competencies to meet local needs prior to submitting these Standards to the appropriate Registration Agency for approval.

5. SCHEDULE OF RELATED INSTRUCTION

Apprenticeship Sponsors may utilize a wide range of Related Instruction resources and providers, including classroom and laboratory activities offered by the National Tooling and Machining Association, technical colleges, community colleges, career and technology centers, online training programs, correspondence programs, and company specific programs. It is not the intent of this project to change the delivery method of any Related Instruction program. The NIMS Certified CNC Set-up Programmer - Milling and Turning Curriculum Guide is provided as a resource so that the Related Instruction program can be aligned with the Core Competencies and the corresponding NIMS Credentials.

See the attached Related Instruction Outline for details.

CORE COMPETENCY REQUIREMENTS
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING

	APPRENTICE CORE COMPETENCIES	NIMS CREDENTIALS
1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	Measurement, Materials, and Safety Level I
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and	
3.	Machine Operations and Material Handling, Hazardous Materials	
4.	Part Inspection	
5.	Perform the Inspection of Parts	
6.	Process Control	
7.	Process Adjustment – Single Part Production	
8.	Participation in Processes Improvement	
9.	Manual Operations: Layout	Job Planning, Benchwork, and Layout Level I
10.	Manual Operations: Benchwork	
11.	Sawing	
12.	Job Process Planning	
13.	Drilling Operations	Drill Press Skills Level I
14.	Milling: Square Up a Block	Milling Level I
15.	Manual Milling: Vertical and Horizontal	
16.	CNC Programming - Milling	CNC Milling Level I
17.	CNC: Write a Simple CNC Milling Program and Review Tool Path	
18.	CNC: Operate a CNC Milling Machine	
19.	CNC: Operate a CNC Milling Machine or CNC Machining Center	CNC Milling Level II
20.	CNC: Advanced Manual Programming	CNC Milling Level III
21.	Use Manufacturing Modeling Software to Create Milling Programs	
22.	Turning Operations: Turning Between Centers	Turning Between Centers Level
23.	Turning Operations: Chucking	Chucking Level I
24.	CNC Programming - Turning	CNC Turning Level I
25.	CNC: Write a Simple CNC Turning Program and Review Tool	
26.	CNC: Operate a CNC Lathe	
27.	CNC: Operate a CNC Lathe or Turning Center	CNC Turning Level II
28.	CNC: Advanced Manual Programming	CNC Turning Level III
29.	Use Manufacturing Modeling Software to Create Turning	
30.	General Housekeeping & Maintenance	Included in all Machining Credentials
31.	Preventative Maintenance – Machine Tools	
32.	Tooling Maintenance	

***NOTE: There is not a specific sequence to the implementation of the Core Competencies. The thirty two Core Competencies and twelve NIMS Credentials, listed above, must be satisfactorily completed to meet the requirements of a NIMS Certified CNC Setup Programmer - Milling and Turning Apprenticeship Program and earn a *Certificate of Completion of Apprenticeship*.**

WORK PROCESSES SCHEDULE
RELATED INSTRUCTION OUTLINES
CNC SET-UP PROGRAMMER – MILLING AND TURNING

NIMS CREDENTIAL: Level I Machining Skills, Measurement, Materials & Safety

Core Competency

1. Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment

NIMS Duty & Performance Standard

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with Occupational Safety and Health Administration (OSHA) requirements and guidelines. Document safety activities as required. Include appropriate personal protective equipment.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned duties.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Identify areas in plant that require hearing devices and safety glasses.

b. Identify proper clothing required on the job to include shoes, gloves, sleeve and pant length, jewelry items, hair length and personal cleanliness.

c. Demonstrate OSHA lifting techniques, proper air gun usage and identification, and safe chip handling techniques.

d. Identify all pinch points on primary and supportive machine tools and the proper placements of guards.

e. Demonstrate both emergency and standard shut down of all required equipment.

f. Demonstrate the proper use of hand tools to include hammer, wrenches, screw drivers, punches and pliers.

Core Competency

2. Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

NIMS DUTY & PERFORMANCE STANDARD

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned responsibilities.

NOTE

Lock-out/tag-out and right-to-know will be accounted for in Industrial Safety and Environmental Protection. Material handling here means handling of shafts and overhead cranes, etc., and personal protection. The apprentice should recognize pinch points, cutting points, and control points.

Core Competency

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

Duty: Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions detailing the handling and storage of hazardous materials in compliance with OSHA and EPA requirements and guidelines, demonstrate safe workplace practices in the identification, handling, and storage of hazardous materials.

Core Competency

4. Part Inspection

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop an inspection plan and inspect simple parts using precision tools and techniques. Prepare reports on the compliance of the parts.

Performance Standard: Given the necessary job process sheets for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedure(s). Complete required written inspection report and make a decision to accept or reject component parts. Provide brief verbal explanation of inspection procedures, results, and decisions.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheet for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedures.

b. Verify calibrations and sizes of all measuring devices.

c. Take measurements to an accuracy of 1/64 for fractions, .002 for decimals and ½ degree for angles.

d. Read standard orthographic prints and understand types of lines, title block Information, revision levels, abbreviations, symbols, and tolerances.

e. Identify surface defects, burrs and any adverse conditions such as flat or torn threads, out of round conditions, eccentricity, etc.

Core Competency

5. Perform the Inspection of Parts

NIMS DUTY & PERFORMANCE STANDARD

Duty: Perform the inspection of parts.

Performance Standard: Develop an inspection plan and inspect production parts that will include the use of basic precision measuring tools, optical comparators and profilometers.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheet for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedures.

b. Verify calibrations and sizes of all measuring devices.

c. Inspect a part with specified profiles including angles and radius with an optical comparator and describe the compliance of the profiles.

d. Read standard orthographic prints and understand types of lines, title block information, revision levels, abbreviations, symbols, and tolerances.

e. Using a profilometer, check the finish on a turned part, record the surface finish and compare it to blueprint specifications to determine if it is in compliance.

Core Competency

6. Process Control

NIMS DUTY & PERFORMANCE STANDARD

Duty: Follow a sampling plan. Inspect the samples for the required data. Enter the data on appropriate charts. Graph the data. Respond to the warning conditions indicated by the process charts.

Performance Standard: Given the necessary job process sheets for a part, verbal instructions, and the necessary charts and inspection tools, inspect parts according to the sampling plan, collecting the data required for the process control chart. Working with the supplied control and warning limits, place the data, produce new data as needed, graph the data, and take the Stop or Go actions as indicated by the results of producing the process control chart. Provide brief verbal explanation regarding the decision taken.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheets for a part, verbal instructions and the necessary charts and inspection tools, the apprentice will inspect the parts according to the sampling plan or inspection plan, collecting the data required for the process adhering to the time parameter. Working with the supplied control and warning limits, the apprentice will place the data, produced new data as needed (mean and range), graph the data and take Stop or Go actions as indicated by the results of producing the process control chart. The apprentice will provide a brief verbal explanation supporting the decision taken.

b. Given a needed capability study and the data collected to satisfy the needs of the capability study, the apprentice will participate as a team member in support of the capability study through an understanding of capability and determining if a calculated Cpk value is acceptable or non-

acceptable. With the direction of the team leader, the apprentice will provide all the machining expertise and statistical calculation needed to satisfy the requirements of a capability study (the apprentice is not expected to calculate Cpk values through complex formulas).

Core Competency

7. Process Adjustment - Single Part Production

NIMS DUTY & PERFORMANCE STANDARD

Duty: Analyze the performance of a single-part production process. Formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustment and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a part having routine problems being processed, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Explain the corrective actions and the reasoning used to perform the diagnosis.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to adjust and recalculate speeds and feeds for proper tool-life, surface finish, and cycle time optimization.

b. The apprentice will be able to inspect a manufactured part.

c. The apprentice will be able to edit changes into a CNC milling program.

Core Competency

8. Participation in Process Improvement

NIMS DUTY & PERFORMANCE STANDARD

Duty: As a member of a process team, analyze the performance of a production process. With the team formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustments and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a routine production process having a problem(s), as a team member, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Carry out the cause and effect analysis by participating in the development of the appropriate Q.C. methodology with the team, i.e., fishbone diagram. Explain the Q.C. tool, the corrective actions and the reasoning connecting the root cause analysis to the remedial actions taken.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Measurement, Materials, and Safety*** credentialing exam are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook ok to solve application problems. Referencing thread percentage, finish symbols, and allowances are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percent.

Industrial Safety: The apprentice must become familiar with Hazmat, MSDS, basic personal protective equipment (PPE), and machine tool safety. Apprentice assessment includes identification of a government body that regulates industrial safety - Occupational Safety and Health Administration (OSHA).

Maintenance: Apprentice assessment includes elementary knowledge of referencing and researching maintenance procedures, hand tool maintenance and safety, and simple tool maintenance.

Process Adjustment: The exam presents basic problems of machining processes such as tapping, threading, drilling, milling, reaming, and grinding in which a process adjustment functions as the corrective action. Apprentices must identify a basic goal of process improvement.

Quality Control Procedures: The exam will evaluate knowledge of basic concepts of SPC and sampling plans. Basic knowledge of inspection plans includes rationale, criteria for choosing the correct measuring instrument, and organization. The evaluation includes basic knowledge of inspection setups and measuring instruments.

NIMS CREDENTIAL: Level I Machining Skills, Job Planning, Benchwork, & Layout

Core Competency

9. Manual Operations: Layout

NIMS DUTY & PERFORMANCE STANDARD

Duty: Layout the location of hole centers and surfaces within an accuracy of +/- .015 inch.

Performance Standard: Given a surface plate, surface gauge, layout height gauge, combination set, scriber, layout ink, prick punch, ball peen hammer, process plan, and part print, lay out hole locations, radii, and surfaces matching the specifications.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

b. Given a part print, surface plate and all the required layout tools, the apprentice will select proper tools, and use correct procedure, to lay out a part including the location of hole centers and surfaces within the accuracy of +/- .015 inch.

Core Competency

10. Manual Operations: Benchwork

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using aluminum or mild steel, hand drill and hand tap holes. Use hand drills, hand taps, tap wrench, files, scrapers, and coated abrasives to deburr parts. Use arbor presses to perform press fits. Use bench vises and hand tools appropriately.

Performance Standard: Given a process plan, blueprint, and access to hand tools, produce a part with two holes prepared for hand tapping, a hole prepared (reamed) for the press fit of a bushing, and a stud for one of the tapped holes. Deburr the part, hand drill and hand tap the holes, press in the bushing, and install the stud.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

Core Competency

11. Sawing

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform sawing to a layout. Choose and mount appropriate blades; weld, break, and re-weld blades as necessary.

Performance Standard: Given a part with a finished layout and access to an appropriate band saw and blades, finish saw the part to the layout.

Core Competency

12. Job Process Planning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop a process plan for a part requiring milling, drilling, turning, or grinding. Fill out an operation sheet detailing the process plan and required speeds and feeds.

Performance Standard: Given a print detailing a part requiring milling, drilling, turning, and grinding, verbal instructions, and appropriate references, formulate a set of strategies to manufacture the part and fill out an operation sheet reflecting the chosen strategies including the required speeds and feeds. Identify all major components and functions of the machine tools, and all major hand tools, measuring tools, tools and fixtures, and work materials. Provide the rationale for the speeds and feeds selected.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will choose the most appropriate location for the origin on the part, and establish a method for defining that location during set-up.

b. The apprentice will be able to select appropriate work holding devices for various work pieces.

c. The apprentice will be able to select appropriate tooling for various operations and materials.

d. The apprentice will be able to calculate speeds and feeds for proper tool- life and surface finish.

Related Instruction

The knowledge and skills an apprentice will need to pass the ***Level I Machining Skills, Job Planning, Benchwork, and Layout*** credentialing exam are as follows:

Basic Mathematics: The exam will assess basic math knowledge from whole number computations and algebra to basic geometry. Application of formulas involving tapping, tapers, speeds and feeds, and threading will be evaluated.

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing limits, tolerance, and parameters of a material or process are essential skills.

Basic Measurement: The exam will test interpretation of basic measuring instruments, resolution, and applicability of basic measuring tools for given situations. Apprentices must demonstrate knowledge of the differences and similarities of semi-precision and precision measurement.

Basic Machining Theory: The apprentice must understand basic types of tooling materials, applications of tooling and processes for drilling, milling, and sawing, turning, and proper procedures using hand tools. A basic understanding of fits and allowances, as well as defining surface finish and machining operation/surface finish relationships, is expected.

Layout: The exam will evaluate an understanding of basic and precision layout equipment and procedures. The apprentice should have a basic knowledge of print reading and orthographic projection. Knowledge of the layout of linear, angular, and circular dimensions will be assessed.

<u>NIMS CREDENTIAL: Level I Machining Skills, Drill Press Skills</u>

Core Competency

13. Drilling Operations

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate machine tools to perform routine drilling operations.

Performance Standard: Given a semi-finished part, process plan, part print, and hand, precision, and cutting tools, as well as access to a drill press and its accessories, produce a part matching the process plan and the blueprint specifications. The part specified will be in the semi-finished state, having been squared up and the outer surfaces completed with five center-drilled locations. Finishing the part will require the finishing of the five center-drilled locations. Each hole must have at least two secondary operations. The

secondary operations will consist of reaming, spot facing, countersinking, counter boring, and counter drilling. At least one hole must be a blind hole and one a through hole. At least one hole will be power tapped.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of safety procedures, and the identification of drill press and radial drill press parts and their function.

b. Given instruction/demonstration on the proper selection, mounting, set-up and usage procedure for necessary work-holding devices on the drill press, the apprentice will select, mount, set-up, hold, and align work, using work holding devices on the drill press to perform the required drill press operations.

c. Given instruction/demonstration on the proper selection, mounting, set-up and usage procedure for necessary tool-holding devices on the drill press, the apprentice will select, mount, set-up, and align tool-holding devices on the drill press to perform the required drill press operations.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required machining operations on the drill press.

e. Given a drill press, process plan, part print, semi-finished part, cutting tools, hand tools, drill press accessories, and instruction/demonstration on the proper set-up and procedures used for drilling, tapping, reaming, spot facing, countersinking, and counter boring, the apprentice will perform these secondary operations on the semi-finished part within the tolerances specified on the part print.

Related Instruction

The knowledge and skills an apprentice will need to pass the ***Level I Machining Skills, Drill Press Skills*** credentialing exam are as follows:

Drill Press Components: Proper operation of a drill press depends on knowledge of drill press components and their functions. Identification of the spindle, base, table, column, variable speed control, and feed handle are essential for safe and effective use of this machine tool. Other essential components are the table lock, column lock, motor, and base.

Process Involvement: An important part of any process improvement is an understanding of the symptoms and causes of some common problems associated with drilling operations. Understanding root causes of drill breakage, excessive wear, enlarged diameters, and excessive RPM enable the apprentice to analyze the process and make the correct improvement.

Twist Drill Nomenclature and Sizing: Each twist drill is comprised of many separate features. Identifying the web and understanding web thickness enables the apprentice to recognize the effects of excessive web thickness. Knowing the purpose and location of the margin facilitates proper drill diameter measurement as well as the effect of worn margin near the point of the drill. All general-purpose drills have the same identical point angle. The included point angle of a drill will vary dependent on the application and the material being machined.

Safety Practices: Proper safety procedures insure safe and productive machining. Safety includes safe lifting procedures, hair containment, jewelry removal, and loose clothing containment. Drill press safety includes the proper location of the vise, storage of the chuck key, and chip removal. Safety awareness should be apparent at all times through the correct application of speeds and feeds.

Countersinking, Counter boring, Spot facing, and Center Drilling: Spot facing, countersinking, and counter boring are drilling procedures used to seat screws and bolts with special head configurations or to seat a fastener or washer evenly on a rough surface. Center drilling is an important procedure for accurate hole location as well as shaft preparation for turning between centers. The specific drilling operations have speeds and feeds that are proportionally slower than drilling with general purpose twist drills.

Layout and Inspection: Choosing the correct measuring instrument is primarily dependent on the tolerance range of the specific dimension. Proper set-up and correct measuring procedures for each measuring device are critical. The apprentice must also know when and where to apply semi-precision and precision layout. Selection and application of proper layout tools and setups are essential in any machining operation.

Tapping: The drill diameter used to create a hole for internal threading will dictate the thread percentage or amount of engagement between two mating threaded components. Most tap drill charts for conventional thread forms are based on 70% – 75% engagement. Pipe taps used for some pneumatic and fluid connects have tap drills based on other parameters. With the proper equipment, tapping can be performed under power if the drill press is capable of reversing the rotation.

Work Holding: The work piece must be held securely to prevent part pullout from the work holding device. The equipment used for work holding parts is dependent upon the shape and size of the part being drilled. Proper location of the vise may prevent the vise from whipping around if the drill gets jammed in the part. Proper selection of work holding devices is critical for safe and accurate application of a drill press.

NIMS CREDENTIAL: Level I Machining Skills, Milling: Square up a Block

Core Competency

14. Milling: Square up a Block

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform squaring up the six surfaces of a block to within +/- .002 inch and .002 inch over 4.5 inches squareness.

Performance Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part will require squaring up from its raw state.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, as well as the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required milling operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

Related Instruction

The knowledge and skills an apprentice will need to pass Milling***: Square up a Block, Level I Machining Skills*** credentialing exam are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and to apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds, and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the apprentice to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions, and basic machine adjustments.

Threads and Tapping: Specific areas of knowledge include an understanding of tap drill charts and thread percentage, tapping lubricants, tap drills for pipe threads, and taps used for specific operations. The apprentice must be able to troubleshoot basic tapping and threading problems.

Safety Practices: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first aid procedures they can perform on themselves.

Milling Operations Set-up: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance include centering various details or shapes and the proper procedure for utilizing center-finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included within milling operations set-up.

NIMS CREDENTIALS: Level I Machining Skills, Manual Milling Skills

Core Competency

15. Manual Milling: Vertical and Horizontal, Level I Machining Skills

NIMS DUTY & PERFORMANCE

STANDARD Duty: Vertical Milling

Set-up and operate vertical milling machines. Perform routine milling and location of hole centers within +/-.005 inch.

Performance Standard: Vertical Milling

Given raw material, process plan, print, and hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch, and have three steps controlled by tolerances of +/-.005 inch.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, and the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and apply these calculations while performing required milling, drilling, and boring operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given required hand and precision tools, instruction/demonstration on the proper set-up and procedures used to perform tramming operations on the vertical milling machine, and the process used to indicate a vise, the apprentice will adjust the milling machine head perpendicular to the table within +/- .001 inch, and indicate a vise maintaining parallelism and perpendicularity measurement of .002 inch over 4.5 inches.

g. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

h. Given raw material, process plan, print, and hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch, and have three steps controlled by tolerances of +/-.005 inch.

i. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce three bores to specification. The holes will be between ¾ inch and 1½ inches and their locations are to be held within +/- .001 inch and diameters within +/-.0005 inch. One hole is to be counter bored to a decimal depth holding within +/-.002 inch and counter bore diameter within +/-.005 inch.

j. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part specified will require the milling of three deep-slots two parallel to one another, the third at right angles to the first two.

Related Instruction

The knowledge and skills an apprentice will need to pass the ***Manual Milling: Vertical and Horizontal, Level I Machining Skills*** and ***Manual Milling: Vertical and Horizontal, Level II Machining Skills*** credentialing exams are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and to apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds, and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the apprentice to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions, and basic machine adjustments.

Threads and Tapping: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Safety Practices: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Milling Operations Set-up: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance include centering various details or shapes and the proper procedure for utilizing center finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included within milling operations set-up.

NIMS CREDENTIAL: Level I CNC Milling

Core Competency

16. CNC Programming - Milling

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates, develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison, apply the principles of three dimensional coordinate planes in the development of a simple program for the production of the part on a CNC milling machine.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector) and R (radium value) methods.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

17. CNC: Write a Simple CNC Milling Program and Review Tool Path

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor software, write simple CNC programs using M and G codes from the *Machinery's Handbook*. Simple programs are single plane, cutter centerline, linear and circular interpolation, and single cutter, with no canned cycles as specified on the print.

Performance Standard: Given a part print with the tool path shown, and computer with editor software, write a program, including speeds and feeds, to drive an end mill through a continuous path around three sides of a part requiring the development of a linear interpolation tool path as well as circular interpolation. Store the program on computer media.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to a part.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

e. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J or R (radius value) methods.

f. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

18. CNC: Operate a CNC Milling Machine

NIMS DUTY & PERFORMANCE STANDARD

Duty: Operate a CNC Milling Machine

Performance Standard: Given a CNC mill, create a qualified CNC program, setup and operate the mill, change tool values as necessary, and replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., which will be used.

e. The apprentice will be able to install and qualify the required tooling for the program.

f. The apprentice will be able to mount, locate, and set the origin of the work piece on a CNC milling machine.

g. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC milling machine control.

h. The apprentice will be able to safely execute a program for its first run (debugging).

NIMS CREDENTIAL: Level II CNC Milling

Core Competency

19. Operate CNC Mill or CNC Milling Centers

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate a CNC Mill or CNC milling center.

Performance Standard: Set-up the tooling and work piece. Qualify the work piece to the control. Prepare tools or load tools into tool magazine as required, qualify the tools to the control with respect to the work, match their identity to the program. Establish initial tool values or offsets. The part specified should have at least two steps with +/-.001 tolerances, one UNC tapped hole, an arc/tangent surface, and require the use of at least one "canned cycle" available on the machine control.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes and other program commands.

b. The apprentice will be able to mount, locate and set the part origin of the work piece on a CNC milling center.

c. The apprentice will be able to install and qualify the required tooling for the program.

d. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC milling machine control.

NIMS CREDENTIAL: Level III CNC Milling

Core Competency

20. CNC: Advanced Manual Programming

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor write sophisticated RS-274-D programs. Sophisticated programs will contain various combinations of change of plane, canned cycles, will employ multiple tools, cutter offsets, linear, circular and helical interpolation as well as requiring the matching of surfaces along lines and points of tangency in 3 axes. Store the results on computer media.

Performance Standard: Given a blueprint and a process plan, write a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of "canned cycles", and tool offsets. Use a computer to write and store the program.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool-life and surface finish.

c. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J (arc vector), and R (radius value) methods.

e. The apprentice will be able to implement automatic cutter radius compensation.

f. The apprentice will be able to change and perform machining on different work planes.

g. The apprentice will be able to program helical interpolation.

h. The apprentice will be able to form and solve triangular constructions on a blueprint to find missing coordinates.

Core Competency

21. Use Manufacturing Modeling Software to Create CNC Milling Programs

NIMS DUTY & PERFORMANCE STANDARD

Duty: Create programs using a manufacturing modeling software package.

Performance Standard: Given a blueprint, use a graphics-based software package to develop a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of "canned cycles," and tool offsets.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool-life and surface finish.

c. The apprentice will be able to identify and use menus and icons used in the software package.

d. The apprentice will be able to draw basic geometric shapes and constructions.

e. The apprentice will be able to edit basic geometric shapes and constructions.

f. The apprentice will be able to create tool paths for contour milling, pocketing, drilling and tapping.

g. The apprentice will be able to post-process tool paths into programs.

<u>NIMS CREDENTIALS: Level I Turning Operations, Turning Between Centers</u>

Core Competency

22. Turning Operations: Turning Between Centers, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and carry out between centers turning operations for straight turning.

Performance Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.002 inch, one UNC external thread, one UNF external thread, and require an end-for-end swap.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b. Given instruction/demonstration by a qualified individual on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required turning operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required various turning operations on the engine lathe.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f. Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g. Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, and grooving operations within the specified tolerances on the part print.

h. Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i. Given instruction/demonstration on the proper set-up procedure used for knurling on the engine lathe, the apprentice will set-up the machine and perform knurling operations within the tolerances specified on the part print.

j. Given instruction/demonstration on Unified National Thread nomenclature, formulas and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external U.N. thread within the tolerances specified on the part print.

k. Given a blueprint, instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting internal and external tapers on the engine lathe, the apprentice will cut a taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills an apprentice will need to pass the ***Turning Operations: Turning Between Centers, Level I Machining Skills*** credentialing exam are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center run out, properly turning hard, material and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to operate a lathe safely and effectively. Proper lifting techniques, learning how to find MSDS and HMIS information and some basic personal first aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is critical to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever and the proper method to change speeds and feeds is also critical knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead and different families of thread forms. Proper alignments of the threading tool, as well as the proper location of the compound rest are essential setup steps needed to turn threads with a single point tool. An apprentice must be able to calculate the proper indeed to prevent the thread from either being too deep or too shallow.

Tapping, Fits, and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: The best choice depends on the accuracy and reliability of the measuring instrument. Tolerance as well as the application will also be important factors. An apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer, and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is, knowing when the part is accepted or rejected. Basic knowledge of process control techniques such as inspection sheets, Pareto charts, capability studies, and X bar/R charts are an effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit, and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool by applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree of accuracy of each method depends on the tolerance of the work piece dimensions. Proper setups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi-precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

NIMS Credentials: Level I Machining Skills, Turning Operations: Chucking

Core Competency

23. Turning Operations: Chucking: Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARDS

Duty: Set-up and carry out chucking operations for turning.

Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.005 inch, two bores within +/-.005 inch, one UNC external thread, and requires at least two chucking or other work holding set-up.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b. Given instruction/demonstration on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder by a qualified individual, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning and boring operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required turning, and boring operations within the specified tolerances on a part print.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing various required turning operations on the engine lathe.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f. Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g. Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, boring, and grooving operations within the specified tolerances on the part print.

h. Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i. Given instruction/demonstration on Unified National Thread nomenclature, formulas, and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external and internal U.N. thread within the tolerances specified on the part print.

j. Given a blueprint, instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting tapers on the engine lathe, the apprentice will cut an external and internal taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills an apprentice will need to pass the ***Turning Operations:***

Chucking, Level I Machining Skills credentialing exam are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center run out, properly turning hard material, and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to effectively operate a lathe safely. Proper lifting techniques, learning how to find MSDS and HMIS information and some basic personal first-aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is imperative to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever, and the proper method to change speeds and feeds is imperative knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead and different families of thread forms. Proper alignments of the threading tool as well as the proper location of the compound rest are essential set-up steps needed to turn threads with a single point tool. An apprentice must be able to calculate the proper in feed to prevent the thread from either being cut too deep or too shallow.

Tapping, Fits and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: Choosing the proper measuring instrument is an important facet of proper inspection. The best choice is dependent on the accuracy and reliability of the measuring instrument. The tolerance as well as the application will determine the choice. An apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer, and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is, knowing when the part is accepted or rejected. Basic knowledge of process control techniques such as inspection sheets, Pareto charts, capability studies and X bar/R charts are an effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit, and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool by applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree of accuracy of each method depends on the tolerance of the work piece dimensions. Proper setups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi-precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

NIMS CREDENTIAL: Level I CNC Turning

Core Competency

24. CNC Programming - Turning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison, apply the principles of two-dimensional coordinate planes in the development of a simple program for the production of the part on a CNC lathe or CNC turning center.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector) and R (radius value) methods.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

25. CNC: Write a Simple CNC Turning Program and Review Tool Path

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor software write simple CNC programs using M and G codes from the *Machinery's Handbook*. Simple programs are single plane, cutter centerline, linear and circular interpolation, and single cutter, with no canned cycles as specified on the print.

Performance Standard: Given a part print with the tool path shown, and the computer with editor software; write a program including speeds and feeds, to drive a cutting tool through a continuous path following the geometry of a part requiring the development of a linear interpolation tool path as well as circular interpolation. Store the program on computer media.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

e. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J (arc vector), and R (radius value) methods.

f. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

26. Level I CNC: Operate a CNC Lathe

NIMS DUTY & PERFORMANCE STANDARD

Duty: Operate a CNC Lathe

Performance Standard: Given a CNC lathe create a qualified CNC program, setup and operate the lathe, change tool values as necessary, and replace and qualify tooling as necessary.

<u>NIMS CREDENTIAL: Level II CNC Turning</u>

Core Competency

27. Level II CNC: Operate a CNC Lathe

NIMS DUTY & PERFORMANCE STANDARD
Duty: Operate a CNC Lathe

Performance Standard: Given a CNC lathe create a qualified CNC program, setup and operate the lathe, change tool values as necessary, replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc. that will be used.

f. The apprentice will be able to install and qualify the required tooling for the program.

g. The apprentice will be able to mount, locate, and set the origin of the work piece on a CNC lathe.

h. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC lathe control.

i. The apprentice will be able to safely execute a program for its first run (debugging).

NIMS CREDENTIAL: Level III CNC Turning

Core Competency

28. CNC: Advanced Manual Programming

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor, write sophisticated programs. Sophisticated programs will contain various combinations of change of plane, canned cycles; will employ multiple tools, cutter offsets, linear, circular and helical interpolation as well as requiring the matching of surfaces along lines and points of tangency in 3 axis. All results will be stored on computer media.

Performance Standard: Given a blueprint and a process plan, write a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of "canned cycles," and tool offsets. Use a computer to write and store the program.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool-life and surface finish.

c. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J (arc vector), and R (radius value) methods.

e. The apprentice will be able to implement automatic cutter radius compensation.

f. The apprentice will be able to change and perform machining on different work planes.

g. The apprentice will be able to program helical interpolation.

h. The apprentice will be able to form and solve triangular constructions on a blueprint to find missing coordinates.

Core Competency

29. Use Manufacturing Modeling Software to Create CNC Turning Programs

NIMS DUTY & PERFORMANCE STANDARD

DUTY: Create programs using a manufacturing modeling software package.

Performance Standard: Given a blueprint, use a graphics-based software package to develop a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of "canned cycles," and tool offsets.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool-life and surface finish.

c. The apprentice will be able to identify and use menus and icons used in the software package.

d. The apprentice will be able to draw basic geometric shapes and constructions.

e. The apprentice will be able to edit basic geometric shapes and constructions.

f. The apprentice will be able to create tool paths for contour milling, pocketing, drilling and tapping.

g. The apprentice will be able to post-process tool paths into programs.

CORE COMPETENCIES ALIGNED WITH ALL MACHINING CREDENTIALS

Core Competency

30. General Housekeeping and Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Keep the duty station clean and safe for work. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.

Performance Standard: Given maintenance, cleaning, and housekeeping checklists, as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Core Competency

31. Preventative Maintenance - Machine Tools

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the general condition of an assigned machine tool. Make routine adjustments as necessary and as authorized. Report problems to supervision which are beyond the scope of authority. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.

Performance Standard: Given the preventive maintenance procedures and schedules for a given machine tool, as well as sufficient instruction and experience to recognize maintenance problems, carry out routine maintenance, report problems which are beyond the scope of authority, and fill out the history forms for tracking maintenance.

Core Competency

32. Tooling Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the condition of tooling. Refurbish tooling where appropriate. Refer tooling for repair or regrind where appropriate.

Performance Standard: Given samples of tooling in various conditions, diagnose the tooling and take the correct steps to put the tooling back in service. The sample tooling should include turning, milling, and drilling tools. These tools should be both insert tooling as well as conventional tooling. The apprentice must demonstrate the offhand grinding of a drill between the diameter of .125 inch and 1.000 inch. The offhand regrinding of a turning tool and the correct rotation and replacement of inserts in an insert style milling cutter body must be demonstrated. The apprentice must demonstrate the ability to recognize when a cutter should be referred to a tool and cutter grinder.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

General Housekeeping and Maintenance

Given maintenance, cleaning ,and housekeeping checklist as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Preventative Maintenance - Machine Tools

Given a specific machine tool, the learner will locate, check, and fill all applicable lubrication reservoirs, check for proper oil pressure, and check that all lubrication points are functioning properly. Check the general condition of the equipment and make routine adjustments as stated in the maintenance schedule.

Tooling Maintenance

a. Diagnose tooling in various conditions and take the correct steps to put the tooling back in service.

b. Perform cutter-sharpening operations.

c. Understand insert identification nomenclature and index or change inserts.

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING
CORE COMPETENCY ASSESSMENT FORM

APPRENTICE: _____EMPLOYEE NUMBER:_____
SUPERVISOR: _____DEPARTMENT: _____

INSTRUCTIONS: Check-off each Core Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC SET-UP PROGRAMMER – MILLING AND TURNING CORE COMPETENCIES

1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Perform the Inspection of Parts	
6.	Process Control	
7.	Process Adjustment – Single Part Production	
8.	Participation in Processes Improvement	
9.	Manual Operations: Layout	
10.	Manual Operations: Benchwork	
11.	Sawing	
12.	Job Process Planning	
13.	Drilling Operations	
14.	Milling: Square Up a Block	
15.	Manual Milling: Vertical and Horizontal - Level I Machining Skills	
16.	CNC Programming - Milling - Level I Machining Skills	
17.	CNC: Write a Simple CNC Milling Program and Review Tool Path - Level I Machining Skills	
18.	CNC: Operate a CNC Milling Machine - Level I Machining Skills	
19.	CNC: Operate a CNC Milling Machine or Milling Center - Level II Machining Skills	
20.	CNC: Advanced Manual Programming - Level III Machining Skills	
21.	Use Manufacturing Modeling Software to Create Programs - Level III Machining Skills	
22.	Turning Operations: Turning Between Centers - Level I Machining Skills	
23.	Turning Operations: Chucking - Level I Machining Skills	
24.	CNC Programming - Turning - Level I Machining Skills	
25.	CNC: Write a Simple CNC Turning Program and Review Tool Path - Level I Machining Skills	
26.	CNC: Operate a CNC Lathe - Level I Machining Skills	
27.	CNC: Operate a CNC Lathe or Turning Center - Level II Machining Skills	
28.	CNC: Advanced Manual Programming - Level III Machining Skills	
29.	Use Manufacturing Modeling Software to Create CNC Turning Programs - Level III Machining Skills	
30.	General Housekeeping & Maintenance	
31.	Preventative Maintenance - Machine Tools	
32.	Tooling Maintenance	

COMMENTS:

APPRENTICE'S SIGNATURE: _____DATE: _____
SUPERVISOR'S SIGNATURE: _____DATE:_____

NIMS COMPETENCY BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING CORE COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each NIMS Core Competency, the *Date the NIMS Core Competency was attained*, are required for the apprentice to attain each NIMS Core Competency.

NIMS CERTIFIED CNC SETUP PROGRAMMER - MILLING CORE COMPETENCIES

1. Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2. Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4. Part Inspection

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5. Perform the Inspection of Parts

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6. Process Control

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

7. Process Adjustment – Single Part Production

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

8. Participation in Processes Improvement

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

9. Manual Operations: Layout

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

10. Manual Operations: Benchwork

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

11. Sawing

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

12. Job Process Planning

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

13. Drilling Operations

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

14. Milling: Square Up a Block - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

15. Manual Milling: Vertical and Horizontal - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

16. CNC Programming - Milling - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

17. CNC: Write a Simple CNC Milling Program and Review Tool Path

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

18. CNC: Operate a CNC Milling Machine - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

19. CNC: Operate a CNC Milling Machine or Milling Center - Level II Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

20. CNC: Advanced Manual Programming - Level III Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

21. Use Manufacturing Modeling Software to Create Milling Programs

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

22. Turning Operations: Turning Between Centers - Level I Machining

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

23. Turning Operations: Chucking - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

24. CNC Programming - Turning - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

25. CNC: Write a Simple CNC Turning Program and Review Tool Path

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

26. CNC: Operate a CNC Lathe - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

27. CNC: Operate a CNC Lathe or Turning Center - Level II Machining

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

28. CNC: Advanced Manual Programming Level III Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

29. Use Manufacturing Modeling Software to Create Turning Programs

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

30 General Housekeeping & Maintenance

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

31. Preventative Maintenance - Machine Tools

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

32 Tooling Maintenance

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING COMPANY SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____
SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING COMPANY SPECIFIC COMPETENCIES

33.		
34.		
35.		
36.		
37.		
38.		
39.		
40.		
41.		
42.		
43.		
44.		
45.		
46.		
47.		
48.		
49.		
50.		
51.		
52.		
53.		
54.		
55.		

COMMENTS:

APPRENTICE'S SIGNATURE: _____ DATE: _____
SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING COMPANY SPECIFIC COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained* for the apprentice to attain each company specific competency.

COMPANY SPECIFIC COMPETENCIES

33.

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

34.

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

35.

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

36.

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

37.

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

COMPANY SPECIFIC COMPETENCIES

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

38.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

39.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

40.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

41.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

42.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

43.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

44.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

COMPANY SPECIFIC COMPETENCIES

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

45.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

46.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

47.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

48.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

49.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

50.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

51.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

COMPANY SPECIFIC COMPETENCIES

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

52.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

53.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

54.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

55.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

56.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

57.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

58.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING RELATED INSTRUCTION RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____
SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		

COMMENTS:

APPRENTICE'S SIGNATURE: _____ DATE: _____
SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING CREDENTIALING RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____
SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1. Measurement, Materials, and Safety - Level I Machining Skills
2. Job Planning, Benchwork, and Layout - Level I Machining Skills
3. Drill Press Skills - Level I Machining Skills
4. Manual Milling Skills - Level I Machining Skills
5. CNC Milling - Level I Machining Skills
6. CNC Milling - Level II Machining Skills
7. CNC Milling - Level III Machining Skills
8. Turning Between Centers - Level I Machining Skills
9. Turning Operations: Chucking - Level I Machining Skills
10. CNC Turning - Level I Machining Skills
11. CNC Turning - Level II Machining Skills
12. CNC Turning - Level III Machining Skills

NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES

13.

14.

15.

16.

17.

18.

19.

20.

COMMENTS:

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING JOB PERFORMANCE ASSESSMENT FORM

APPRENTICE: _____ EMPLOYEE NUMBER: _____
SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and the completion of all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker CNC Set-up Programmer - Milling and Turning.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING AND TURNING JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		

COMMENTS:

APPRENTICE'S SIGNATURE: _____ DATE: _____
SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR

DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified CNC Set-Up Programmer - Milling and Turning**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified CNC Set-Up Programmer – Milling and Turning**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

Appendix A.3

Core Competency Requirements
NIMS Certified Mold Maker

I. MOLD MAKER SKILL LEVEL: BASIC COMPETENCIES
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Molds, Details & Materials*		
A1	Measure Material & Detail Thickness and Verify to Engineering Specifications		
A2	Measure Material & Detail Length and Width		
A3	Determine Material Hardness		
A7	Measure Diameters		
A11	Measure Leader Pins & Bushings		
A13	Measure Runners		
A14	Measure Sprue		
A15	Measure Water Lines		
A17	Measure Point-to-Point Distances		
C	*Machine Details*		
C8	Grind Flats		
C12	Set-up Drill Press		
C15	Drill Holes (Mill or Turn)		
C19	Countersink/Counterbore Holes (Mill or Turn)		
D	*Perform Benchwork*		
D5	Demagnetize Details		
D8	Verify Steel Size		
E	*Assemble Mold*		
E1	Install 0-Rings, Gaskets & Baffles		
E15	Prepare Mold for Pick-up		

II. Core Competency Assessment: Mold Maker Intermediate Competencies

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Molds, Details & Materials*		
A4	Check/Verify Surface Finish Requirements		
A5	Check Detail Cosmetics		
A6	Verify Shut-Off Edges		
A8	Measure Angles		
A9	Measure Radius/Radii		
A10	Measure Depth & Width of Vents		
A12	Measure Gates		
A16	Measure Critical Dimensions of Tryout Parts		
A18	Check Details for Damage & Flaws		
A19	Measure Electrode & Check Over burn/Soverburnpark Gap		
A20	Check/Verify Engraving for Quality & Compliance		
A21	Calculate for an Unknown Dimension		
B	*Plan & Design Job*		
B1	Review Work Order		
B2	Verify Prints/Drawings		
B3	Confirm Tolerances & Work piece Specifications		
B6	Order/Receive Material, Die Components and Hardware		
B7	Inventory & Stage Material, Mold Details and Hardware		
B8	Determine Appropriateness & Availability of Equipment		
B10	Determine & Verify Vent Sizes & Locations (where applicable)		
B11	Establish & Verify Waterline Size & Locations		

II. Core Competency Assessment: Mold Maker Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
C	*Machine Details*		
C1	Set-up Grinders & Wheels		
C2	Grind ID/OD		
C3	Grind Diameters		
C4	Grind Contours		
C5	Grind Angles & Radius		
C7	Grind Edges for Clearance		
C10	Sharpen Cutting Tools		
C11	Set-up Lathe (CNC/Non-CNC)		
C13	Set-up Mill (CNC/Non-CNC, Vertical or Horizontal)		
C14	Square Block		
C16	Lap and/or Hone Holes		
C17	Tap Holes (Mill or Turn)		
C18	Bore Holes (Mill or Turn)		
C20	Ream/Drill Holes (Mill or Turn)		
C21	Cut Keyways, Frames, Pockets & Profiles (Mill or Turn)		
C22	Machine Electrodes		
C23	Cut Hardened Material (Mill or Turn)		
C24	Mill/Grind Grease Grooves		
C26	Turn Between Centers		
C27	Turn Chucked Work piece		
C28	Chase Threads		
C29	(Gun) Drill Holes & Waterlines		
C30	Cut Side Pockets		
C31	Set-up Conventional Electronic Discharge Machine(EDM)		
C32	Burn Threads		
C33	Alter Surface Finish (EDM)		
C34	Burn Holes		
C35	Burn Profiles		
C36	Set-up Wire EDM		
C37	Wire Cuts Features Through Material		
C39	Inspect Machined Parts for Quality & Compliance		
C40	Verify Timing and Shutoff		

II. Core Competency Assessment: Mold Maker Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
D	*Perform Benchwork*		
D2	Assemble Mold on Bench		
D4	Deburr Details & Surfaces		
D6	Engrave Mold Information & Detail Identifications		
D7	Layout/Scribe Part Details		
E	*Assemble Mold*		
E2	Install Manifolds/Drops		
E3	Install Cavity & Core Blocks		
E4	Install Ejector & Return Pins		
E5	Install & Fit Interlocks & Side Locks		
E6	Test for Water Leaks & Check Pressure		
E7	Test for Hydraulic/Pneumatic Leaks & Pressure		
E8	Install CAM/Rocker Sub-Assembly		
E9	Lubricate Moving Parts, Components & Details		
E11	Test Limit/Proxy Switches		
E12	Install Water/Hydraulic Fittings		
E14	Mount & Install Insulator Board/Sheet		
F	*Conduct Tryouts & Validate Mold*		
F1	Setup Mold in Press (if applicable)		
F2	Determine & Communicate Tryout Process (if applicable)		
F3	Run Parts to Part Count or Time Specs (if applicable)		
F5	Prepare Tryout Parts for Sampling (if applicable)		
F7	Adjust Z-Pin/Puller (if applicable)		
F9	Repair Water Leaks (if applicable)		
F10	Adjust Vents (if applicable)		
F11	Add Air Manifolds (if applicable)		
F13	Clear/Unblock Water Passages (if applicable)		
F15	Clean-Out/Unblock Manifold Nozzles (if applicable)		
F16	Pull Mold or Tools for Rework (if applicable)		
G	*Troubleshoot Mold & Process Problems (Selected Examples)*		
G5	Respond to Part that was not Ejected and Trapped in Mold		
H	*Coordinate/Manage Project*		
H4	Participate in Pre/Post Mold Building Meetings		
H5	Document & Track Engineering Changes & Closeout Project (with approval)		

III. MOLD MAKER SKILL LEVEL: ADVANCED COMPETENCIES
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

III. Core Competency Assessment: Mold Maker Advanced Competencies

Duty Area	Task	Date Completed	Supervisor Signature
B	*Plan & Design Job*		
B4	Determine & Establish Job Flow, Milestones and Timelines (with approval)		
B5	Develop/Outline Manufacturing Plan		
B9	Design Tools From Part Print (non-designed tools/prototypes)		
B12	Verify Heat Treating Requirements		
B13	Verify Coating Requirements		
B14	Calculate Shrink for Non-Designed Tools		
B15	Estimate Mold Construction & Assembly Hours (Compare to Quoted Hours)		
B16	Draw/Sketch Details, Components and/or Parts		
C	*Machine Details*		
C9	Grind Electrodes		
C38	Wire Profiles & Angles Through Material		
D	*Perform Benchwork*		
D1	Polish Parts/Details		
D3	Fit & Mount Details		
E	*Assemble Mold*		
E10	Test Manifold Zones		
E13	Set Timing & Shutoff		
F	*Conduct Tryouts & Validate Mold*		
F4	Inspect Tryout Parts for Quality & Compliance		
F6	Repair/Adjust Slides		
F8	Adjust/Set Timing		
F12	Adjust/Repair Gates		

III. Core Competency Assessment: Mold Maker Advanced Competencies (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
F	*Conduct Tryouts & Validate Mold*		
F14	Adjust Stack Height		
G	*Troubleshoot Mold & Process Problems (Selected Examples)*		
G1	Isolate the Cause of Water, Air or Hydraulic Leaks		
G2	Find Out Why Flash has Occurred		
G3	Respond to a "Short Shot" Situation		
G4	Determine Why Parts are Sticking		
G6	Respond to Plastic Deformation on a Part		
H	*Coordinate/Manage Project*		
H1	Delegate & Monitor Work Assignments		
H2	Maintain Timelines and Monitor Building Schedule		
H3	Oversee Mold Making Assignments		
H6	Evaluate In-Process Inspection Results & Data		
H7	Develop Contingency or Corrective Action Plans		
H8	Communicate With Contractors, Vendors & Suppliers (optional)		
H9	Communicate Tolerances, Fits, Specifications and Customer Requirements		
H10	Identify & Communicate Hours Over Quoted Hours		
H11	Acknowledge Validation of Mold		
H12	Closeout Project (Deleted) (with approval)		

Required NIMS Credentials

In order to demonstrate proficiency in all of the competencies listed in this appendix, the apprentice will have completed all of the following NIMS Credentials.

Name of Credential	Date Completed	Supervisor Signature
Measurement, Materials and Safety		
Job Planning, Benchwork and Layout		
Drill Press Skills		
One of the Following Two		
Manual Milling Skills I CNC Milling: Programming Set-up and Operations I		
One of the Following Three		
Turning Operations: Turning Between Centers I Turning Operations: Turning Chucking Skills CNC Turning: Programming Set-up and Operations		
Grinding Skills I		
One of the Following Two		
Manual Milling Skills II CNC Milling Skills II		
One of the Following Three		
Turning II—Chucking Turning II—Between Centers CNC Turning Skills II		
Surface Grinding Skills		
Cylindrical Grinding Skills		
EDM—Plunge (Optional)		
EDM—2-Axis Wire (Optional)		
Mold making and Die Cast Die making Level II		
Mold making and Die Cast Die making Level III		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM

NIMS CERTIFIED MOLD MAKER CORE COMPETENCY ASSESSMENT FORM

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

APPRENTICE:_____ EMPLOYEE NUMBER:_____
SUPERVISOR:_____ DEPARTMENT:_____

INSTRUCTIONS: CHECK-OFF EACH CORE COMPETENCY AS THE APPRENTICE DEMONSTRATES A LEVEL OF PROFICIENCY THAT IS EQUIVALENT TO THE APPROPRIATE LEVEL

MOLD MAKER: BASIC WORK PROCESS SCHEDULE
(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
B1	Obtain & review work orders (Job Planning)		
A2	Measure raw material & detail length, width & height/thickness (Inspection)		
A7	Measure diameters (Inspection)		
A17 ***A8*** ***A9*** ✓	***Measure point-to-point dimensions (Inspection): hole-to-edge, edge-to-edge, etc*** ***Measure angles*** ***Measure radius/radii***		
A+	Convert measurements (Inspection): English/metric		
A11	Measure leader pins & bushings (Inspection)		
A3	Determine material hardness (Inspection)		
C12 ***C15*** ✓	***Set-up Drilling Operations (Machining)*** ***Drill press: Drill press***		
D5	Demagnetize details (Benchwork)		
E15	Prepare molds for pickup (Assembly)		

Mold Maker: Intermediate Work Process Schedule
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

(Prep Checks in Bold)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
A12	Calculate for unknown dimensions		
B2 ✓ ***B8***	***Obtain, review & verify prints & drawings (Job Planning)*** ***Assess appropriateness of necessary mold building processes and available equipment***		
C+ ✓ **C+**	**Edit existing programs (Machining)** **Program CNC**		
C13	Setup mills (Machining): CNC/non-CNC, vertical or horizontal		
C14	Square block (Machining): Mill		
C11	Setup lathes (Machining); CNC/non-CNC: May include “live tooling”		
C+	Deburr/polish parts (Machining): Lathe		
C18	Bore holes (Machining		
C17 ✓ ***C19***	***Tap holes (Machining)*** ***Countersink/counterbore holes***		
C20	Ream/drill holes (Machining		

II. Mold Maker: Intermediate Work Process Schedule (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
C21 ✓ ***C22***	***Machine keyways, frames, pockets & profiles (Machining) Mill or Turn Machine electrodes (Machining): Mill or lathe***		
C27	Turn chucked workpieces (Machining)		
C+	Turn diameters (Machining): ID/OD		
C23	Cut hardened materials (Machining); Mill or lathe		
C1	Setup grinders & wheels (Machining): CNC/non-CNC		
C8	Grind flats (Machining) Surface grinding		
C3	Grind diameters (Machining)		
C7	Grind edges for clearance (Machining)		
C24	Grind or mill grease grooves (Machining)		
C2 ✓ ***C5***	***Machine and/or Grind ID/OD (Machining)*** ***Machine and/or Grind angles & radii***		
C4	Grind contours (Machining)		
C9	Grind electrodes (Machining)		
C10	Sharpen cutting tools (Machining)		
C6	Grind threads (Machining)		
A19	Measure electrodes & check overburn/spark gap (Inspection)		
C31 ✓ **C25**	***Set-up conventional EDM (Machining)(if applicable)*** ***Burn profiles (if applicable)***		
C36	Set-up wire EDM (Machining)		
C37	Wire cuts & holes through material (Machining)		

II. Mold Maker: Intermediate Work Process Schedule (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
C38	Wire profiles & angles through material (Machining)		
C+	Modify/customize tooling (Machining): Mill or lathe		
A6	Verify shut-off edges (Inspection)		
D4	Deburr details & surfaces/edges (Benchwork)		
D+	Tap parts by hand (Benchwork)		
A4	Check/verify finish requirements (Inspection)		
D1 ✓	***Polish finished parts & details (Benchwork)***		
D6	Engrave mold information & detail identifications (Benchwork)		
C39	Inspect machined parts for quality & compliance (Machining)		
C40	Verify Timing and Shutoff		
A10	**Measure depth & width of vents (Inspection)**		
A12	**Measure gates (Inspection)**		
A13	**Measure runners (Inspection)**		
A14	**Measure sprue (Inspection)**		
F13	Clear/unblock water passages (Tryouts)		
E1 ***E9*** ✓ ***E4***	***Install O-rings, gaskets & baffles (Assembly)*** ***Lubricate moving parts, components, hardware & details*** ***Install ejector pins & return pins***		
E12	Install water/hydraulic fittings (Assembly)		

III. Mold Maker: Advanced Work Process Schedule
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

(Prep Checks in Bold)

Task Code	OJL Activity (Proposed prep check task checked and highlighted)	Date Competency Started	Date Competency Gained
B10 ✓	***Determine/verify vent sizes & locations (Job Planning)***		
A5	Check detail cosmetics (Inspection)		
A18	Check details for damage & flaws (Inspection)		
A20	Verify engraving for compliance and quality (Inspection)		
E3 ✓ ***E8***	***Install cavity & core blocks (Assembly)*** ***Install CAM/Rocker sub-assembly***		
D3 ✓	***Fit & mount details (Benchwork)***		
E2	Install manifolds/drops (Assembly)		
E5	Install & fit interlocks & side locks (Assembly)		
E13	***Verify timing & shutoff (Assembly)***		
E11	Test limit/proxy switches (Assembly)		
E6 ✓	***Test for water leaks & check pressure (Assembly)***		
E7	Test for hydraulic/pneumatic leaks & pressure (Assembly)		
E10	Test manifold zones (Assembly)		
A16	Identify & measure GD&T of tryout parts (Inspection)		
F4 ✓	***Inspect tryout parts for quality and compliance (Tryouts)***		

III. Mold Maker: Advanced Work Process Schedule

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
H6	Evaluate in-process inspection results & data (Project Mgmt)		
H9	Communicate tolerances, fits, specifications, timelines & customer requirements (Project Mgmt)		
H7 ✓	***Develop contingency plans and/or corrective action plans (Project Mgmt)(if applicable)***		
F7	Adjust Z-pin/puller (Tryouts)		
F10	Adjust vents (Tryouts)		
F9	Repair water leaks (Tryouts)		
F15	Clean/unblock manifold nozzles (Tryouts)		
F14	Adjust stack height (Tryouts)		
F6	Adjust/repair slides (Tryouts)		
F12	Adjust/repair gates (Tryouts)		
F8 ✓	***Adjust/reset timing (Tryouts)***		
G5	Respond to (Isolate the cause of) an uncontrolled drop (Troubleshooting)		
G2 ✓	***Identify root cause of flash (Troubleshooting)***		
G6	Respond to (Isolate the cause of) plastic deformation on a part (Troubleshooting)		
H4	Participate in pre/post mold building meetings (Project Mgmt)		
B5 ✓	***Develop/outline a manufacturing plan (Job Planning): May include progress schedules, protocol, timelines, milestones, etc***		
B9	Design tools from part print (Job Planning): Non-designed tools or prototypes		

III. Mold Maker: Advanced Work Process Schedule

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
B16	Draw/sketch mold details, accessories and components (Job Planning)		
B6	Order/receive raw materials, die components & hardware (Job Planning)		
H1	Delegate & monitor/oversee work assignments (Project Mgmt.)		
H2	Maintain timelines & monitor mold building schedule (Project Mgmt.)		
H5	***Document & track engineering changes and closeout projects (Project Mgmt.) (with approval)***		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MOLD MAKER
SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

Instructions: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED MOLD MAKER COMPANY SPECIFIC COMPETENCIES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MOLD MAKER
COMPANY SPECIFIC COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained* for the apprentice to attain each company specific competency.

COMPANY SPECIFIC COMPETENCIES

1.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

9.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

10.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

11.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

12.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

13.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

14.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

15.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

16.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

17.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

18.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

19.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

20.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

21.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

22.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

23.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

24.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

25.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

26.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

27.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

28.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

28.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD
NIMS CERTIFIED MOLD MAKER
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED MOLD MAKER RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED MOLD MAKER
CREDENTIALING RECORD

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials and Safety	
2.	Job Planning, Benchwork and Layout	
3.	Drill Press Skills	
4.	**One of the Following Two**	
5.	Manual Milling Skills I CNC Milling: Programming Set-up and Operations I	
6.		
7.	**One of the Following Three**	
8.	Turning Operations: Turning Between Centers I Turning Operations: Turning Chucking Skills CNC Turning: Programming Set-up and Operations	
9.		
10.		
11.	Grinding Skills I	
12.	**One of the Following Two**	
13.	Manual Milling Skills II CNC Milling Skills II	
14.		
15.	**One of the Following Three**	
16.	Turning II—Chucking Turning II—Between Centers CNC Turning Skills II	
17.		
18.		
19.	Surface Grinding Skills	
20.	Cylindrical Grinding Skills	
21.	EDM—Plunge (Optional)	
22.	EDM—2-Axis Wire (Optional)	
23.	Mold making and Die Cast Die making Level II	
24.	Mold making and Die Cast Die making Level III	

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED MOLD MAKER
JOB PERFORMANCE ASSESSMENT FORM
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED MOLD MAKER JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR

DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified Mold Maker**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified Mold Maker**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

APPENDIX A.4

CORE COMPETENCY-REQUIREMENTS NIMS CERTIFIED TOOL AND DIE MAKER

I. Tool and Die Maker Skill Level: Basic Competencies
O*NET-SOC CODE: 51-4111.00. RAPIDS CODE: 0586CB

I. Core Competency Assessment: Tool and Die Maker Basic Competencies

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Materials, Die Components, Features & Details*		
A1	Measure size of raw materials		
A16	Verify calibration of measurement devices		
A17	Convert measurements (English metric)		
B	*Plan Job & Set-up Workstation*		
B17	Verify availability of tryout material		
C	*Set Up Equipment & Machine Components and Details*		
C1	Move and stage material and parts for machining (CNC/non-CNC)		
C3	Drill/tap holes		
C4	Countersink/counter bore holes		
C11	Scribe location lines and profiles		
C17	Rough cut/saw tool steel and details		
C20	Make shims		
C22	Remove burr from machined parts		
D	*Assemble Tools & Die*		
D12	Grind/deburr & mount parallels		
D23	Check for sharp edges on non-cutting tools		
	Preventative/Routine Maintenance		
	Shop Protocols		

II. Core Competency Assessment: Tool and Die Maker Intermediate Competencies

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Materials, Die Components, Features & Details*		
A2	Measure diameters (ID/OD)		
A3	Measure GD&T		
A4	Determine hardness of surfaces		
A5	Measure point-to-point distances		
A6	Measure radius/radii		
A7	Measure angles		
A9	Measure material thinning of production part		
A10	Calculate unknown dimensions		
A11	Measure burr height of production part		
A13	Check surface finish		
A14	Check surface for defects and flaws		
A15	Identify material by type (includes spark test)		
A18	Locate centerlines		
A19	Check fit & form using gagging		
A20	Measure threads		
B	*Plan Job and Set Up Workstation*		
B1	Review and verify prints and drawings		
B2	Obtain and stage raw materials		
B3	Verify bill of materials		
B4	Prioritize & schedule work flow/progression		
B5	Determine availability of materials & equipment		
B6	Obtain & stage die pre-manufactured components		

II. Core Competency Assessment: Tool and Die Maker Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
B	*Plan Job and Set-up Workstation*		
B7	Determine grinding and heat treating allowances		
B8	Sketch/highlight critical processing information & specs		
B9	Determine machining requirements & processes		
B11	Verify/assess shut height specifications		
B12	Verify/assess tonnage requirements		
B13	Verify/assess feedline		
B14	Check safety devices for function		
B15	Identify & determine availability of perishable tooling		
B18	Determine resources to adhere to die building and tryout times		
B19	Determine lubrication requirements & plumbing standards		
B20	Assess part & scrap ejection methods		
C	*Set-up Equipment & Machine Components & Details*		
C2	Polish parts		
C5	Bore/ream holes		
C7	Schedule heat treatments		
C8	Grind edges & flats		
C9	Grind OD		
C12	Square block		
C13	Thread diameters (ID/OD)		
C14	Mill slots, pockets & keyways (2-D milling)		
C15	Turn diameters (chucked CNC or non-CNC)		
C18	Lap/hone holes		
C21	Inspect machined work pieces for quality & compliance		

II. Core Competency Assessment: Tool and Die Maker Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
D	*Assemble Tools & Die(T/D)*		
D1	Check punch to die clearance		
D7	Install & set pressure devices or systems		
D8	Install stripping & holding devices		
D10	Mount/adjust CAMs or sliding components		
D11	Verify/adjust slug clearance		
D15	Install & set quick die change components (quick setup)		
D16	Install/check slug/scrap removal & part ejection devices		
D17	Install part ejection devices		
D20	Align upper & lower die assembly		
D21	Check/adjust material feed & level on the bench		
D22	Install/make guide components		
D24	Identify and mark first strip (edge) stop		
D25	Verify presence of or install balances & levelers		
D26	Set blocks		
E	*Conduct Tryouts & Develop T/D*		
E1	Set-up press for dry run and/or tryouts		
E2	Conduct dry run		
E4	Adjust/replace or relocate sensors		
E9	Adjust or rework tooling		
E10	Adjust pressures (holding & stripping)		
E11	Adjust/reset ejection devices or systems		
E12	Feed/run strip to start point (first stop)		
E13	Jog strip through stations		
E15	Apply die lubrication/forming lubes		
E16	Verify feed progression & pilot release		

II. Core Competency Assessment: Tool and Die Maker Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
E	*Conduct Tryouts & Develop Tools/Die*		
E18	Check/adjust shut height & set blocks		
E20	Conduct "run at rate"		
E21	Inspect tryout parts for quality & conformance (read strip)		
E22	Submit tryout parts for final inspections (validate part)		
G	*Manage/Coordinate Projects*		
G2	Participate & contribute in continuous improvement efforts		
G3	Participate & contribute in die preventive maintenance efforts and activities		
G5	Monitor & adhere to project milestones & timelines (project reports)		
G6	Communicate with management & engineering regarding project resources & schedules		
G7	Update/track prints for required die design changes		
G8	Monitor/report use of materials & resource		
G9	Monitor/apply 5S's and lean manufacturing applications		
	Interpret CAD/CAM Drawings		
	Demonstrate a basic understanding of wire EDM		
	Demonstrate a basic understanding of EDM		

III. Core Competency Assessment: Tool and Die Maker Advanced Competencies

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Materials, Die Components, Features & Details*		
A8	Measure circle grinds		
A12	Identify material properties		
B	*Plan Job & Set-up Work Station*		
B10	Determine coating & finishing requirements		
B16	Order/obtain & make special tooling		
C	*Set-up Equipment & Machine Components & Details*		
C6	Grind holes (jig)		
C10	Grind forms (contours)		
C16	Turn between centers		
C19	Grind graphite electrodes		
D	*Assemble Tools & Die*		
D2	Mount & check details for fit and function		
D3	Mount & align punching tools		
D4	Mount & align forming tools & components		
D5	Install & fit cutting tools & components		
D6	Install & align drawing tools & components		
D9	Establish & set die timing		
D13	Mount/align in-die assembly & hardware		
D14	Mount/align in-die tapping heads		
D18	Install QC sensors & electronics		
D19	Install die protection sensors & devices		

III. Core Competency Assessment: Tool and Die Maker: Advanced Competencies (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Duty Area	Task	Date Completed	Supervisor Signature
E	*Conduct Tryouts & Develop Tools/Die*		
E3	Conduct tryout(s) (first to finish)		
E5	Check for interference & adjust clearance		
E6	Adjust/reset timing		
E7	Rework/replace forms & draws		
E8	Adjust draw beads		
E14	Set/adjust pilot release		
E17	Develop blank/trim profiles		
E19	Analyze, solve & correct formability problems		
F	*Trouble Shoot Tool & Die Problems (10 Examples)*		
F1	Find out why strip is mis-feeding		
F2	Respond to a slug pulling situation		
F3	Determine why galling has occurred		
F4	Find out why material is wrinkling or splitting		
F5	Find out why part dimensions are varying or out of control		
F6	Isolate the cause of why strip is not feeding straight into or through die		
F7	Determine why tool steel is chipping or showing premature wear		
F8	Determine why die components are breaking		
F9	Find out why scrap or materials is accumulating in the die		
F10	Isolate the cause of why a sensor has shut down the press		
G	*Manage/Coordinate Projects*		
G1	Participate in design & strip review meetings		
G4	Train co-workers & apprentices		

Required NIMS Credentials

In order to demonstrate proficiency in all of the competencies listed in this appendix, the apprentice will have completed all of the following NIMS Credentials.

Name of Credential	Date Completed	Supervisor Signature
Measurement, Materials and Safety		
Job Planning, Benchwork and Layout		
Drill Press Skills		
One of the Following Two		
Manual Milling Skills I CNC Milling: Programming Set-up and Operations I		
One of the Following Three		
Turning Operations: Turning Between Centers I Turning Operations: Turning Chucking Skills CNC Turning: Programming Set-up and Operations		
Grinding Skills I		
One of the Following Two		
Manual Milling Skills II CNC Milling Skills II		
One of the Following Three		
Turning II—Chucking Turning II—Between Centers CNC Turning Skills II		
Surface Grinding Skills		
Cylindrical Grinding Skills		
EDM—Plunge (Optional)		
EDM—2-Axis Wire (Optional)		
Die making Level II		
Mold making Level III		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM

NIMS CERTIFIED TOOL AND DIE MAKER
CORE COMPETENCY ASSESSMENT FORM

APPRENTICE: _____ EMPLOYEE NUMBER:_____
SUPERVISOR: _____ DEPARTMENT:_____

INSTRUCTIONS: Check-off each core competency as the apprentice demonstrates a level of proficiency that is equivalent to the appropriate level

TOOL AND DIE MAKER: BASIC WORK PROCESS SCHEDULE
(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
A16	***Verify/test calibration of inspection & measuring devices (Inspection)***		
A17	Convert measurements (Inspection): English/metric		
A15	Identify raw materials by type (Inspection): Includes spark test		
A5	Measure point-to-point distances (Inspection)		
A2	Measure diameters (Inspection): ID/OD		
B3	Verify/overcheck bill of materials (Job Planning & Prep)		
A1 ✓	***Measure size of raw material (Inspection) thickness, length, width***		
A6 **A7** ✓	***Measure radius/radii (Inspection)*** ***Measure angles (Inspection)***		
B14 ✓	***Locate & check machine/equipment safety devices for function (Job Planning and Prep)***		
C22	Remove burr from machined parts (Machining): Benchwork		
C17	Saw/rough-cut tool steel and details (machining)		

TOOL AND DIE MAKER: INTERMEDIATE WORK PROCESS SCHEDULE
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
A4	Determine hardness of material or surfaces (Inspection		
B2	Identify, obtain & stage raw materials (Job Planning & Prep)		
B6	Identify, obtain & state pre-manufactured die components (Job Planning & Prep)		
B15	Determine & identify availability of perishable tooling (Job Planning & Prep)		
C5	Bore/Ream Holes (Machining), Drill press		
C18	Lap/Tap Parts (Machining) Benchwork		
C+	Set-up mills, lathe & grinders (Machining: CNC or non-CNC		
C20	Make shims (Machining)		
C12 C3 C4 ✓	**Square block (Machining) Mill Drill/cut or tap holes (Machining) Countersink/counterbore holes (Machining): Mill**		
C14	Mill slots, pockets & keyways (Machining): 2-D milling		
C+	Cut face to length (Machining): Lathe		
C15	Turn diameters (Machining): Chucked, lathe		
C8 ✓	**Grind edges & flats (Machining): Surface grinding**		
C9 C10 ✓	**Grind OD (Hard Machining): Grinding Grind forms/contours (Machining and/or Grinding)**		

II. Tool and Die Maker: Intermediate Work Process Schedule (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
C2	Polish finished parts, components & Details (Machining)		
A14	Check surfaces for defects, flaws & drainage (Inspection)		
C21 ✓	**Inspect machined parts for quality & compliance (Machining)**		
A19	Check fit & form using gagging (Inspection)		
A10 ✓	**Calculate unknown dimensions (Inspection)**		
D12	Grind/deburr & mount parallels (Assemble Tools/Die)		
D11	Verify/adjust slug clearance (Assemble Tools/Die)		
D19 ✓	**Install die protection sensors & devices (Assemble Tools/Die)**		

TOOL AND DIE MAKER: ADVANCED WORK PROCESS SCHEDULE
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
B1 **B8** ✓	**Review & verify/overcheck prints/drawings and die design (Job Planning & Prep)** **Sketch/highlight critical dimensions, features, specifications, tolerances & processing information**		
B4	Prioritize & estimate work flow, die building progression and timelines (Job Planning & Prep)		
B9	Determine machining requirements & processes (Job Planning and Prep)		
B7	Determine grinding & heat treating allowances (Job Planning & Prep)		
B10	Determine coating & finishing requirements (Job Planning & Prep)		
B12	Verify/assess tonnage requirements (Job Planning & Prep)		
B18	Determine resources to adhere to die building schedule & tryouts (Job Planning & Prep)		
G5	Monitor/coordinate & adhere to project milestones & timelines (Project Mgmt.): Project reports required		
D2	Mount details & check for fit and form (Assemble tools/die		
D22	Install guide components (Assemble tools/die)" Make as needed		
D20 **D1** ✓	**Align upper & lower die assembly (Assemble tools/die)** **Check/preset punch to die clearance**		
D16	Install or check slug/scrap removal and part ejection devices (Assemble tools/die)		

III. Tool and Die Maker: Advanced Work Process Schedule (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
D+	Develop blank/trim profiles (Assemble Tools/Die)		
D7 ✓ **D8**	**Install & set pressure devices or systems (Assemble Tools/Die) Install stripping & holding devices**		
D10	Mount/adjust CAMs or sliding components (Assemble Tools/Die)		
D25	Confirm presence of, or install balances & levelers (Assemble Tools/Die)		
D9 ✓	**Establish & set die timing (Assemble Tools/Die)**		
D13	Mount/align in-die assembly & hardware (Assemble Tools/Die)		
E5	Check for interference/adjust clearance (Die Tryout & Development)		
D18	Install QC sensors & electronics (Assemble Tools/Die)		
A3 ✓	**Determine & measure GD&T (Inspection)**		
E1 ✓ **E19**	**Set-up press for dry run and/or tryouts (Die Tryout & Development) Verify feed progression & pilot release**		
E15	Apply die lubrication (Die Tryout & Development): Forming lubes		
E 18 ✓ **E6**	**Check/adjust shut height & set blocks (Die Tryout & Development) Adjust/reset timing**		
E3	Conduct die tryouts (Die Tryout & Development): First to finish		
E21 ✓	**Inspect tryout parts for quality & conformance (Die Tryout & Development): Includes "reading the strip"**		
E9	Adjust or rework tooling (Die Tryout & Development)		
E4 ✓	**Adjust, relocate or replace sensors (Die Tryout & Development)**		
E7	Replace or rework forms & draws (Die Tryout & Development)		
E10	Adjust pressures (Die Tryout & Development): Holding & stripping		
E11	Adjust/reset ejection devices or systems (Die Tryout & Development): Part, scrap, slugs		

III. Tool and Die Maker: Advanced Work Process Schedule (cont.)

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
E20	Conduct "run at rate" (Die Tryout & Development): Monitor press run		
E22	Check & submit tryout parts and strip for final evaluations (Die Tryout & Development): Validate Part		
F10	Isolate the cause of why a sensor has shut down the press (Troubleshooting)		
F1 ✓	**Find out why strip is mis-feeding (Troubleshooting)**		
F7	Determine why tool sheet is chipping or showing premature wear (Troubleshooting)		
F+	Analyze, solve & correct formability problems (Troubleshooting)		
F5	Find out why part dimensions are varying or out of control (Troubleshooting)		
G7 ✓	**Update/track prints for required die design changes (Project Mgmt.)**		
G3	Participate in & contribute to die preventive maintenance efforts and activities changes (Project Mgmt.)		
G1	Participate in die design & strip review meetings changes (Project Mgmt.)		
G+	Closeout die building, tryout & die validation (Project Mgmt.)		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED TOOL AND DIE MAKER
SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED TOOL AND DIE MAKER COMPANY SPECIFIC COMPETENCIES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED TOOL AND DIE MAKER
COMPANY SPECIFIC COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained*, for the apprentice to attain each company specific competency.

1.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

7.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

8.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

9.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

10.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

11.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

12.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

13.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

14.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

15.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

16.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

17.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

18.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

19.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

20.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

21.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

22.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

23.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

24.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

25.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

26.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

27.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

28.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD
NIMS CERTIFIED TOOL AND DIE MAKER

O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED TOOL AND DIE MAKER RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: DATE: _____

_____

CREDENTIALING RECORD
NIMS CERTIFIED TOOL AND DIE MAKER
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials and Safety	
2.	Job Planning, Benchwork and Layout	
3.	Drill Press Skills	
4.	**One of the Following Two**	
5.	Manual Milling Skills I CNC Milling: Programming Set-up and Operations I	
6.		
7.	**One of the Following Three**	
8.	Turning Operations: Turning Between Centers I Turning Operations: Turning Chucking Skills CNC Turning: Programming Setup and Operations	
9.		
10.		
11.	Grinding Skills I	
12.	**One of the Following Two**	
13.	Manual Milling Skills II CNC Milling Skills II	
14.		
15.	**One of the Following Three**	
16.	Turning II—Chucking Turning II—Between Centers CNC Turning Skills II	
17.		
18.		
19.	Surface Grinding Skills	
20.	Cylindrical Grinding Skills	
21.	EDM—Plunge (Optional)	
22.	EDM—2-Axis Wire (Optional)	
23.	Diemaking Level II	
24.	Moldmaking Level III	

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

JOB PERFORMANCE ASSESSMENT FORM
NIMS CERTIFIED TOOL AND DIE MAKER
O*NET-SOC CODE: 51-4111.00 RAPIDS CODE: 0116CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED TOOL AND DIE MAKER JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR

DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: Request for Certificate of Completion of Apprenticeship

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified Tool and Die Maker**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified Tool and Die Maker**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

APPENDIX A.5

CORE COMPETENCY REQUIREMENTS
NIMS CERTIFIED CNC SET-UP PROGRAMMER – MILLING

WORK PROCESS SCHEDULE
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1099CB

This Appendix is attached to and a part of these Standards for the above identified occupation.

1. TERM OF APPRENTICESHIP

The term of training for a NIMS Certified CNC Set-up Programmer - Milling will include approximately four years of structured on-the-job learning (OJL), supplemented by the required hours of related instruction, that will lead to successful completion of the required Core Competencies and corresponding NIMS Credentials as stated in the Core Competency Requirements (Appendix A).

Full credit will be given for OJL evaluated as satisfactory and previous acquisition of the required competencies and corresponding NIMS Credentials.

This is a competency-based apprenticeship program and is not constrained by time. The term of apprenticeship will provide sufficient OJL to enable the apprentice to attain the required competencies for each registered occupation.

2. RATIO OF APPRENTICES TO JOURNEYWORKERS

Consistent with proper supervision, training, safety, and continuity of employment throughout the apprenticeship, the ratio of apprentices to journeyworkers will be one (1) apprentice to one (1) journeyworker. This ratio should provide the quantity of NIMS Certified CNC Set-up Programmers - Milling necessary for the future needs of the metalworking industry.

3. APPRENTICE PROGRESSIVE WAGE SCHEDULE

Apprentices shall be paid a progressively increasing schedule of wages and fringe benefits based on a percentage of the current journeyworker wage rate.

FOUR-YEAR APPROXIMATE TERM:

PERFORMANCE REVIEW CYCLE	% of Journeyworker Wage and Fringe Benefits
Entry Level Performance Review	= 50% Journeyworker Wage Rate and Fringe Benefits
End of Probationary Period Review	= 60% Journeyworker Wage Rate and Fringe Benefits

First-Year Performance Review	= 70% Journeyworker Wage Rate and Fringe Benefits
Second-Year Performance Review	= 80% Journeyworker Wage Rate and Fringe Benefits
Third-Year Performance Review	= 90% Journeyworker Wage Rate and Fringe Benefits
Completion/Journeyworker Review	= 100% Journeyworker Wage Rate and Fringe Benefits

4. SCHEDULE OF WORK EXPERIENCE

The following Core Competency Requirements will provide the focus for the OJL and Related Instruction requirements for the NIMS Certified CNC Set-up Programmer - Milling occupation.

These Standards of Apprenticeship result from a deliberative process that included a national validation of the competencies and field testing through a national pilot effort. The goal of the NIMS is to develop and implement apprenticeship programs that are aligned with industry defined Core Competencies, and company specific competencies that are used to tailor the apprenticeship program to each company's individual business needs.

The Sponsor may modify the company specific competencies to meet local needs prior to submitting these Standards to the appropriate Registration Agency for approval.

5. SCHEDULE OF RELATED INSTRUCTION

Apprenticeship Sponsors may utilize a wide range of Related Instruction resources and providers, including classroom and laboratory activities offered by the National Tooling and Machining Association, technical colleges, community colleges, career and technology centers, online training programs, correspondence programs, and company specific programs. It is not the intent of this project to change the delivery method of any Related Instruction program. The NIMS Certified CNC Set-up Programmer - Milling Curriculum Guide is provided as a resource so that the Related Instruction program can be aligned with the Core Competencies and the corresponding NIMS Credentials.

See the attached Related Instruction Outline for details.

CORE COMPETENCY REQUIREMENTS
NIMS CERTIFIED CNC SET-UP PROGRAMMER – MILLING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1099CB

	APPRENTICE CORE COMPETENCIES	NIMS CREDENTIALS
1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	Measurement, Materials, and Safety Level I
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Perform the Inspection of Parts	
6.	Process Control	
7.	Process Adjustment – Single Part Production	
8.	Participation in Processes Improvement	
9.	Manual Operations: Layout	Job Planning, Benchwork, and Layout Level I
10.	Manual Operations: Benchwork	
11.	Sawing	
12.	Job Process Planning	
13.	Drilling Operations	Drill Press Skills Level I
14.	Milling: Square Up a Block	Milling Level I
15.	Manual Milling: Vertical and Horizontal	
16.	Manual Milling: Vertical and Horizontal	Milling Level II
17.	CNC Programming - Milling	CNC Milling Level I
18.	CNC: Write a Simple CNC Milling Program and Review Tool Path	
19.	CNC: Operate a CNC Milling Machine	
20.	CNC: Operate a CNC Milling Machine or CNC Machining Center	CNC Milling Level II
21.	CNC: Advanced Manual Programming	CNC Milling Level III
22.	Use Manufacturing Modeling Software to Create Programs	
23.	General Housekeeping & Maintenance	Included in all Machining Credentials
24.	Preventative Maintenance – Machine Tools	
25.	Tooling Maintenance	

***NOTE: There is not a specific sequence to the implementation of the Core Competencies. The twenty five Core Competencies and eight NIMS Credentials, listed above, must be satisfactorily completed to meet the requirements of a NIMS Certified CNC Setup Programmer - Milling Apprenticeship Program and earn a *Certificate of Completion of Apprenticeship*.**

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING

NIMS CREDENTIAL: Level I Machining Skills, Measurement, Materials & Safety

---

Core Competency

1. Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment

NIMS Duty & Performance Standard

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with Occupational Safety and Health Administration (OSHA) requirements and guidelines. Document safety activities as required. Include appropriate personal protective equipment.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned duties.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Identify areas in plant that require hearing devices and safety glasses.

b. Identify proper clothing required on the job to include shoes, gloves, sleeve and pant length, jewelry items, hair length and personal cleanliness.

c. Demonstrate OSHA lifting techniques, proper air gun usage and identification, and safe chip handling techniques.

d. Identify all pinch points on primary and supportive machine tools and the proper placements of guards.

e. Demonstrate both emergency and standard shut down of all required equipment.

f. Demonstrate the proper use of hand tools to include hammer, wrenches, screw drivers, punches and pliers.

Core Competency

2. Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

NIMS DUTY & PERFORMANCE STANDARD

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned responsibilities.

NOTE

Lock-out/tag-out and right-to-know will be accounted for in Industrial Safety and Environmental Protection. Material handling here means handling of shafts and overhead cranes, etc., and personal protection. The apprentice should recognize pinch points, cutting points, and control points.

Core Competency

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

Duty: Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions detailing the handling and storage of hazardous materials in compliance with OSHA and EPA requirements and guidelines, demonstrate safe workplace practices in the identification, handling, and storage of hazardous materials.

Core Competency

4. Part Inspection

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop an inspection plan and inspect simple parts using precision tools and techniques. Prepare reports on the compliance of the parts.

Performance Standard: Given the necessary job process sheets for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedure(s). Complete required written inspection report and make a decision to accept or reject component parts. Provide brief verbal explanation of inspection procedures, results, and decisions.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently)

a. Given the necessary job process sheet for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedures.

b. Verify calibrations and sizes of all measuring devices.

c. Take measurements to an accuracy of 1/64 for fractions, .002 for decimals and ½ degree for angles.

d. Read standard orthographic prints and understand types of lines, title block information, revision levels, abbreviations, symbols, and tolerances.

e. Identify surface defects, burrs and any adverse conditions such as flat or torn threads, out of round conditions, eccentricity, etc.

Core Competency

5. Perform the Inspection of Parts

NIMS DUTY & PERFORMANCE STANDARD

Duty: Perform the inspection of parts.

Performance Standard: Develop an inspection plan and inspect production parts that will include the use of basic precision measuring tools, optical comparators and profilometers.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheet for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedures.

b. Verify calibrations and sizes of all measuring devices.

c. Inspect a part with specified profiles including angles and radius with an optical comparator and describe the compliance of the profiles.

d. Read standard orthographic prints and understand types of lines, title block information, revision levels, abbreviations, symbols, and tolerances.

e. Using a profilometer, check the finish on a turned part, record the surface finish and compare it to blueprint specifications to determine if it is in compliance.

Core Competency

6. Process Control

NIMS DUTY & PERFORMANCE STANDARD

Duty: Follow a sampling plan. Inspect the samples for the required data. Enter the data on appropriate charts. Graph the data. Respond to the warning conditions indicated by the process charts.

Performance Standard: Given the necessary job process sheets for a part, verbal instructions, and the necessary charts and inspection tools, inspect parts according to the sampling plan, collecting the data required for the process control chart. Working with the supplied control and warning limits, place the data, produce new data as needed, graph the data, and take the Stop or Go actions as indicated by the results of producing the process control chart. Provide brief verbal explanation regarding the decision taken.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheets for a part, verbal instructions and the necessary charts and inspection tools, the apprentice will inspect the parts according to the sampling plan or inspection plan, collecting the data required for the process adhering to the time parameter. Working with the supplied control and warning limits, the apprentice will place the data, produce new data as needed (mean and range), graph the data and take Stop or Go actions as indicated by the results of producing the process control chart. The apprentice will provide a brief verbal explanation supporting the decision taken.

b. Given a needed capability study and the data collected to satisfy the needs of the capability study, the apprentice will participate as a team member in support of the capability study through an understanding of capability and determining if a calculated Cpk value is acceptable or non- acceptable. With the direction of the team leader, the apprentice will provide all the machining expertise and statistical calculation needed to satisfy the requirements of a capability study (the apprentice is not expected to calculate Cpk values through complex formulas).

Core Competency

7. Process Adjustment - Single Part Production

NIMS DUTY & PERFORMANCE STANDARD

Duty: Analyze the performance of a single-part production process. Formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustment and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a part having routine problems being processed, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Explain the corrective actions and the reasoning used to perform the diagnosis.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to adjust and recalculate speeds and feeds for proper tool-life, surface finish, and cycle time optimization.

b. The apprentice will be able to inspect a manufactured part.

b. The apprentice will be able to edit changes into a CNC milling program.

Core Competency

8. Participation in Process Improvement

NIMS DUTY & PERFORMANCE STANDARD

Duty: As a member of a process team, analyze the performance of a production process. With the team formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustments and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a routine production process having a problem(s), as a team member, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Carry out the cause and effect analysis by participating in the development of the appropriate Q.C. methodology with the team, i.e., fishbone diagram. Explain the Q.C. tool, the corrective actions and the reasoning connecting the root cause analysis to the remedial actions taken.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Measurement, Materials, and Safety*** credentialing exam are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing thread percentage, finish symbols, and allowances are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percent.

Industrial Safety: The apprentice must become familiar with Hazmat, MSDS, basic personal protective equipment (PPE), and machine tool safety. Apprentice assessment includes identification of a government body that regulates industrial safety - OSHA.

Maintenance: Apprentice assessment includes elementary knowledge of referencing and researching maintenance procedures, hand tool maintenance and safety, and simple tool maintenance.

Process Adjustment: The exam presents basic problems of machining processes such as tapping, threading, drilling, milling, reaming, and grinding in which a process adjustment functions as the corrective action. Apprentices must identify a basic goal of process improvement.

Quality Control Procedures: The exam will evaluate knowledge of basic concepts of SPC and sampling plans. Basic knowledge of inspection plans includes rationale, criteria for choosing the correct measuring instrument, and organization. The evaluation includes basic knowledge of inspection setups and measuring instruments.

NIMS CREDENTIAL: Level I Machining Skills, Job Planning, Benchwork, & Layout

Core Competency

9. Manual Operations: Layout

NIMS DUTY & PERFORMANCE STANDARD

Duty: Layout the location of hole centers and surfaces within an accuracy of +/- .015 inch.

Performance Standard: Given a surface plate, surface gauge, layout height gauge, combination set, scriber, layout ink, prick punch, ball peen hammer, process plan, and part print, lay out hole locations, radii, and surfaces matching the specifications.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

b. Given a part print, surface plate and all the required layout tools, the apprentice will select proper tools, and use correct procedure, to lay out a part including the location of hole centers and surfaces within the accuracy of +/- .015 inch.

Core Competency

10. Manual Operations: Benchwork

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using aluminum or mild steel, hand drill and hand tap holes. Use hand drills, hand taps, tap wrench, files, scrapers, and coated abrasives to deburr parts. Use arbor presses to perform press fits. Use bench vises and hand tools appropriately.

Performance Standard: Given a process plan, blueprint, and access to hand tools, produce a part with two holes prepared for hand tapping, a hole prepared (reamed) for the press fit of a bushing, and a stud for one of the tapped holes. Deburr the part, hand drill and hand tap the holes, press in the bushing, and install the stud.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

Core Competency

11. Sawing

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform sawing to a layout. Choose and mount appropriate blades; weld, break, and re-weld blades as necessary.

Performance Standard: Given a part with a finished layout and access to an appropriate band saw and blades, finish saw the part to the layout.

12. Job Process Planning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop a process plan for a part requiring milling, drilling, turning, or grinding. Fill out an operation sheet detailing the process plan and required speeds and feeds.

Performance Standard: Given a print detailing a part requiring milling, drilling, turning, and grinding, verbal instructions, and appropriate references, formulate a set of strategies to manufacture the part and fill out an operation sheet reflecting the chosen strategies including the required speeds and feeds. Identify all major components and functions of the machine tools, and all major hand tools, measuring tools, tools and fixtures, and work materials. Provide the rationale for the speeds and feeds selected.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will choose the most appropriate location for the origin on the part, and establish a method for defining that location during set-up.

b. The apprentice will be able to select appropriate work holding devices for various workpieces.

c. The apprentice will be able to select appropriate tooling for various operations and materials.

d. The apprentice will be able to calculate speeds and feeds for proper tool-life and surface finish.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Job Planning, Bench work, and Layout*** credentialing exam are as follows:

Basic Mathematics: The exam will assess basic math knowledge from whole number computations and algebra to basic geometry. Application of formulas involving tapping, tapers, speeds and feeds, and threading will be evaluated.

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing limits, tolerance, and parameters of a material or process are essential skills.

Basic Measurement: The exam will test interpretation of basic measuring instruments, resolution, and applicability of basic measuring tools for given situations. Apprentices must demonstrate knowledge of the differences and similarities of semi-precision and precision measurement.

Basic Machining Theory: The apprentice must understand basic types of tooling materials, applications of tooling and processes for drilling, milling, and sawing, turning, and proper procedures using hand tools. A basic understanding of fits and allowances, as well as defining surface finish and machining operation/surface finish relationships, is expected.

Layout: The exam will evaluate an understanding of basic and precision layout equipment and procedures. The apprentice should have a basic knowledge of print reading and orthographic projection. Knowledge of the layout of linear, angular, and circular dimensions will be assessed.

NIMS CREDENTIAL: Level I Machining Skills, Drill Press Skills

---

Core Competency

13. Drilling Operations

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate machine tools to perform routine drilling operations.

Performance Standard: Given a semi-finished part, process plan, part print, and hand, precision, and cutting tools, as well as access to a drill press and its accessories, produce a part matching the process plan and the blueprint specifications. The part specified will be in the semi-finished state, having been squared up and the outer surfaces completed with five center-drilled locations. Finishing the part will require the finishing of the five center-drilled locations. Each hole must have at least two secondary operations. The secondary operations will consist of reaming, spot facing, countersinking, counter boring, and counter drilling. At least one hole must be a blind hole and one a through hole. At least one hole will be power tapped.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of safety procedures, and the identification of drill press radial drill press parts and their function.

b. Given instruction/demonstration on the proper selection, mounting, set-up and usage procedure for necessary work-holding devices on the drill press, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the drill press to perform the required drill press operations.

c. Given instruction/demonstration on the proper selection, mounting, set-up and usage procedure for necessary tool-holding devices on the drill press, the apprentice will select, mount, set-up, and align tool-holding devices on the drill press to perform the required drill press operations.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required machining operations on the drill press.

e. Given a drill press, process plan, part print, semi-finished part, cutting tools, hand tools, drill press accessories, and instruction/demonstration on the proper set-up and procedures used for drilling, tapping, reaming, spot facing, countersinking, and counter boring, the apprentice will perform these secondary operations on the semi-finished part within the tolerances specified on the part print.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Drill Press Skills*** credentialing exam are as follows:

Drill Press Components: Proper operation of a drill press depends on knowledge of drill press components and their functions. Identification of the spindle, base, table, column, variable speed control, and feed handle are essential for safe and effective use of this machine tool. Other essential components are the table lock, column lock, motor, and base.

Process Involvement: An important part of any process improvement is an understanding of the symptoms and causes of some common problems associated with drilling operations. Understanding root causes of drill breakage, excessive wear, enlarged diameters, and excessive RPM enable the apprentice to analyze the process and make the correct improvement.

Twist Drill Nomenclature and Sizing: Each twist drill is comprised of many separate features. Identifying the web and understanding web thickness enables the apprentice to recognize the effects of excessive web thickness. Knowing the purpose and location of the margin facilitates proper drill diameter measurement as well as the effect of worn margin near the point of the drill. All general-purpose drills have the same identical point angle. The included point angle of a drill will vary dependent on the application and the material being machined.

Safety Practices: Proper safety procedures insure safe and productive machining. Safety includes safe lifting procedures, hair containment, jewelry removal, and loose clothing containment. Drill press safety includes the proper location of the vise, storage of the chuck key, and chip removal. Safety awareness should be apparent at all times through the correct application of speeds and feeds.

Countersinking: Counter boring, Spot facing, and Center Drilling: Spot facing, countersinking, and counter boring are drilling procedures used to seat screws and bolts with special head configurations or to seat a fastener or washer evenly on a rough surface. Center drilling is an important procedure for accurate hole location as well as shaft preparation for turning between centers. The specific drilling operations have speeds and feeds that are proportionally slower than drilling with general purpose twist drills.

Layout and Inspection: Choosing the correct measuring instrument is primarily dependent on the tolerance range of the specific dimension. Proper set-up and correct measuring procedures for each measuring device are critical. The apprentice must also know when and where to apply semi-precision and precision layout. Selection and application of proper layout tools and setups are essential in any machining operation.

Tapping: The drill diameter used to create a hole for internal threading will dictate the thread percentage or amount of engagement between two mating threaded components. Most tap drill charts for conventional thread forms are based on 70% – 75% engagement. Pipe taps used for some pneumatic and fluid connects have tap drills based on other parameters. With the proper equipment, tapping can be performed under power if the drill press is capable of reversing the rotation.

Work Holding: The workpiece must be held securely to prevent part pullout from the work holding device. The equipment used for work holding parts is dependent upon the shape and size of the part being drilled. Proper location of the vise may prevent the vise from whipping around if the drill gets jammed in the part. Proper selection of work holding devices is critical for safe and accurate application of a drill press.

NIMS CREDENTIAL: Level I Machining Skills, Milling: Square up a Block

---

Core Competency

14. Milling: Square up a Block

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform squaring up the six surfaces of a block to within +/- .002 inch and .002 inch over 4.5 inches squareness.

Performance Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part will require squaring up from its raw state.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, as well as the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required milling operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

Related Instruction

The knowledge and skills the apprentice will need to pass Milling***: Square up a Block, Level I Machining Skills*** credentialing exam are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and to apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds, and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the apprentice to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions, and basic machine adjustments.

Threads and Tapping: Specific areas of knowledge include an understanding of tap drill charts and thread percentage, tapping lubricants, tap drills for pipe threads, and taps used for specific operations. The apprentice must be able to troubleshoot basic tapping and threading problems.

Safety Practices: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Milling Operations Set-up: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance include centering various details or shapes and the proper procedure for utilizing center-finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included within milling operations set-up.

NIMS CREDENTIALS: Levels I and II Machining Skills, Manual Milling Skills

---

Core Competency

15. Manual Milling: Vertical and Horizontal, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Vertical Milling

Set-up and operate vertical milling machines. Perform routine milling and locate hole centers within +/-.005 inch.

Performance Standard: Vertical Milling

Given raw material, process plan, print, and hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch, and have three steps controlled by tolerances of +/-.005 inch.

16. Manual Milling: Vertical and Horizontal, Level II Machining Skills

NIMS DUTIES & PERFORMANCE STANDARDS

Duty: Vertical Mill - Precision Location of Holes

Set-up and perform boring for location, size, and finish.

Performance Standard: Vertical Mill - Precision Location of Holes Produce three bores to specification. The holes will be between ¾ inch and 1½ inches and their locations are to be held within +/-.001 inch and diameters within +/-.005 inch. One hole is to be counter bored to a decimal depth holding within +/-.002 inch and counter bore diameter within +/-.005 inch.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, and the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required milling, drilling, and boring operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given required hand and precision tools, instruction/demonstration on the proper set-up and procedures used to perform tramming operations on the vertical milling machine, and the process used to indicate a vise, the apprentice will adjust the milling machine head perpendicular to the table within +/- .001 inch, and indicate a vise maintaining parallelism and perpendicularity measurement of .002 inch over 4.5 inches.

g. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

h. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch, and have three steps controlled by tolerances of +/-.005 inch.

i. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce three bores to specification. The holes will be between ¾ inch and 1½ inches and their locations are to be held within +/- .001 inch and diameters within +/-.005 inch. One hole is to be counter bored to a decimal depth holding within +/-.002 inch and counter bore diameter within +/-.005 inch.

j. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part specified will require the milling of three deep slots two parallel to one another, the third at right angles to the first two.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Manual Milling: Vertical and Horizontal, Level I Machining Skills*** and ***Manual Milling: Vertical and Horizontal, Level II Machining Skills*** credentialing exams are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds, and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the apprentice to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions, and basic machine adjustments.

Threads and Tapping: Specific areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Safety Practices: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Milling Operations Set-up: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance include centering various details or shapes and the proper procedure for utilizing center finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included within milling operations set-up.

NIMS CREDENTIAL: Level I CNC Milling

Core Competency

17. CNC Programming - Milling

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates, develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison, apply the principles of three dimensional coordinate planes in the development of a simple program for the production of the part on a CNC milling machine.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector) and R (radium value) methods.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

18. CNC: Write a Simple CNC Milling Program and Review Tool Path

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor software, write simple CNC programs using M and G codes from the *Machinery's Handbook*. Simple programs are single plane, cutter centerline, linear and circular interpolation, and single cutter, with no canned cycles as specified on the print.

Performance Standard: Given a part print with the tool path shown, and computer with editor software, write a program, including speeds and feeds, to drive an end mill through a continuous path around three sides of a part requiring the development of a linear interpolation tool path as well as circular interpolation. Store the program on computer media.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to a part.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

e. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J or R (radius value) methods.

f. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

19. CNC: Operate a CNC Milling Machine

NIMS DUTY & PERFORMANCE STANDARD

Duty: Operate a CNC Milling Machine

Performance Standard: Given a CNC mill, create a qualified CNC program, setup and operate the mill, change tool values as necessary, and replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

e. The apprentice will be able to install and qualify the required tooling for the program.

f. The apprentice will be able to mount, locate and set the origin of the work piece on a CNC milling machine.

g. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC milling machine control.

h. The apprentice will be able to safely execute a program for its first run (debugging).

NIMS CREDENTIAL: Level II CNC Milling

Core Competency

20. Operate CNC Mill or CNC Milling Centers

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate a CNC Mill or CNC Milling Center.

Performance Standard: Set-up the tooling and work piece. Qualify the work piece to the control. Prepare tools or load tools into tool magazine as required, qualify the tools to the control with respect to the work, match their identity to the program. Establish initial tool values or offsets. The part specified should have at least two steps with +/-.001 tolerances, one UNC tapped hole, an arc/tangent surface, and require the use of at least one "canned cycle" available on the machine control.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes and other program commands.

b. The apprentice will be able to mount, locate and set the part origin of the work piece on a CNC milling center.

c. The apprentice will be able to install and qualify the required tooling for the program.

d. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC milling machine control.

NIMS CREDENTIAL: Level III CNC Milling

Core Competency

21. CNC: Advanced Manual Programming

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor write sophisticated RS-274-D programs. Sophisticated programs will contain various combinations of change of plane, canned cycles, will employ multiple tools, cutter offsets, linear, circular, and helical interpolation as well as requiring the matching of surfaces along lines and points of tangency in 3 axes. Store the results on computer media.

Performance Standard: Given a blueprint and a process plan, write a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of "canned cycles," and tool offsets. Use a computer to write and store the program.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool-life and surface finish.

c. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J (arc vector), and R (radius value) methods.

e. The apprentice will be able to implement automatic cutter radius compensation.

f. The apprentice will be able to change and perform machining on different work planes.

g. The apprentice will be able to program helical interpolation.

g. The apprentice will be able to form and solve triangular constructions on a blueprint to find missing coordinates.

Core Competency

22. Use Manufacturing Modeling Software to Create Programs

NIMS DUTY & PERFORMANCE STANDARD

Duty: Create programs using a manufacturing modeling software package

Performance Standard: Given a blueprint, use a graphics-based software package to develop a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of "canned cycles," and tool offsets.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool-life and surface finish.

c The apprentice will be able to identify and use menus and icons used in the software package.

d. The apprentice will be able to draw basic geometric shapes and constructions.

e. The apprentice will be able to edit basic geometric shapes and constructions.

f. The apprentice will be able to create tool paths for contour milling, pocketing, drilling and tapping.

h. The apprentice will be able to post-process tool paths into programs.

CORE COMPETENCIES ALIGNED WITH ALL MACHINING CREDENTIALS

Core Competency

23. General Housekeeping and Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Keep the duty station clean and safe for work. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.

Performance Standard: Given maintenance, cleaning, and housekeeping checklists, as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Core Competency

24. Preventative Maintenance - Machine Tools

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the general condition of an assigned machine tool. Make routine adjustments as necessary and as authorized. Report problems to supervision which are beyond the scope of authority. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.

Performance Standard: Given the preventive maintenance procedures and schedules for a given machine tool, as well as sufficient instruction and experience to recognize maintenance problems, carry out routine maintenance, report problems which are beyond the scope of authority, and fill out the history forms for tracking maintenance.

Core Competency

25. Tooling Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the condition of tooling. Refurbish tooling where appropriate. Refer tooling for repair or regrind where appropriate.

Performance Standard: Given samples of tooling in various conditions, diagnose the tooling and take the correct steps to put the tooling back in service. The sample tooling should include turning, milling, and drilling tools. These tools should be both insert tooling as well as conventional tooling. The apprentice must demonstrate the offhand grinding of a drill between the diameter of .125 inch and 1.000 inch.

The offhand regrinding of a turning tool and the correct rotation and replacement of inserts in an insert style milling cutter body must be demonstrated. The apprentice must demonstrate the ability to recognize when a cutter should be referred to a tool and cutter grinder.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

General Housekeeping and Maintenance

Given maintenance, cleaning, and housekeeping checklist as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Preventative Maintenance - Machine Tools

Given a specific machine tool, the learner will locate, check, and fill all applicable lubrication reservoirs, check for proper oil pressure, and check that all lubrication points are functioning properly. Check the general condition of the equipment and make routine adjustments as stated in the maintenance schedule.

Tooling Maintenance

a. Diagnose tooling in various conditions and take the correct steps to put the tooling back in service.

b. Perform cutter-sharpening operations.

c. Understand insert identification nomenclature and index or change inserts.

CORE COMPETENCY ASSESSMENT FORM
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Core Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING CORE COMPETENCIES

1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Perform the Inspection of Parts	
6.	Process Control	
7.	Process Adjustment – Single Part Production	
8.	Participation in Processes Improvement	
9.	Manual Operations: Layout	
10.	Manual Operations: Benchwork	
11.	Sawing	
12.	Job Process Planning	
13.	Drilling Operations	
14.	Milling: Square Up a Block - Level I Machining Skills	
15.	Manual Milling: Vertical and Horizontal - Level I Machining Skills	
16.	Manual Milling: Vertical and Horizontal - Level II Machining Skills	
17.	CNC Programming - Milling - Level I Machining Skills	
18.	CNC: Write a Simple CNC Milling Program and Review Tool Path - Level I Machining Skills	
19.	CNC: Operate a CNC Milling Machine - Level I Machining Skills	
20.	CNC: Operate a CNC Milling Machine or Milling Center - Level II Machining Skills	
21.	CNC: Advanced Manual Programming - Level III Machining Skills	
22.	Use Manufacturing Modeling Software to Create Programs - Level III Machining Skills	
23.	General Housekeeping & Maintenance	
24.	Preventative Maintenance - Machine Tools	
25.	Tooling Maintenance	

COMMENTS: _____

_____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

CORE COMPETENCY RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each NIMS Core Competency, the *Date the NIMS Core Competency was attained*, for the apprentice to attain each NIMS Core Competency.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING CORE COMPETENCIES

1. Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2. Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4. Part Inspection

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5. Perform the Inspection of Parts

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

6. Process Control

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

7. Process Adjustment – Single Part Production

DATE TRAINING STARTED _____ _____

8. Participation in Processes Improvement

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

9. Manual Operations: Layout

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

10. Manual Operations: Benchwork

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

11. Sawing

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

12. Job Process Planning

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

13. Drilling Operations

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

14. Milling: Square Up a Block - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

15. Manual Milling: Vertical and Horizontal - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

16. Manual Milling: Vertical and Horizontal - Level II Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

17. CNC Programming - Milling - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

18. CNC: Write a Simple CNC Milling Program and Review Tool Path

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

19. CNC: Operate a CNC Milling Machine - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

20. CNC: Operate a CNC Milling Machine or Milling Center - Level II Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

21. CNC: Advanced Manual Programming - Level III Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

22. Use Manufacturing Modeling Software to Create Programs

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

23. General Housekeeping & Maintenance

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

24. Preventative Maintenance - Machine Tools

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

25. Tooling Maintenance

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING
COMPANY SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

Instructions: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING COMPANY SPECIFIC COMPETENCIES

26.		
27.		
28.		
29.		
30.		
31.		
32.		
33.		
34.		
35.		
36.		
37.		
38.		
39.		
40.		
41.		
42.		
43.		
44.		
45.		
46.		
47.		
48.		
49.		
50.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

COMPANY SPECIFIC COMPETENCY RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1099CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained*, for the apprentice to attain each company specific competency.

26.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

27.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

28.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

29.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

30.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

31.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

32.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

33.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

34.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

35.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

36.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

37.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

38.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

39.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

40.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

41.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

42.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

43.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

44.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

45.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

46.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

47.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

48.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

49.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

50.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

51.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

52.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

53.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

54.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM NIMS
CERTIFIED CNC SET-UP PROGRAMMER - MILLING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1099CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by theapprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

CREDENTIALING RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1099CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____
SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials, and Safety - Level I Machining Skills	
2.	Job Planning, Benchwork, and Layout - Level I Machining Skills	
3.	Drill Press Skills - Level I Machining Skills	
4.	Manual Milling Skills - Level I Machining Skills	
5.	Manual Milling Skills - Level II Machining Skills	
6.	CNC Milling - Level I Machining Skills	
7.	CNC Milling - Level II Machining Skills	
8.	CNC Milling - Level III Machining Skills	
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

PERFORMANCE ASSESSMENT FORM
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM NIMS CERTIFIED CNC SET-UP PROGRAMMER – MILLING
O*NET-SOC CODE: 54-4012.00 RAPIDS CODE: 1099CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, , and the completion of all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker CNC Set-up Programmer - Milling.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - MILLING JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR

DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified CNC Set-up Programmer - Milling**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified CNC Set-up Programmer – Milling**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

APPENDIX A.6

CORE COMPETENCY REQUIREMENTS
NIMS CERTIFIED CNC SET-UP PROGRAMMER – TURNING

CORE COMPETENCY REQUIREMENTS
NIMS CERTIFIED CNC SET-UP PROGRAMMER – TURNING
O*NET-SOC CODE: 54-4012.00 RAPIDS CODE: 1095CB

	APPRENTICE CORE COMPETENCIES	NIMS CREDENTIALS
1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	Measurement, Materials, and Safety Level I
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Perform the Inspection of Parts	
6.	Process Control	
7.	Process Adjustment – Single Part Production	
8.	Participation in Processes Improvement	
9.	Manual Operations: Layout	Job Planning, Bench work, and Layout Level I
10.	Manual Operations: Bench work	
11.	Sawing	
12.	Job Process Planning	
13.	Drilling Operations	Drill Press Skills Level I
14.	Turning Operations: Turning Between Centers	Turning Between Centers Level I
15.	Turning Operations: Chucking	Chucking Level I
16.	CNC Programming – Turning	CNC Turning Level I
17.	CNC: Write a Simple CNC Turning Program and Review Tool Path	
18.	CNC: Operate a CNC Lathe	
19.	CNC: Operate a CNC Lathe	CNC Turning Level II
20.	CNC: Advanced Manual Programming	CNC Turning Level III
21.	Use Manufacturing Modeling Software to Create Programs	
22.	General Housekeeping & Maintenance	Included in all Machining Credentials
23.	Preventative Maintenance – Machine Tools	
24.	Tooling Maintenance	

***NOTE: There is not a specific sequence to the implementation of the Core Competencies. The twenty four Core Competencies and eight NIMS Credentials, listed above, must be satisfactorily completed to meet the requirements of a NIMS Certified CNC Set-up Programmer - Turning Apprenticeship Program and earn a *Certificate of Completion of Apprenticeship*.**

WORK PROCESS SCHEDULE
RELATED INSTRUCTION OUTLINE
CNC SET-UP PROGRAMMER – TURNING
O*NET-SOC CODE: 54-4012.00
RAPIDS CODE: 1095CB

NIMS CREDENTIAL: Level I Machining Skills, Measurement, Materials and Safety

---

Core Competency

1. Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment

NIMS Duty & Performance Standard

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with Occupational Safety and Health Administration (OSHA) requirements and guidelines. Document safety activities as required. Include appropriate personal protective equipment.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned duties.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Identify areas in plant that require hearing devices and safety glasses.

b. Identify proper clothing required on the job to include shoes, gloves, sleeve and pant length, jewelry items, hair length and personal cleanliness.

c. The apprentice will demonstrate OSHA lifting techniques, proper air gun usage and identification, and safe chip handling techniques.

d. The apprentice will identify all pinch points on primary and supportive machine tools and the proper placements of guards.

e. The apprentice will demonstrate both emergency and standard shut down of all required equipment.

f. The apprentice will demonstrate the proper use of hand tools to include hammer, wrenches, screw drivers, punches and pliers.

Core Competency

2. Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

NIMS DUTY & PERFORMANCE STANDARD

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned responsibilities.

NOTE

Lock-out/tag-out and right-to-know will be accounted for in Industrial Safety and Environmental Protection. Material handling here means handling of shafts and overhead cranes, etc., and personal protection. The apprentice should recognize pinch points, cutting points, and control points.

Core Competency

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

Duty: Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions detailing the handling and storage of hazardous materials in compliance with OSHA and EPA requirements and guidelines, demonstrate safe workplace practices in the identification, handling, and storage of hazardous materials.

Core Competency

4. Part Inspection

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop an inspection plan and inspect simple parts using precision tools and techniques. Prepare reports on the compliance of the parts.

Performance Standard: Given the necessary job process sheets for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedure(s). Complete required written inspection report and make a decision to accept or reject component parts. Provide brief verbal explanation of inspection procedures, results, and decisions.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheet for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedures.

b. Verify calibrations and sizes of all measuring devices.

c. Take measurements to an accuracy of 1/64 for fractions, .002 for decimals and ½ degree for angles.

d. Read standard orthographic prints and understand types of lines, title block information, revision levels, abbreviations, symbols, and tolerances.

e. Identify surface defects, burrs and any adverse conditions such as flat or torn threads, out of round conditions, eccentricity, etc.

Core Competency

5. Perform the Inspection of Parts

NIMS DUTY & PERFORMANCE STANDARD

Duty: Perform the inspection of parts.

Performance Standard: Develop an inspection plan and inspect production parts that will include the use of basic precision measuring tools, optical comparators and profilometers.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheet for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedures.

b. Verify calibrations and sizes of all measuring devices.

c. Inspect a part with specified profiles including angles and radius with an optical comparator and describe the compliance of the profiles.

d. Read standard orthographic prints and understand types of lines, title block information, revision levels, abbreviations, symbols, and tolerances.

e. Using a profilometer, check the finish on a turned part, record the surface finish and compare it to blueprint specifications to determine if it is in compliance.

Core Competency

6. Process Control

NIMS DUTY & PERFORMANCE STANDARD

Duty: Follow a sampling plan. Inspect the samples for the required data. Enter the data on appropriate charts. Graph the data. Respond to the warning conditions indicated by the process charts.

Performance Standard: Given the necessary job process sheets for a part, verbal instructions, and the necessary charts and inspection tools, inspect parts according to the sampling plan, collecting the data required for the process control chart. Working with the supplied control and warning limits, place the data, produce new data as needed, graph the data, and take the Stop or Go actions as indicated by the results of producing the process control chart. Provide brief verbal explanation regarding the decision taken.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given the necessary job process sheets for a part, verbal instructions and the necessary charts and inspection tools, the apprentice will inspect the parts according to the sampling plan or inspection plan, collecting the data required for the process adhering to the time parameter. Working with the supplied control and warning limits, the apprentice will place the data,

produced new data as needed (mean and range), graph the data and take Stop or Go actions as indicated by the results of producing the process control chart. The apprentice will provide a brief verbal explanation supporting the decision taken.

b. Given a needed capability study and the data collected to satisfy the needs of the capability study, the apprentice will participate as a team member in support of the capability study through an understanding of capability and determining if a calculated Cpk value is acceptable or non- acceptable. With the direction of the team leader, the apprentice will provide all the machining expertise and statistical calculation needed to satisfy the requirements of a capability study (the apprentice is not expected to calculate Cpk values through complex formulas).

Core Competency

7. Process Adjustment - Single Part Production

NIMS DUTY & PERFORMANCE STANDARD

Duty: Analyze the performance of a single-part production process. Formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustment and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a part having routine problems being processed, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Explain the corrective actions and the reasoning used to perform the diagnosis.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to adjust and recalculate speeds and feeds for proper tool-life, surface finish, and cycle time optimization.

b. The apprentice will be able to inspect a manufactured part.

c. The apprentice will be able to edit changes into a CNC milling program.

Core Competency

8. Participation in Process Improvement

NIMS DUTY & PERFORMANCE STANDARD

Duty: As a member of a process team, analyze the performance of a production process. With the team formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustments and/or improvements. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a routine production process having a problem(s), as a team member, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Carry out the cause and effect analysis by participating in the development of the appropriate Q.C. methodology with the team, i.e., fishbone diagram. Explain the Q.C. tool, the corrective actions and the reasoning connecting the root cause analysis to the remedial actions taken.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Measurement, Materials, and Safety*** credentialing exam are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing thread percentage, finish symbols, and allowances are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percent.

Industrial Safety: The apprentice must become familiar with Hazmat, MSDS, basic personal protective equipment (PPE), and machine tool safety. Apprentice assessment includes identification of a government body that regulates industrial safety – OSHA.

Maintenance: Apprentice assessment includes elementary knowledge of referencing and researching maintenance procedures, hand tool maintenance and safety, and simple tool maintenance.

Process Adjustment: The exam presents basic problems of machining processes such as tapping, threading, drilling, milling, reaming, and grinding in which a process adjustment functions as the corrective action. Apprentices must identify a basic goal of process improvement.

Quality Control Procedures: The exam will evaluate knowledge of basic concepts of SPC and sampling plans. Basic knowledge of inspection plans includes rationale, criteria for choosing the correct measuring instrument, and organization. The evaluation includes basic knowledge of inspection Set-ups and measuring instruments.

NIMS CREDENTIAL: Level I Machining Skills, Job Planning, Bench work, & Layout

---

Core Competency

9. Manual Operations: Layout

NIMS DUTY & PERFORMANCE STANDARD

Duty: Layout the location of hole centers and surfaces within an accuracy of +/- .015 inch.

Performance Standard: Given a surface plate, surface gauge, layout height gauge, combination set, scriber, layout ink, prick punch, ball peen hammer, process plan, and part print, layout hole locations, radii, and surfaces matching the specifications.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

b. Given a part print, surface plate and all the required layout tools, the apprentice will select proper tools, and use correct procedure, to lay out a part including the location of hole centers and surfaces within the accuracy of +/- .015 inch.

Core Competency

10. Manual Operations: Benchwork

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using aluminum or mild steel, hand drill and hand tap holes. Use hand drills, hand taps, tap wrench, files, scrapers, and coated abrasives to deburr

parts. Use arbor presses to perform press fits. Use bench vises and hand tools appropriately.

Performance Standard: Given a process plan, blueprint, and access to hand tools, produce a part with two holes prepared for hand tapping, a hole prepared (reamed) for the press fit of a bushing, and a stud for one of the tapped holes. Deburr the part, hand drill and hand tap the holes, press in the bushing, and install the stud.

PERFORMANCE OBJECTIVE: (What an apprentice must know and/or do to perform the work competently).

Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

Core Competency

11. Sawing

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform sawing to a layout. Choose and mount appropriate blades; weld, break, and re-weld blades as necessary.

Performance Standard: Given a part with a finished layout and access to an appropriate band saw and blades, finish saw the part to the layout.

Core Competency

12. Job Process Planning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop a process plan for a part requiring milling, drilling, turning, or grinding. Fill out an operation sheet detailing the process plan and required speeds and feeds.

Performance Standard: Given a print detailing a part requiring milling, drilling, turning, and grinding, verbal instructions, and appropriate references, formulate a set of strategies to manufacture the part and fill out an operation sheet reflecting the chosen strategies including the required speeds and feeds. Identify all major components and functions of the machine tools, and all major hand tools, measuring tools, tools and fixtures, and work materials. Provide the rationale for the speeds and feeds selected.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will choose the most appropriate location for the origin on the part, and establish a method for defining that location during set-up.

b. The apprentice will be able to select appropriate work holding devices for various work pieces.

c. The apprentice will be able to select appropriate tooling for various operations and materials.

d. The apprentice will be able to calculate speeds and feeds for proper tool- life and surface finish.

Related Instruction

The knowledge and skills you will need to pass the ***Level I Machining Skills, Job Planning, Benchwork, and Layout*** credentialing exam are as follows:

Basic Mathematics: The exam will assess basic math knowledge from whole number computations and algebra to basic geometry. Application of formulas involving tapping, tapers, speeds and feeds, and threading will be evaluated.

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing limits, tolerance, and parameters of a material or process are essential skills.

Basic Measurement: The exam will test interpretation of basic measuring instruments, resolution, and applicability of basic measuring tools for given situations. Apprentices must demonstrate knowledge of the differences and similarities of semi-precision and precision measurement.

Basic Machining Theory: The apprentice must understand basic types of tooling materials, applications of tooling and processes for drilling, milling, and sawing, turning, and proper procedures using hand tools. A basic understanding of fits and allowances, as well as defining surface finish and machining operation/surface finish relationships, is expected.

Layout: The exam will evaluate an understanding of basic and precision layout equipment and procedures. The apprentice should have a basic knowledge of print reading and orthographic projection. Knowledge of the layout of linear, angular, and circular dimensions will be assessed.

NIMS CREDENTIAL: Level I Machining Skills, Drill Press Skills

---

Core Competency

13. Drilling Operations

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate machine tools to perform routine drilling operations.

Performance Standard: Given a semi-finished part, process plan, part print, and hand, precision, and cutting tools, as well as access to a drill press and its accessories, produce a part matching the process plan and the blueprint specifications. The part specified will be in the semi-finished state, having been squared up and the outer surfaces completed with five center-drilled locations. Finishing the part will require the finishing of the five center-drilled locations. Each hole must have at least two secondary operations. The secondary operations will consist of reaming, spot facing, countersinking, counterboring, and counterdrilling. At least one hole must be a blind hole and one a through hole. At least one hole will be power tapped.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of safety procedures, and the identification of drill press and radial drill press parts and their function.

b. Given instruction/demonstration on the proper selection, mounting, set-up and usage procedure for necessary work-holding devices on the drill press, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the drill press to perform the required drill press operations.

c. Given instruction/demonstration on the proper selection, mounting, set-up and usage procedure for necessary tool-holding devices on the drill press, the apprentice will select, mount, set-up, and align tool-holding devices on the drill press to perform the required drill press operations.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required machining operations on the drill press.

e. Given a drill press, process plan, part print, semi-finished part, cutting tools, hand tools, drill press accessories, and instruction/demonstration on the proper set-up and procedures used for drilling, tapping, reaming, spot facing, countersinking, and counterboring, the apprentice will perform these secondary operations on the semi-finished part to within the tolerances specified on the part print.

Related Instruction

The knowledge and skills you will need to pass the ***Level I Machining Skills, Drill Press Skills*** credentialing exam are as follows:

Drill Press Components: Proper operation of a drill press depends on knowledge of drill press components and their functions. Identification of the spindle, base, table, column, variable speed control, and feed handle are essential for safe and effective use of this machine tool. Other essential components are the table lock, column lock, motor, and base.

Process Involvement: An important part of any process improvement is an understanding of the symptoms and causes of some common problems associated with drilling operations. Understanding root causes of drill breakage, excessive wear, enlarged diameters, and excessive RPM enable the apprentice to analyze the process and make the correct improvement.

Twist Drill Nomenclature and Sizing: Each twist drill is comprised of many separate features. Identifying the web and understanding web thickness enables the apprentice to recognize the effects of excessive web thickness. Knowing the purpose and location of the margin facilitates proper drill diameter measurement as well as the effect of worn margin near the point of the drill. All general-purpose drills have the same identical point angle. The included point angle of a drill will vary dependent on the application and the material being machined.

Safety Practices: Proper safety procedures insure safe and productive machining. Safety includes safe lifting procedures, hair containment, jewelry removal, and loose clothing containment. Drill press safety includes the proper location of the vise, storage of the chuck key, and chip removal. Safety awareness should be apparent at all times through the correct application of speeds and feeds.

Countersinking, Counterboring, Spotfacing, and Center Drilling: Spotfacing, countersinking, and counterboring are drilling procedures used to seat screws and bolts with special head configurations or to seat a fastener or washer evenly on a rough surface. Center drilling is an important procedure for accurate hole location as well as shaft preparation for turning between centers. The specific drilling operations have speeds and feeds that are proportionally slower than drilling with general purpose twist drills.

Layout and Inspection: Choosing the correct measuring instrument is primarily dependent on the tolerance range of the specific dimension. Proper set-up and correct measuring procedures for each measuring device are critical. The apprentice must also know when and where to apply semi-precision and precision layout. Selection and application of proper layout tools and Set-ups are essential in any machining operation.

Tapping: The drill diameter used to create a hole for internal threading will dictate the thread percentage or amount of engagement between two mating threaded components. Most tap drill charts for conventional thread forms are based on 70% – 75% engagement. Pipe taps used for some pneumatic and fluid connects have tap drills based on other parameters. With the proper equipment, tapping can be performed under power if the drill press is capable of reversing the rotation.

Work Holding: The work piece must be held securely to prevent part pullout from the work holding device. The equipment used for work holding parts is dependent upon the shape and size of the part being drilled. Proper location of the vise may prevent the vise from whipping around if the drill gets jammed in the part. Proper selection of work holding devices is critical for safe and accurate application of a drill press.

NIMS CREDENTIALS: Level I Turning Operations, Turning Between Centers

---

Core Competency

14. Turning Operations: Turning Between Centers, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and carry out between centers turning operations for straight turning.

Performance Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.002 inch, one UNC external thread, one UNF external thread, and require an end-for-end swap.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b. Given instruction/demonstration by a qualified individual on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required turning operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required various turning operations on the engine lathe.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f. Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g. Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, and grooving operations within the specified tolerances on the part print.

h. Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i. Given instruction/demonstration on the proper set-up procedure used for knurling on the engine lathe, the apprentice will set-up the machine and perform knurling operations within the tolerances specified on the part print.

j. Given instruction/demonstration on Unified National Thread nomenclature, formulas and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external U.N. thread within the tolerances specified on the part print.

k. Given a blueprint, instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting internal and external tapers on the engine lathe, the apprentice will cut a taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills you will need to pass the ***Turning Operations: Turning Between Centers, Level I Machining Skills*** credentialing exam are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center run out, properly turning hard material, and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to operate a lathe safely and effectively. Proper lifting techniques, learning how to find MSDS and HMIS information, and some basic personal first-aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is critical to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever, and the proper method to change speeds and feeds is also critical knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead, and different families of thread forms. Proper alignment of the threading tool, as well as the proper location of the compound rest, is essential Set-up steps needed to turn threads with a single point tool. An apprentice must be able to calculate the proper in feed to prevent the thread from either being too deep or too shallow.

Tapping, Fits, and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: The best choice depends on the accuracy and reliability of the measuring instrument. Tolerance as well as the application will also be important factors. An apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer, and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is knowing when the part is accepted or rejected. Basic knowledge of process control techniques such as inspection sheets, Pareto charts, capability studies, and X bar/R charts are an effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit, and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree of accuracy of each method depends on the tolerance of the work piece dimensions. Proper Set-ups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi-precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

NIMS Credentials: Level I Machining Skills, Turning Operations: Chucking

---

Core Competency

15. Turning Operations: Chucking: Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARDS

Duty: Set-up and carry out chucking operations for turning.

Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate turning machine and its

accessories, produce a part matching the process plan and the print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.005 inch, two bores within +/-.005 inch, one UNC external thread, and requires at least two chuckings or other work holding set-up.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b. Given instruction/demonstration on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder by a qualified individual, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning, and boring operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required turning and boring operations within the specified tolerances on a part print.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing various required turning operations on the engine lathe.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f. Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g. Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, boring, and grooving operations within the specified tolerances on the part print.

h. Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i. Given instruction/demonstration on Unified National Thread nomenclature, formulas, and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external and internal U.N. thread within the tolerances specified on the part print.

j. Given a blueprint, instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting tapers on the engine lathe, the apprentice will cut an external and internal taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills you will need to pass the ***Turning Operations: Chucking, Level I Machining Skills*** credentialing exam are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center run out, properly turning hard material, and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to effectively operate a lathe safely. Proper lifting techniques, learning how to find MSDS and HMIS, information, and some basic personal first-aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is imperative to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever, and the proper method to change speeds and feeds is imperative knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead, and different families of thread forms. Proper

alignment of the threading tool as well as the proper location of the compound rest is essential set-up steps needed to turn threads with a single point tool. An apprentice must be able to calculate the proper in feed to prevent the thread from either being cut too deep or too shallow.

Tapping, Fits and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: Choosing the proper measuring instrument is an important facet of proper inspection. The best choice is dependent on the accuracy and reliability of the measuring instrument. The tolerance as well as the application will determine the choice. An apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer, and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is knowing when the part is accepted or rejected. Basic knowledge of process control techniques, such as inspection sheets, Pareto charts, capability studies and X bar/R charts, are an effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit, and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool by applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree of accuracy of each method depends on the tolerance of the work piece dimensions. Proper Set-ups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi-precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

NIMS CREDENTIAL: Level I CNC Turning

Core Competency

16. CNC Programming - Turning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison, apply the principles of two-dimensional coordinate planes in the development of a simple program for the production of the part on a CNC lathe or CNC turning center.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector) and R (radius value) methods.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

17. CNC: Write a Simple CNC Turning Program and Review Tool Path

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor software write simple CNC programs using M and G codes from the *Machinery's Handbook*. Simple programs are single plane, cutter centerline, linear and circular interpolation, and single cutter, with no canned cycles as specified on the print.

Performance Standard: Given a part print with the tool path shown, and the computer with editor software; write a program including speeds and feeds, to drive a cutting tool through a continuous path following the geometry of a part requiring the development of a linear interpolation tool path as well as circular interpolation. Store the program on computer media.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

e. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J (arc vector), and R (radius value) methods.

f. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

18. Level I CNC: Operate a CNC Lathe

NIMS DUTY & PERFORMANCE STANDARD

Duty: Operate a CNC Lathe

Performance Standard: Given a CNC lathe, create a qualified CNC program, set-up and operate the lathe, change tool values as necessary, replace and qualify tooling as necessary.

NIMS CREDENTIAL: Level II CNC Turning

Core Competency

19. Level II CNC: Operate a CNC Lathe

NIMS DUTY & PERFORMANCE STANDARD

Duty: Operate a CNC Lathe

Performance Standard: Given a CNC lathe, create a qualified CNC program, set-up and operate the lathe, change tool values as necessary, replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

e. The apprentice will be able to install and qualify the required tooling for the program.

f. The apprentice will be able to mount, locate, and set the origin of the work piece on a CNC lathe.

g. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC lathe control.

h. The apprentice will be able to safely execute a program for its first run (debugging).

Core Competency

20. CNC: Advanced Manual Programming

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor, write sophisticated programs. Sophisticated programs will contain various combinations of change of plane, canned cycles, will employ multiple tools, cutter offsets, linear, circular, and helical interpolation as well as requiring the matching of surfaces along lines and points of tangency in 3 axis. All results will be stored on computer media.

Performance Standard: Given a blueprint and a process plan, write a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of canned cycles, and tool offsets. Use a computer to write and store the program.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

c. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using the I & J (arc vector), and R (radius value) methods.

e. The apprentice will be able to implement automatic cutter radius compensation.

f. The apprentice will be able to change and perform machining on different work planes.

g. The apprentice will be able to program helical interpolation.

h. The apprentice will be able to form and solve triangular constructions on a blueprint to find missing coordinates.

Core Competency

21. Use Manufacturing Modeling Software to Create Programs

NIMS DUTY & PERFORMANCE STANDARD

DUTY: Create programs using a manufacturing modeling software package.

Performance Standard: Given a blueprint, use a graphics-based software package to develop a program to drive a collection of tooling through the tool paths needed to produce the part shown on the blueprint. The program will require change of tools, change of planes, use of "canned cycles." and tool offsets.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to identify coordinates with respect to an origin.

b. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

c. The apprentice will be able to identify and use menus, and icons used in the software package.

d. The apprentice will be able to draw basic geometric shapes and constructions.

e. The apprentice will be able to edit basic geometric shapes and constructions.

f. The apprentice will be able to create tool paths for contour milling, pocketing, drilling, and tapping.

g. The apprentice will be able to post-process tool paths into programs.

<u>CORE COMPETENCIES ALIGNED WITH ALL MACHINING CREDENTIALS</u>

Core Competency

22. General Housekeeping and Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Keep the duty station clean and safe for work. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.

Performance Standard: Given maintenance, cleaning, and housekeeping checklists, as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Core Competency

23. Preventative Maintenance - Machine Tools

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the general condition of an assigned machine tool. Make routine adjustments as necessary and as authorized. Report problems to supervision which are beyond the scope of authority. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.

Performance Standard: Given the preventive maintenance procedures and schedules for a given machine tool, as well as sufficient instruction and experience to recognize maintenance problems, carry out routine maintenance, report problems which are beyond the scope of authority, and fill out the history forms for tracking maintenance.

Core Competency

24. Tooling Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the condition of tooling. Refurbish tooling where appropriate. Refer tooling for repair or regrind where appropriate.

Performance Standard: Given samples of tooling in various conditions, diagnose the tooling and take the correct steps to put the tooling back in service. The sample tooling should include turning, milling, and drilling tools. These tools should be both insert tooling as well as conventional tooling. The apprentice must demonstrate the offhand grinding of a drill between the diameter of .125 inch and 1.000 inch. The offhand regrinding of a turning tool and the correct rotation and replacement of inserts in an insert style milling cutter body must be demonstrated. The apprentice must demonstrate the ability to recognize when a cutter should be referred to a tool and cutter grinder.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

General Housekeeping and Maintenance

Given maintenance, cleaning, and housekeeping checklist as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Preventative Maintenance - Machine Tools

Given a specific machine tool, the apprentice will locate, check, and fill all applicable lubrication reservoirs, check for proper oil pressure, and check that all lubrication points are functioning properly. Check the general condition of the equipment and make routine adjustments as stated in the maintenance schedule.

Tooling Maintenance

a. Diagnose tooling in various conditions and take the correct steps to put the tooling back in service.

b. Perform cutter-sharpening operations.

c. Understand insert identification nomenclature and index or change inserts.

CORE COMPETENCY ASSESSMENT FORM
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER – TURNING
O*NET-SOC CODE: 54-4012.00RAPIDS CODE: 1095CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC SET-UP PROGRAMMER – TURINNG CORE COMPETENCIES

1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Perform the Inspection of Parts	
6.	Process Control	
7.	Process Adjustment – Single Part Production	
8.	Participation in Processes Improvement	
9.	Manual Operations: Layout	
10.	Manual Operations: Bench work	
11.	Sawing	
12.	Job Process Planning	
13.	Drilling Operations	
14.	Turning Operations: Turning Between Centers	
15.	Turning Operations: Chucking	
16.	CNC Programming – Turning	
17.	CNC: Write a Simple CNC Turning Program and Review Tool Path	
18.	CNC: Operate a CNC Lathe	
19.	CNC: Operate a CNC Lathe	
20.	CNC: Advanced Manual Programming	
21.	Use Manufacturing Modeling Software to Create Programs	
22.	General Housekeeping & Maintenance	
23.	Preventative Maintenance – Machine Tools	
24.	Tooling Maintenance	

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

CORE COMPETENCY RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING
O*NET-SOC CODE: 54-4012.00 RAPIDS CODE: 1095CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each NIMS Core Competency, the *Date the NIMS Core Competency was attained*, for the apprentice to attain each NIMS Core Competency.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING CORE COMPETENCIES

1. Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2. Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4. Part Inspection

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5. Perform the Inspection of Parts

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6. Process Control

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

7. Process Adjustment – Single Part Production

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

8. Participation in Processes Improvement

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

9. Manual Operations: Layout

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

10. Manual Operations: Benchwork

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

11. Sawing

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

12. Job Process Planning

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

13. Drilling Operations

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

14. Turning Operations: Turning Between Centers - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

15. Turning Operations: Chucking - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

16. CNC Programming - Turning - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

17. CNC: Write a Simple CNC Turning Program and Review Tool Path

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

18. CNC: Operate a CNC Lathe - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

19. CNC: Operate a CNC Lathe - Level II Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

20. CNC: Advanced Manual Programming Level III Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

21. Use Manufacturing Modeling Software to Create Programs

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

22. General Housekeeping & Maintenance

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

23. Preventative Maintenance - Machine Tools

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

24. Tooling Maintenance

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

COMPANY SPECIFIC COMPETENCY ASSESSMENT
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1095CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING COMPANY SPECIFIC COMPETENCIES

25.		
26.		
27.		
28.		
29.		
30.		
31.		
32.		
33.		
34.		
35.		
36.		
37.		
38.		
39.		
40.		
41.		
42.		
43.		
44.		
45.		
46.		
47.		
48.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

COMPANY SPECIFIC COMPETENCY RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE 1095CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained*, for the apprentice to attain each company specific competency.

25.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

26.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

27.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

28.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

29.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

30.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

31.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

32.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

33.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

34.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

35.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

36.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

37.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

38.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

39.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

40.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

41.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

42.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

43.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

44.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

45.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

46.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

47.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

48.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

49.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

50.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

51.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

52.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

53.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE 1095CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

CREDENTIALING RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM NIMS CERTIFIED CNC SE-TUP PROGRAMMER - TURNING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1095CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials, and Safety - Level I Machining Skills	
2.	Job Planning, Benchwork, and Layout - Level I Machining Skills	
3.	Drill Press Skills - Level I Machining Skills	
4.	Turning Between Centers - Level I Machining Skills	
5.	Turning Operations: Chucking - Level I Machining Skills	
6.	CNC Turning - Level I Machining Skills	
7.	CNC Turning - Level II Machining Skills	
8.	CNC Turning - Level III Machining Skills	
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

JOB PERFORMANCE ASSESSMENT FORM
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING
O*NET-SOC CODE: 51-4012.00 RAPIDS CODE: 1095CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and the completion of all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker CNC Set-up Programmer - Turning.

NIMS CERTIFIED CNC SET-UP PROGRAMMER - TURNING JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR

DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified CNC Set-up Programmer - Turning**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified CNC Set-up Programmer – Turning**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

Appendix A.7

Core Competency Requirements
NIMS Certified Stamping Press Set-up Operator

I. Core Competency Assessment: Stamping Press Set-up Operator Basic Competencies

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Material & Parts For Quality*		
A9	Measure ID/OD		
A10	Verify Type & Characteristics of Raw Material		
A11	Check & Verify Part Cosmetics		
A15	Measure & Verify Material Thickness and Width		
A16	Measure Overall Height and Length of Part		
A20	Clean & Zero Micrometer, Calipers and Indicators		
B	*Plan & Prepare for Set-up and Production*		
B1	Review Production Packets		
B2	Review/Verify Setup Sheets and/or Checklists		
B3	Locate, Identify & Verify Die		
B5	Verify Raw Material		
B6	Verify Setup of Bins or Chutes and Conveyors		
B7	Verify Stage Lubricant(s)		
B8	Verify & Review MSDS's		
B9	Verify & Stage Packaging		
B10	Clean & Prepare Work Area/Station		
C	*Set-up Safety Equipment & Devices*		
C2	Clean Sensors and/or Switches		
D	*Run Production (Operate Press)*		
D2	Start/Stop Press (with approval)		
D3	Set/Re-Set Counters to Zero		
D6	Monitor Scrap/Slugs		
D7	Remove & Isolate Scrapped Parts		

I. Core Competency Assessment: Stamping Press Set-up Operator Basic Competencies (cont.)

Duty Area	Task	Date Completed	Supervisor Signature
D	*Run Production (Operate Press)*		
D10	Replenish Part Lubrication Reservoirs		
D15	Adhere to Frequency of Part Inspections		
D17	Package/Contain or Palletize Finished Parts		
E	*Set-up Die*		
E2	Clean Bolster & Ram		
E3	Clean Top/Bottom of Die		
E4	Stone Press Bolster		
E12	Replace/Clean Filters		
E13	Grease/Lube Guide Components		
F	*Set-up Auxiliaries & Press*		
F12	Orient Parts for Secondary Operations (if applicable)		
F13	Prepare/Position Part Cleaning Equipment (if applicable)		
F14	Set/Position Packaging for Production		
H	*Conduct End-of-Run Requirements*		
H1	Submit Final Part for Inspection		
H2	Get Approval for Final Part		
H5	Stage & Organize Die Clamping Devices for Next Set-up		
H6	Empty Scrap Bins/Containers		
H7	Clean Conveyors and/or Chutes		
H8	Stage Completed Parts for Pick-up		
H9	Submit End-of-Run Samples and/or Strip		

II. Core Competency Assessment: Stamping Press Setup Operator Intermediate Competencies

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Material & Parts For Quality*		
A1	Match Part to Print		
A2	Identify Critical Dimensions		
A3	Check Parts for Absence of Features		
A4	Match Gauge/Fixture to Part Specifications		
A5	Measure Height of Features		
A6	Measure Depth of Coining (if applicable)		
A7	Measure Internal/External Radius or Radii (if applicable)		
A8	Measure Depth of Draw or Cup (if applicable)		
A12	Check & Verify Hole Size and Location(s)		
A13	Measure Hole-to-Edge Dimensions		
A14	Measure Hole-to-Hole Dimensions		
A17	Measure Critical GD&T (if applicable)		
A18	Check/Verify Part Profiles		
A19	Chart/Record Critical SPC Data		
B	*Plan & Prepare for Setup and Production*		
B4	Verify Gages and Inspection Devices		
C	*Set-up Safety Equipment & Devices*		
C1	Connect Sensors to Readout Devices		
C4	Test & Verify Operation of Light Curtains and Mats (if applicable)		
C5	Install Safety Blocks		
C6	Inspect Crane/Hoists & Rigging for Safety and Function		
C9	Complete & Submit Safety Inspection Documentation or Checklist (if applicable)		

II. Core Competency Assessment: Stamping Press Setup Operator Intermediate Competencies (cont.)

Duty Area	Task	Date Completed	Supervisor Signature
D	*Run Production (Operate Press)*		
D1	Load Coil, Strip or Blanks		
D4	Feed (Jog/Inch) Material Through Die		
D5	Weld End-Tail to Beginning of New Coil (if applicable)		
D8	Set Press Speed & Adjust and Control Process		
D9	Adjust Shut Height		
D11	Change out Lubricants		
D12	Monitor & Adjust Press/Press Line Controls (with approval)		
D13	Monitor Transfer Controls (if applicable)		
D16	Label/Tag/Identify Parts for Traceability		
D18	Record Required Production Data /Information		
E	*Set-up Die*		
E1	Set Shut Height		
E5	Select Clamping Devices		
E6	Align Die to Feed Line		
E7	Place Die Into Press		
E8	Check, Install & Set Bolster Blocks (Quick Die Change) (if applicable)		
E9	Install & Clamp Die in Press		
E10	Connect In-Die Sensors (if applicable)		
E11	Adjust Material Bridge		
E14	Set Pilot Release		
E15	Set Knockouts		
E16	Set Air Cushion (if applicable)		
E17	Set Manifold Pressure (Nitro/Hyd) (if applicable)		
E18	Install/Adjust Lubrication System or Equipment		

II. Core Competency Assessment: Stamping Press Setup Operator Intermediate Competencies (cont.)

Duty Area	Task	Date Completed	Supervisor Signature
E	*Set-up Auxiliaries & Press*		
E19	Run First Part(s) (with approval)		
E22	Inspect Parts & Obtain First Part Approvals		
F	*Set-up Auxiliaries & Press*		
F1	Install Conveyors I Stackers (if applicable)		
F2	Install Part-Out Conveyors (if applicable)		
F3	Set/Position Uncoiler, Magazine or Blank Stacker (if applicable)		
F5	Set/Adjust Material Feeder		
F8	Set Tension on Slack Loop		
F9	Install/Set Transfer or Automated System or Devices (if applicable)		
F10	Install/Set/Adjust Hydraulic and/or Pneumatic Systems (if applicable)		
F15	Clean Feed & Straightener Rollers		
G	*Troubleshoot Operations (Selected Examples) (if applicable)*		
G1	Determine Cause of Double Hits (if applicable)		
G2	Find Out Why Material Has Buckled (if applicable)		
G3	Diagnose the Cause of a Short/Over-Feed Condition (if applicable)		
G5	Determine Why Parts are Sticking in the Die (if applicable)		
G6	Respond to Sensor Faults (if applicable)		
G7	Determine Why Parts Have Visual Defects (if applicable)		
H	*Conduct End-of-Run Requirements*		
H3	Complete End-of-Run Documentation		
H4	Remove Die From Press and Stage for Storage		
H10	Return or Prepare Un-Used Material (Pick-up or Inventory		

III. STAMPING PRESS SETUP OPERATOR SKILL LEVEL: ADVANCED COMPETENCIES

Duty Area	Task	Date Completed	Supervisor Signature
C	*Set-up Safety Equipment & Devices*		
C3	Program Tonnage Monitor to pre-determined engineering specifications		
C7	Fit & Set Pullbacks (if applicable)		
C8	Test Vision System (if applicable)		
D	*Run Production (Operate Press)*		
D14	Set/Adjust Counter Balance		
E	*Set-up Die*		
E20	Inspect Parts for Compliance During Run		
E21	Adjust Process/Equipment to Part Compliance		
F	*Set-up Auxiliaries & Press*		
F4	Set/Adjust Straightener		
F6	Set Feed Length		
F7	Set/Adjust Leveler (if applicable)		
F11	Install/Prepare Butt Welder (if applicable)		
G	*Troubleshoot Operations (Selected Examples)*		
G4	Find Out Why Press Will Not Start (if applicable)		

Required NIMS Credentials

In order to demonstrate proficiency in all of the competencies listed in this appendix, the apprentice will have completed all of the following NIMS Credentials.

Name of Credential	Date Completed	Supervisor Signature
Metalforming Level I		
Parts Inspection & Quality Control		
One of the following 5 (as applicable)		
Operate with Single Hit Tooling II* Operate with Compound Dies II* Operate with Progressive Dies II* Operate with Deep Draw Dies II* Operate with Transfer Dies II*		
One of the following 5 (as applicable)		
Set-up with Single Hit Tooling III* Set-up with Compound Dies III* Set-up with Progressive Dies III* Set-up with Deep Draw Dies III* Set-up with Transfer Dies III*		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED STAMPING PRESS SET-UP OPERATOR
CORE COMPETENCY ASSESSMENT FORM

APPRENTICE:_____ EMPLOYEE NUMBER:_____
SUPERVISOR:_____ DEPARTMENT:_____

INSTRUCTIONS: CHECK-OFF EACH CORE COMPETENCY AS THE APPRENTICE DEMONSTRATES A LEVEL OF PROFICIENCY THAT IS EQUIVALENT TO THE APPROPRIATE LEVEL

STAMPING PRESS SET-UP OPERATOR: BASIC WORK PROCESS SCHEDULE
(PREP CHECKS IN BOLD)

I. Stamping Press Set-up Operator: Basic Work Process Schedule

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
B1	Review Production Packet(s)/ Process Plan (Job Training)		
A2	***Identify Critical Dimensions (Inspection)***		
A11	Check & Verify Part Cosmetics (Inspection)		
A20 ***A16*** ✓ ***A15***	***Clean & Zero Micrometer, Calipers & Indicators (Inspection)*** ***Measure Overall Height & Length of parts (Inspection)*** ***Measure Raw Material Thickness & Width (Inspection)***		
A5	Measure Height & Diameter of Features (Inspection)		
A+	Measure Point-to-Point (Inspection) – i.e., Hole-to-hole, hole-to-edge, edge-to-edge		
A8	Measure Depth of Draw or Cup (Inspection)		
A6	Measure Depth of Coining (Inspection)		
A9	Measure ID/OD (Inspection)		
A7	Calculate & Measure Internal/External Radius or Radii (Inspection)		
A+	Measure Angles (Inspection)		
D15	Acknowledge Frequency of In-Process Part Inspections (Run Production)		

I. Stamping Press Setup Operator: Basic Work Process Schedule (cont.)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
B10	Clean & Prepare Work Area/Station (Job Planning/Prep)		
C6	Inspect Crane/Hoists & Rigging for Safety & Function (Safety)		
B5 ✓	***Measure Raw Materials (Job Planning) – Verify Dimensions, Type & Characteristics of Raw Materials***		
B8	Review MSDS's (Job Planning)		
B7	Identify & Stage Lubricants (Job Planning)		
E3	Clean Top/Bottom of Die (Die Setup)		
C5	***Install Safety/Stop Blocks (Safety Equipment)***		
E4	Stone/Clean Press Bolster (Die Set-up)		
D2	Start/Stop Press (Run Production)		
C4 ✓	***Test & Verify Operation of Light Curtains and/or Safety Mats (Safety Equipment)***		
D17	Package/Contain or Palletize Finished Parts (Run Production)		
H7	Clean Conveyors and/or Chutes (End of Run – Closeout Job)		

STAMPING PRESS SET-UP OPERATOR: INTERMEDIATE WORK PROCESS SCHEDULE

(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
A1	Match Parts to Prints (Inspection)		
A4	Match Gage/Fixtures to Part Specifications (Inspection)		
B4 ✓	***Stage Gages & Inspection Instruments and Devices (Job Planning – Prep); Verify calibration as needed***		
B9	Identify & Stage Packaging (Job Prep); may include pallets and containers as needed, Forklift certification/licensing may be required		
B3	Identify, Locate & Verify Die(s) to be Set-up (Job Planning – Prep)		
B6	Identify & Set-up Scrap Bins, Chutes and/or Conveyors (Job Prep)		
D1	Load Coil, Strip or Blanks (Run Production); Forklift/truck may be required		
E8	Check/Install & Set Bolster Blocks/QDC (Set-up Die)		
F15	Clean Feed & Straightener Rolls (Press/Press Line Set-up)		
E13	Grease/ Lube Guide Components (Die Set-up)		
D11	Change out Lubricants (Run Production)		
F8	Set Tension on Slack Loop (Press/Press Line Set-up)		

II. Stamping Press Set-up Operator: Intermediate Work Process Schedule (cont.)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
D4 ✓ ***D9***	***Start Press & Feed (Jog / Inch Mode) Material Through Die (Run Production)*** ***Adjust Shut Height (Run Production)(with approval)***		
D12	Run Quota – Monitor Press/Press Line controls in Run Mode & Adjust Process as Needed (Run Production – Operate Press)		
E22	Inspect First Parts & Obtain First Part Approvals as Needed (Die Set-up)		
D16	Label/Tag & Identify Finished Parts for Traceability (Run Production)		
D3	Set/Re-Set counters to Zero (Run Production)		
D10	Replenish Part Lubrication Reservoirs (Run Production)		
D+	***Operate Press, Control Process & Inspect Finished Parts for Quality & Compliance During Run (Run Production) – Adhere to Frequency of Part Inspections – Isolate Non-Conforming Parts***		
D6	Monitor/Dump Scrap/Slugs (Run Production) – Segregate Scrap by Type or Material Grade		
A18	Check/Verify Part Profiles & Features on Optical Comparator (Inspection) or CMM if applicable		
D7	Remove & Isolate Scrapped/Non-Conforming Parts (Run Production		
A12	Check & Verify Hole Sizes & Locations (Inspection)		

II. Stamping Press Set-up Operator: Intermediate Work Process Schedule (cont.)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
A17 ✓	***Measure Critical Dimensions (Inspection)***		
G7	Determine (Isolate the Cause of) Why Parts Have Visual Defects (Troubleshooting)		
H3 ***H9*** ✓	***Complete End-of-Run Documentation (Closeout Job)*** ***Submit End-of-Run Samples and/or Strip (Closeout Job)***		
H10	Return or Prepare Unused Material for Pick-up or Inventory (Closeout Job)		
H5	Select, Stage & Organize Die Clamping Devices for Next Set-up (Closeout Job)		
C9	Complete & Submit Safety Checklist (Safety)		

III. STAMPING PRESS SET-UP OPERATOR: ADVANCED WORK PROCESS SCHEDULE

(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
B2	Review & Verify Set-up Sheets, Instructions & Checklists (Job Planning)		
E1 ✓	***Verify & Set Shut Height (Die Set-up)***		
D14 ✓	***Set/Adjust Counter Balance (Run Production)***		
E6	Align Die to Feed Line (Set-up Die)		
E9	***Install, Square & Clamp Die in Press (Set-up Die)***		
E16	Set Air Cushion (Set-up Die)		
E17	Set Manifold Pressure (Set-up Die) – Nitro or Hydro		
E15	Set Knockouts (Set-up Die)		
C3 ✓	***Program Tonnage Monitor to predetermined engineering specification (Safety)***		
F3	Position / Set Uncoiler, Magazine or Blank Stacker (Setup Press/Press Line)		
F9	Install/Set Transfer System or Devices (Setup Press/Press Line)		
F1	Install Conveyors/Stackers (Setup Press/Press Line)		
F13	Prepare/Position Part Cleaning Equipment (Set-up Press/Press Line)		
E10 ✓	***Connect In-Die Sensor (Set-up Die)(if applicable)***		

III. Stamping Press Set-up Operator: Advanced Work process Schedule (cont.)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
F10 ✓	**Install/Set/Adjust Hydraulic and/or Pneumatic Systems (if applicable)**		
F4 ***F7*** ✓ ***F5***	***Set/Adjust Straightener (Set-up Press/Press Line)*** ***Set/Adjust Leveler (Set-up Press/Press Line)(if applicable)*** ***Set/Adjust Material Speed & Feed (Setup Press/Press Line)***		
E11	Adjust Material Bridge (Set-up Die)		
F6 ✓	***Set Feed Length (Set-up Press/Press Line)***		
E14 ✓	***Set Pilot Release (Set-up Die)***		
C8	Test Vision System (Safety or Inspection)		
F14	Set/Position Packaging for Production (Setup Press/Press Line)		
A19 ✓	***Chart/Record SPC Data (Inspection)***		
G6	Respond to (Isolate the Cause of) Sensor Faults (Troubleshooting)		
G3 ✓	***Diagnose the Cause of a Short or Over Feed Condition (Troubleshooting)***		
G1	Determine the Cause of Double or Miss Hits (Troubleshooting)		
G4	Find Out Why Press Will Not Start (Troubleshooting)		
H4	Remove Die From Press & Stage/Prepare for Storage (Closeout Job)		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM

NIMS CERTIFIED STAMPING PRESS SET-UP OPERATOR SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED STAMPING PRESS SETUP OPERATOR COMPANY SPECIFIC COMPETENCIES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED STAMPING PRESS SET-UP OPERATOR
COMPANY SPECIFIC COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained* for the apprentice to attain each company specific competency.

1.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

2.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

3.

_____ _____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

4.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

5.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

6.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

7.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

8.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

9.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

10.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

11.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

12.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

13.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

14.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

15.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

16.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

17.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

18.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

19.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

20.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

21.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

22.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

23.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

24.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

25.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

26.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

27.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

28.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

NIMS CERTIFIED STAMPING PRES SET-UP OPERATOR
RELATED INSTRUCTION RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED STAMPING PRESS SETUP OPERATOR RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED STAMPING PRESS SET-UP OPERATOR CREDENTIALING RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Metalforming Level I	
2.	Parts Inspection & Quality Control	
3.	**One of the following 5 (as applicable)**	
4.	Operate with Single Hit Tooling II*	
5.	Operate with Compound Dies II*	
6.	Operate with Progressive Dies II*	
7.	Operate with Deep Draw Dies II*	
8.	Operate with Transfer Dies II*	
9.	**One of the following 5 (as applicable)**	
10.	Set-up with Single Hit Tooling III*	
11.	Set-up with Compound Dies III*	
12.	Set-up with Progressive Dies III*	
13.	Set-up with Transfer Dies III*	
14.	Set-up with Deep Draw Dies III*	
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED STAMPING PRESS SET-UP OPERATOR
JOB PERFORMANCE ASSESSMENT FORM

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED STAMPING PRESS SETUP OPERATOR JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified Stamping Press Set-up Operator**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified Stamping Press Set-up Operator**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

APPENDIX A.8

CORE COMPETENCY REQUIREMENTS
NIMS CERTIFIED MACHINE BUILDER

WORK PROCESS SCHEDULE
NIMS CERTIFIED MACHINE BUILDER
O*NET-SOC CODE: 51-2031.00 RAPIDS CODE: 0291CB

This Appendix is attached to and a part of these Standards for the above identified occupation.

1. TERM OF APPRENTICESHIP

The term of training for a NIMS Certified Machine Builder will include approximately four years of structured on-the-job learning (OJL), supplemented by the required hours of related instruction, that will lead to successful completion of the required Core Competencies and corresponding NIMS Credentials as stated in the Core Competency Requirements (Appendix A).

Full credit will be given for OJL evaluated as satisfactory and previous acquisition of the required competencies and corresponding NIMS Credentials.

This is a competency-based apprenticeship program and is not constrained by time. The term of apprenticeship will provide sufficient OJL to enable the apprentice to attain the required competencies for each registered occupation.

2. RATIO OF APPRENTICES TO JOURNEYWORKERS

Consistent with proper supervision, training, safety, and continuity of employment throughout the apprenticeship, the ratio of apprentices to journeyworkers will be one (1) apprentice to one (1) journeyworker. This ratio should provide the number of NIMS Certified Machine Builder necessary for the future needs of the metalworking industry.

3. APPRENTICE PROGRESSIVE WAGE SCHEDULE

Apprentices shall be paid a progressively increasing schedule of wages and fringe benefits based on a percentage of the current journeyworker wage rate.

FOUR-YEAR APPROXIMATE TERM:

PERFORMANCE REVIEW CYCLE	% of Journeyworker Wage and Fringe Benefits
Entry Level Performance Review	= 50% Journeyworker Wage Rate and Fringe Benefits
End of Probationary Period Review	= 60% Journeyworker Wage Rate and Fringe Benefits

First-Year Performance Review	= 70% Journeyworker Wage Rate and Fringe Benefits
Second-Year Performance Review	= 80% Journeyworker Wage Rate and Fringe Benefits
Third-Year Performance Review	= 90% Journeyworker Wage Rate and Fringe Benefits
Completion/Journeyworker Review	= 100% Journeyworker Wage Rate and Fringe Benefits

4. SCHEDULE OF WORK EXPERIENCE

The Core Competency Requirements will provide the focus for the OJL and Related Instruction requirements for the Standards for the NIMS Certified Machine Builder.

These Standards of Apprenticeship result from a deliberative process that included a national validation of the competencies and field testing through a national pilot effort. The goal of the National Institute for Metalworking Skills is to develop and implement apprenticeship programs that are aligned with industry defined Core Competencies, and company specific competencies that are used to tailor the apprenticeship program to each company's individual business needs.

The Sponsor may modify the company specific competencies to meet local needs prior to submitting these Standards to the appropriate Registration Agency for approval.

5. SCHEDULE OF RELATED INSTRUCTION

Apprenticeship Sponsors may utilize a wide range of Related Instruction resources and providers, including classroom and laboratory activities offered by the National Tooling and Machining Association, technical colleges, community colleges, career and technology centers, online training programs, correspondence programs, and company specific programs. It is not the intent of this project to change the delivery method of any Related Instruction program. The NIMS Certified Machinist Curriculum Guide is provided as a resource so that the Related Instruction program can be aligned with the Core Competencies and the corresponding NIMS Credentials.

See the attached Related Instruction Outline for details.

NIMS CERTIFIED MACHINE BUILDER CORE COMPETENCY REQUIREMENTS

NIMS CERTIFIED MACHINE BUILDER CORE COMPETENCIES		NIMS CREDENTIALS
1.	Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment	Measurement, Materials, and Safety Level I
2.	Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Process Control	
6.	Process Adjustment – Single Part Production	
7.	Participation in Processes Improvement	
8.	Manual Operations: Layout Manual	Job Planning, Benchwork, and Layout Level I
9.	Operations: Benchwork Sawing	
10.	Job Process Planning	
11.		
12.	Drilling Operations	Drill Press Skills Level I
13.	Turning Operations: Turning Between Centers	Turning Between Centers Level I
14.	Turning Operations: Turning Between Centers	Turning Between Centers Level II
15.	Turning Operations: Chucking	Chucking Level I
16.	Turning Operations: Chucking	Chucking Level II
17.	Milling: Square Up a Block	Milling Level I
18.	Manual Milling: Vertical and Horizontal	
19.	Manual Milling: Vertical and Horizontal	Milling Level II
20.	Surface Grinding, Grinding Wheel Safety	Grinding Level I
21.	Surface Grinding, Horizontal Spindle, Reciprocating Table	
22.	Surface Grinding, Horizontal Spindle, Reciprocating Table	Grinding Level II
23.	CNC Programming - Milling and / or CNC Programming - Turning	CNC Milling and / or CNC Turning Level I
24.	CNC: Write a Simple CNC Milling and / or CNC Turning Program and Review Tool Path	
25.	CNC: Operate a CNC Milling Machine and / or Operate a CNC Lathe	
26.	General Housekeeping & Maintenance	Included in all Machining Credentials
27.	Preventative Maintenance - Machine Tools	
28.	Tooling Maintenance	

NIMS CERTIFIED MACHINE BUILDER CORE COMPETENCY REQUIREMENTS

	NIMS CERTIFIED MACHINE BUILDER CORE COMPETENCIES	NIMS CREDENTIALS
29.	Job Process Planning (Machine Building Level II and Level III)	NIMS Credentialing Achievement Records Level II and Level III
30.	Job Planning - Layout (Machine Building Level II and Level III)	NIMS Credentialing Achievement Records Level II and Level III
31.	Parts Identification and Preparation	NIMS Credentialing Achievement Records Level II and Level III
32.	Preparation for Assembly – Level Base of Machine	NIMS Credentialing Achievement Records Level II
33.	Measure and Verify Bearing Surfaces	NIMS Credentialing Achievement Records Level II
34.	Surface Preparation	NIMS Credentialing Achievement Records Level II and Level III
35.	Bolt Hole Preparation	NIMS Credentialing Achievement Records Level II and Level III
36.	Install Bearings and Shafts to Housing	NIMS Credentialing Achievement Records Level II and Level III
37.	Select and Install Gears; Match, Align, Secure and Pin Mating Parts	NIMS Credentialing Achievement Records Level II and Level III
38.	Install Components for Fluids and Air	NIMS Credentialing Achievement Records Level II and Level III
39.	Install Mechanical Components on Machine	NIMS Credentialing Achievement Records Level II and Level III
40.	Install Drive Systems	NIMS Credentialing Achievement Records Level II and Level III
41.	Performance Test Sub-Assembly	NIMS Credentialing Achievement Records Level II and Level III
42.	Mount, Align, and Secure Sub-Assemblies	NIMS Credentialing Achievement Records Level II and Level III
43.	Set Machine Adjustments	NIMS Credentialing Achievement Records Level II and Level III
44.	Install Machine Guarding	NIMS Credentialing Achievement Records Level II and Level III
45.	Verify Machine Operation	NIMS Credentialing Achievement Records Level II and Level III
46.	Tear Down Machine for Shipment (if applicable)	NIMS Credentialing Achievement Records Level II and Level III

***NOTE: There is not a specific sequence to the implementation of the Core Competencies. The forty six Core Competencies and the fourteen NIMS Credentials, listed above, must be satisfactorily completed to meet the requirements of a NIMS Certified Machine Builder Apprentice Apprenticeship Program and earn a *Certificate of Completion of Apprenticeship*.**

WORK PROCESS SCHEDULE
RELATED INSTRUCTION OUTLINE
MACHINE BUILDER
O*NET-SOC CODE: 51-2031.00 RAPIDS CODE: 0291CB

NIMS CREDENTIAL: Level I Machining Skills, Measurement, Materials, & Safety

---

Core Competency

1. Identify and Demonstrate Use of Machine Safety and Personal Protective Equipment

NIMS DUTY & PERFORMANCE STANDARD

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with Occupational Safety and Health Administration (OSHA) requirements and guidelines. Document safety activities as required. Include appropriate personal protective equipment.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned duties.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Given instruction/demonstration and reading, and viewing assignments, the apprentice will:

a. Identify areas in plant that require hearing devices and safety glasses.

b. Identify proper clothing required on the job to include shoes, gloves, sleeve and pant length, jewelry items, hair length, and personal cleanliness.

c. The apprentice will demonstrate OSHA lifting techniques, proper air gun usage and identification and safe chip handling techniques.

d. The apprentice will identify all pinch points on primary and supportive machine tools and the proper placements of guards.

e. The apprentice will demonstrate both emergency and standard shut down of all required equipment.

f. The apprentice will demonstrate the proper use of hand tools to include hammer, wrenches, screwdrivers, punches and pliers.

Core Competency

2. Demonstrate Compliance with Lock-out and Tag-out Procedures and OSHA Requirements and Guidelines

NIMS DUTY & PERFORMANCE STANDARD

Duty: Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions and checklists based on OSHA requirements and guidelines, demonstrate safe workplace practices in material handling, machine operations, handling of tooling, and handling and application of coolants, cutting fluids and lubricants. Orally explain the actions taken which directly or indirectly bear upon safe practice in the execution of assigned responsibilities.

NOTE

Lock-out/tag-out and right-to-know will be accounted for in Industrial Safety and Environmental Protection. Material handling here means handling of shafts and overhead cranes, etc., and personal protection. The apprentice should recognize pinch points, cutting points, and control points.

Core Competency

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

NIMS DUTY & PERFORMANCE STANDARD

Duty: Handle and store hazardous materials as assigned while adhering to safe practices in accordance with OSHA and EPA requirements and guidelines. Document safety activities as required.

Performance Standard: Given written and verbal safety instructions detailing the handling and storage of hazardous materials in compliance with OSHA and EPA requirements and guidelines, demonstrate safe workplace practices in the identification, handling, and storage of hazardous materials.

Core Competency

4. Part Inspection

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop an inspection plan and inspect simple parts using precision tools and techniques. Prepare reports on the compliance of the parts.

Performance Standard: Given the necessary job process sheets for a part and verbal instructions, identify and select the required measuring instruments and conduct the required inspection procedure(s). Complete required written inspection report and make a decision to accept or reject component parts. Provide brief verbal explanation of inspection procedures, results, and decisions.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Verify calibrations and sizes of all measuring devices. Take measurements to an accuracy of 1/64 for fractions, .002 for decimals and ½ degree for angles. Read standard orthographic prints and understand types of lines, title block information, revision levels, abbreviations, symbols, and tolerances. Identify surface defects, burrs and any adverse conditions such as flat or torn threads, out of round conditions, eccentricity, etc.

Core Competency

5. Process Control

NIMS DUTY & PERFORMANCE STANDARD

Duty: Follow a sampling plan. Inspect the samples for the required data. Enter the data on appropriate charts. Graph the data. Respond to the warning conditions indicated by the process charts.

Performance Standard: Given the necessary job process sheets for a part, verbal instructions, and the necessary charts and inspection tools, inspect parts according to the sampling plan, collecting the data required for the process control chart. Working with the supplied control and warning limits, place the data, produce new data as needed, graph the data, and take the Stop or Go actions as indicated by the results of producing the process control chart. Provide brief verbal explanation regarding the decision taken.

Core Competency

6. Process Adjustment—Single Part Production

NIMS DUTY & PERFORMANCE STANDARD

Duty: Analyze the performance of a single-part production process. Formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustment and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement. Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a part having routine problems being processed, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Explain the corrective actions and the reasoning used to perform the diagnosis.

Core Competency

7. Participation in Process Improvement

NIMS DUTY & PERFORMANCE STANDARD

Duty: As a member of a process team, analyze the performance of a production process. With the team formulate process adjustments or improvements where appropriate. Where appropriate, notify supervision of the proposed adjustments and/or improvement. Where authorized, carry out the strategies for process adjustment and/or improvement.

Performance Standard: Given a process plan, part print, inspection process plan, verbal instructions, the necessary tools and equipment, and a routine production process having a problem(s), as a team member, analyze the problem(s), propose a remedy(ies), having been given authorization to implement the process improvement(s), carry it out. Carry out the cause and effect analysis by participating in the development of the appropriate Q.C. methodology with the team, i.e., fishbone diagram. Explain the Q.C. tool, the corrective actions and the reasoning connecting the root cause analysis to the remedial actions taken.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Measurement, Materials, and Safety*** credentialing exam are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing thread percentage, finish symbols, and allowances are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percent.

Industrial Safety: The apprentice must become familiar with Hazmat, MSDS, basic personal protective equipment (PPE), and machine tool safety. Apprentice assessment includes identification of a government body that regulates industrial safety – OSHA.

Maintenance: Apprentice assessment includes elementary knowledge of referencing and researching maintenance procedures, hand tool maintenance and safety, and simple tool maintenance.

Process Adjustment: The exam presents basic problems of machining processes such as tapping, threading, drilling, milling, reaming, and grinding in which a process adjustment functions as the corrective action. Apprentices must identify a basic goal of process improvement.

Quality Control Procedures: The exam will evaluate knowledge of basic concepts of SPC and sampling plans. Basic knowledge of inspection plans includes rationale, criteria for choosing the correct measuring instrument, and organization. The evaluation includes basic knowledge of inspection setups and measuring instruments.

NIMS CREDENTIAL: Level I Job Planning, Benchwork, and Layout

Core Competency

8. Manual Operations: Layout

NIMS DUTY & PERFORMANCE STANDARD

Duty: Layout the location of hole centers and surfaces within an accuracy of +/- .015 inch.

Performance Standard: Given a surface plate, surface gauge, lay out height gauge, combination set, scriber, layout ink, prick punch, ball peen hammer, process plan, and part print, lay out hole locations, radii, and surfaces matching the specifications.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

b. Given a part print, surface plate and all the required layout tools, the apprentice will select proper tools, and use correct procedure, to lay out a part including the location of hole centers and surfaces within the accuracy of +/- .015 inch.

9. Manual Operations: Benchwork

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using aluminum or mild steel, hand drill and hand tap holes. Use hand drills, hand taps, tap wrench, files, scrapers, and coated abrasives to deburr parts. Use arbor presses to perform press fits. Use bench vises and hand tools appropriately.

Performance Standard: Given a process plan, blueprint, and access to hand tools, produce a part with two holes prepared for hand tapping, a hole prepared (reamed) for the press fit of a bushing, and a stud for one of the tapped holes. Deburr the part, hand drill and hand tap the holes, press in the bushing, and install the stud.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge and understanding of blueprint reading, and understand orthographic projections in order to perform all machining tasks.

b. Given a part print, surface plate and all the required layout tools, the apprentice will select proper tools, and use correct procedure, to lay out a part including the location of hole centers and surfaces within the accuracy of +/- .015 inch.

c. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will select the correct tap drills to achieve a minimum of 75% thread in the required tapped holes, and the correct pre-drill hole for reaming operations to achieve tolerances specified on the part print.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds required to perform benchwork-machining operations.

e. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate dimensions required for a press fit, and use an arbor to perform press fit operations.

f. Given instruction/demonstration on the procedure used for hand filing, drilling, and reaming, the apprentice will perform filing, drilling, and reaming operations within the specified tolerances on the part print.

g. Given instruction/demonstration on the proper tap selection and the procedure used for hand tapping, the apprentice will perform tapping operations within the specified tolerances on the part print.

Core Competency

10. Sawing

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform sawing to a layout. Choose and mount appropriate blades; weld, break, and re-weld blades as necessary.

Performance Standards: Given a part with a finished layout and access to an appropriate bandsaw and blades, finish saw the part to the layout.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of band saw safety procedures, and the identification of band saw parts and their function.

b. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary work-holding devices on the band saw, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the band saw to perform the required sawing operations.

c. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will choose the correct blade for specific sawing operations, and calculate cutting speeds and apply these calculations while performing required sawing operations on the band saw.

d. Given instruction/demonstration, reading assignment, and the correct band saw blade material to perform a specific sawing operation, the apprentice will properly weld and mount the finished blade on the band saw.

e. Given a band saw, process plan, part print, part with finished layout, band saw blade, hand tools, band saw accessories, instruction and demonstration on the proper set-up, and procedures used for sawing, the apprentice will perform the sawing operations on the part according to the layout specified on the part print.

Core Competency

11. Job Process Planning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Develop a process plan for a part requiring milling, drilling, turning, or grinding. Fill out an operation sheet detailing the process plan and required speeds and feeds.

Performance Standard: Given a print detailing a part requiring milling, drilling, turning, and grinding, verbal instructions, and appropriate references, formulate a set of strategies to manufacture the part and fill out an operation sheet reflecting the chosen strategies including the required speeds and feeds.

Identify all major components and functions of the machine tools, and all major hand tools, measuring tools, tools and fixtures, and work materials. Provide the rationale for the speeds and feeds selected.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to choose the most appropriate location for the origin on the part, and establish a method for defining that location during set-up.

b. The apprentice will be able to select appropriate work holding devices for various work pieces.

c. The apprentice will be able to select appropriate tooling and tool holders for various operations and materials.

d. The apprentice will be able to calculate speeds and feeds for proper tool-life and surface finish.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Job Planning, Benchwork, and Layout*** credentialing exam are as follows:

Basic Mathematics: The exam will assess basic math knowledge from whole number computations and algebra to basic geometry. Application of formulas involving tapping, tapers, speeds and feeds, and threading will be evaluated.

Applying the *Machinery's Handbook*: The apprentice must be able to reference and apply information found in the handbook to solve application problems. Referencing limits, tolerance, and parameters of a material or process are essential skills.

Basic Measurement: The exam will test interpretation of basic measuring instruments, resolution, and applicability of basic measuring tools for given situations. Apprentices must demonstrate knowledge of the differences and similarities of semi-precision and precision measurement.

Basic Machining Theory: The apprentice must understand basic types of tooling materials, applications of tooling and processes for drilling, milling, and sawing, turning, and proper procedures using hand tools. A basic understanding of fits and allowances, as well as defining surface finish and machining operation/surface finish relationships, is expected.

Layout: The exam will evaluate an understanding of basic and precision layout equipment and procedures. The apprentice should have a basic knowledge of print reading and orthographic projection. Knowledge of the layout of linear, angular, and circular dimensions will be assessed.

NIMS CREDENTIAL: Level I Machining Skills, Drill Press Skills

---

Core Competency

12. Drilling Operations

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate machine tools to perform routine drilling operations.

Performance Standard: Given a semi-finished part, process plan, part print, and hand, precision, and cutting tools, as well as access to a drill press and its accessories, produce a part matching the process plan and the blueprint specifications. The part specified will be in the semi-finished state, having been squared up and the outer surfaces completed with five center-drilled locations. Finishing the part will require the finishing of the five center-drilled locations. Each hole must have at least two secondary operations. The secondary operations will consist of reaming, spot facing, countersinking, counterboring, and counterdrilling. At least one hole must be a blind hole and one a through hole. At least one hole will be power tapped.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of drill press safety procedures, and the identification of drill press, and radial drill press parts and their function.

b. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary work-holding devices on the drill press, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the drill press to perform the required drill press operations.

c. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary tool-holding devices on the drill press, the apprentice will select, mount, set-up, and align tool-holding devices on the drill press to perform the required drill press operations.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required machining operations on the drill press.

e. Given a drill press, process plan, part print, semi-finished part, cutting tools, hand tools, drill press accessories, and instruction/demonstration on the proper set-up and procedures used for drilling, tapping, reaming, spot facing, countersinking, and counterboring, the apprentice will perform these secondary operations on the semi-finished part to within the tolerances specified on the part print.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Level I Machining Skills, Drill Press Skills*** credentialing exam are as follows:

Drill Press Components: Proper operation of a drill press depends on knowledge of drill press components and their functions. Identification of the spindle, base, table, column, variable speed control and feed handle are essential for safe and effective use of this machine tool. Other essential components are the table lock, column lock, motor, and base.

Process Involvement: An important part of any process improvement is an understanding of the symptoms and causes of some common problems associated with drilling operations. Understanding root causes of drill breakage, excessive wear, enlarged diameters, and excessive RPM enable the apprentice to analyze the process and make the correct improvement.

Twist Drill Nomenclature and Sizing: Each twist drill is comprised of many separate features. Identifying the web and understanding web thickness enables the apprentice to recognize the effects of excessive web thickness. Knowing the purpose and location of the margin facilitates proper drill diameter measurement as well as the effect of worn margin near the point of the drill. All general-purpose drills have the same identical point angle. The included point angle of a drill will vary dependent on the application and the material being machined.

Safety Practices: Proper safety procedures insure safe and productive machining. Safety includes safe lifting procedures, hair containment, jewelry removal, and loose clothing containment. Drill press safety includes the proper location of the vise, storage of the chuck key, and chip removal. Safety awareness should be apparent at all times through the correct application of speeds and feeds.

Countersinking: Counterboring, Spotfacing, and Center Drilling: Spotfacing, countersinking, and counterboring are drilling procedures used to seat screws and bolts with special head configurations or to seat a fastener or washer evenly on a rough surface. Center drilling is an important procedure for accurate hole location as well as shaft preparation for turning between centers. The specific drilling operations have speeds and feeds that are proportionally slower than drilling with general-purpose twist drills.

Layout and Inspection: Choosing the correct measuring instrument is primarily dependent on the tolerance range of the specific dimension. Proper set-up and correct measuring procedures for each measuring device are critical. The apprentice must also know when and where to apply semi-precision and precision layout. Selection and application of proper layout tools and setups are essential in any machining operation.

Tapping: The drill diameter used to create a hole for internal threading will dictate the thread percentage or amount of engagement between two mating threaded components. Most tap drill charts for conventional thread forms are based on 70% – 75% engagement. Pipe taps used for some pneumatic and fluid connects have tap drills based on other parameters. With the proper equipment, tapping can be performed under power if the drill press is capable of reversing the rotation.

Work Holding: The work piece must be held securely to prevent part pullout from the work holding device. The equipment used for work holding parts is dependent upon the shape and size of the part being drilled. Proper location of the vise may prevent the vise from whipping around if the drill gets jammed in the part. Proper selection of work holding devices is critical for safe and accurate application of a drill press.

NIMS CREDENTIALS: Levels I and II Machining Skills, Turning Operations, Turning Between Centers

---

Core Competency

13. Turning Operations: Turning Between Centers, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and carry out between centers turning operations for straight turning. Performance Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.002 inch, one UNC external thread, one UNF external thread, and require an end-for-end swap.

Core Competency

14. Turning Operations: Turning Between Centers, Level II Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform between centers turning for straight and tapered turning by offsetting the tailstock.

Performance Standard: Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least two straight diameters within +/-.001 inch, an appropriate taper at each end of the part, and requires an end-for-end reversal of the part.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b. Given instruction/demonstration by a qualified individual on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection, necessary to perform all required turning operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required various turning operations on the engine lathe.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f. Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g. Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, and grooving operations within the specified tolerances on the part print.

h. Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i. Given instruction/demonstration on the proper set-up procedure used for knurling on the engine lathe, the apprentice will set-up the machine and perform knurling operations within the tolerances specified on the part print.

j. Given instruction/demonstration on Unified National Thread nomenclature, formulas and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external U.N. thread within the tolerances specified on the part print.

k. Given a blueprint, instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting internal and external tapers on the engine lathe, the apprentice will cut a taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Turning Operations: Turning Between Centers, Level I Machining Skills*** **and** ***Turning Operations: Turning Between Centers, Level II Machining*** *Skills* credentialing exams are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center run out, properly turning hard material, and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to operate a lathe safely and effectively. Proper lifting techniques, learning how to find MSDS and HMIS information, and some basic personal first-aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is critical to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever, and the proper method to change speeds and feeds is also critical knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead, and different families of thread forms. Proper alignment of the threading tool, as well as the proper location of the compound, rest are essential set-up steps needed to turn threads with a single point tool. An apprentice must be able to calculate the proper infeed to prevent the thread from either being too deep or too shallow.

Tapping, Fits, and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: The best choice depends on the accuracy and reliability of the measuring instrument. Tolerance as well as the application will also be important factors. An apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer, and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is knowing when the part is accepted or rejected. Basic knowledge of process control techniques such as inspection sheets, Pareto charts, capability studies, and X bar/R charts are an effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit, and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree of accuracy of each method depends on the tolerance of the work piece dimensions. Proper setups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi-precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

Core Competency

15. Turning Operations: Chucking: Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARDS

Duty: Set-up and carry out chucking operations for turning.

Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate turning machine and its accessories, produce a part matching the process plan and the print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least three diameters within +/-.005 inch, two bores within +/-.005 inch, one UNC external thread, and requires at least two chuckings or other workholding set-up.

Core Competency

16. Turning Operations: Chucking: Level II Machining Skills

NIMS DUTY & PERFORMANCE STANDARDS

Duty: Set-up and perform tapered boring and turning using a taper attachment.

Standard: Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate turning machine with a taper attachment and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified should have at least two diameters within +/-.002 inch, one bore within +/-.002 inch, one external and one internal taper, and requires at least two chuckings or other workholding set-up.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of engine lathe safety procedures, and the identification of engine lathe parts and their function.

b. Given instruction/demonstration on cutting tool geometry and the proper procedure used for grinding lathe tool bits on the off-hand grinder by a qualified individual, the apprentice will perform grinding operations and produce all the required tool bits necessary to perform all required turning and boring operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required turning and boring operations within the specified tolerances on a part print.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing various required turning operations on the engine lathe.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for the four specified work-holding devices (3-jaw chuck, 4-jaw chuck, face plate and dog, and draw-in collet chuck), the apprentice will select, mount, set-up, hold, and align work using work holding devices on the engine lathe to perform the required turning operations.

f. Given instruction/demonstration on the proper set-up and procedures used for drilling and center drilling on the engine lathe, the apprentice will perform drilling and center drilling operations within the tolerances specified on a part print.

g. Given instruction/demonstration on the proper procedure used for turning, facing, necking, and grooving operations on the engine lathe, the apprentice will perform turning, facing, necking, boring, and grooving operations within the specified tolerances on the part print.

h. Given instruction/demonstration on the proper procedure used for performing shouldering operations on the engine lathe, the apprentice will perform square, angular, and filleted shouldering operations within the tolerances specified on a part print.

i. Given instruction/demonstration on Unified National Thread nomenclature, formulas, and the proper set-up procedure used for cutting threads on the engine lathe, the apprentice will cut an external and internal U.N. thread within the tolerances specified on the part print.

j. Given a blueprint, instruction/demonstration on taper calculations, and the proper set-up procedure used for cutting tapers on the engine lathe, the apprentice will cut an external and internal taper on the engine lathe using the tailstock set-over method, compound rest, and a taper attachment to within the tolerances specified on a part print.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Turning Operations: Chucking, Level I Machining Skills*** **and** ***Turning Operations: Chucking, Level II Machining Skills*** credentialing exams are as follows:

Process Improvement and Troubleshooting: To improve a process, one must first understand the process. A competent apprentice should be able to identify the root cause if a straight cut between centers measures as a taper. Measuring a taper (when a straight cut is intended) and moving the tailstock the proper amount based on the measurement is another skill needed to effectively and efficiently engage in turning operations. Other skill sets include the proper way to take the first cut on cast iron and hot roll steel, the root cause of lathe center run out, properly turning hard material, and the effect of having the lathe tool above or below center.

Turning Safety: Safety knowledge and practice is an important component for lathe operations. The apprentice must know the basic personal protective equipment needed to effectively operate a lathe safely. Proper lifting techniques, learning how to find MSDS and HMIS information, and some basic personal first- aid are essential knowledge for all apprentices. Other safety components involve the safe installation of chucks and collets as well as chip control and chip removal.

Lathe Controls: An understanding of basic lathe control mechanisms enables the apprentice to utilize the lathe in an efficient and productive manner. Knowing how each control works and its function is imperative to any safe turning operation. Knowing how to use the feed reverse lever, half nut lever, and the proper method to change speeds and feeds is imperative knowledge. Each manufacturer of lathes has unique methods of implementing lathe controls. It is the job of the apprentice to become familiar with each particular set of lathe controls.

Single Point Threading: Single point threading is one of the fundamental skill sets needed to operate a lathe. The apprentice must be familiar with thread angles, helix angles, thread pitch diameter, lead, and different families of thread forms. Proper alignments of the threading tool as well as the proper location of the compound rest are essential set-up steps needed to turn threads with a single point tool. An apprentice must be able to calculate the proper infeed to prevent the thread from either being cut too deep or too shallow.

Tapping, Fits and Allowances: The turning process is often used to size shafts and holes for certain fits. Knowledge of the definitions of a fit and an allowance is essential prior to machining. The apprentice should have a basic knowledge of the types of fits and be able to reference the *Machinery's Handbook* to determine the size of each component. Planning the sequence of operations is essential to prevent ruining a fit due to burrs and poor surface finish.

Measurement: Choosing the proper measuring instrument is an important facet of proper inspection. The best choice is dependent on the accuracy and reliability of the measuring instrument. The tolerance as well as the application will determine the choice. An apprentice must also know how to read the measuring instrument properly. An example would be comparing a depth micrometer, outside micrometer, and a dial indicator. Thread measurement and surface finish are also important factors when measuring features produced by the turning process.

Process Control: Monitoring the process with process control techniques results in quality parts and customer satisfaction. The first step in any process control endeavor is knowing when the part is accepted or rejected. Basic knowledge of process control techniques, such as inspection sheets, Pareto charts, capability studies and X bar/R charts are an effective means of process control. The most common method of process control, besides the inspection sheet, is SPC (statistical process control) utilizing the X bar/R chart. The apprentice must understand the definition of range, mean, upper control limit, lower control limit, and sample size.

Tooling and Lathe Set-up: Many lathe applications use tooling with carbide inserts. However, some lathe applications use high-speed steel tools that must be ground to the desired shape. The apprentice should know the proper sequence for grinding the surfaces of the lathe tool by applying the proper rake angles. Knowledge of the various methods of aligning the lathe centers and the degree of accuracy of each method depends on the tolerance of the workpiece dimensions. Proper setups for facing and compound rest fundamentals are other essential skill sets included in this area.

Layout Procedures: Layout is the initial step in any machining process. Understanding the concepts and proper utilization of semi-precision and precision layout techniques is important for every apprentice. The apprentice should know the function of a scriber and the types of layout instruments used with surface plates.

NIMS CREDENTIAL: Level I Machining Skills, Milling: Square Up a Block

---

Core Competency

17. Milling: Square up a Block

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and perform squaring up the six surfaces of a block to within +/-.002 inch and .002 inch over 4.5 inches squareness.

Performance Standard: Given raw material, process plan, part print, and hand, precision and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part will require squaring up from its raw state.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, as well as the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required milling operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

Related Instruction

The knowledge and skills the apprentice will need to pass **Milling*: Square up a Block, Level I Machining Skills*** credentialing exam are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and to apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds, and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction and decimal conversion, addition and subtraction of decimals, and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the apprentice to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions, and basic machine adjustments.

Threads and Tapping: Specific areas of knowledge include an understanding of tap drill charts and thread percentage, tapping lubricants, tap drills for pipe threads, and taps used for specific operations. The apprentice must be able to troubleshoot basic tapping and threading problems.

Safety Practices: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Milling Operations Set-up: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance include centering various details or shapes and the proper procedure for utilizing center-finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included within milling operations set-up.

NIMS CREDENTIALS: Levels I and II Machining Skills, Manual Milling Skills

---

Core Competency

18. Manual Milling: Vertical and Horizontal, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Vertical Milling

Set-up and operate vertical milling machines. Perform routine milling, and location of hole centers within +/-.005 inch.

Performance Standard: Vertical Milling

Given raw material, process plan, print, and hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch, and have three steps controlled by tolerances of +/-.005 inch.

Core Competency

19. Manual Milling: Vertical and Horizontal, Level II Machining Skills

NIMS DUTIES & PERFORMANCE STANDARDS

Duty: Vertical Mill - Precision Location of Holes

Set-up and perform boring for location, size, and finish.

Performance Standard: Vertical Mill - Precision Location of Holes
Produce three bores to specification. The holes will be between ¾ inch and 1-1/2 inches and their locations are to be held within +/-.001 inch and hold diameters within +/-.005 inch. One hole is to be counterbored to a decimal depth holding within +/-.002 inch and counterbore diameter within +/-.005 inch.

Duty: Milling Keyseats

Set-up and perform milling keyseats on a shaft.

Performance Standard: Milling Keyseats

Given raw material, process plan, part print, hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified will require milling two keyseats whose characteristics match the ANSI B17.1 keys and keyseat standards.

Duty: Milling - Cut a Deep Slot

Set-up and perform the cutting of a deep slot.

Performance Standard: Milling - Cut a Deep Slot

Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part specified will require the milling of three deep slots-two parallel to one another, the third at right angles to the first two.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of milling machine safety procedures, and the identification of milling machine parts and their function.

b. Given instruction/demonstration on cutting tool geometry for High Speed Steel milling cutters, the apprentice will perform proper cutting tool selection necessary to perform all required milling operations within the specified tolerances on a part print.

c. Given instruction/demonstration on cutting tool geometry and inserted tooling, the apprentice will demonstrate the proper insert and tool holder selection necessary to perform all required milling operations within the specified tolerances on a blueprint.

d. Given instruction/demonstration, reading assignment, information sheets, and reference charts, the apprentice will calculate cutting speeds and feeds and apply these calculations while performing required milling, drilling, and boring operations on the milling machine.

e. Given instruction/demonstration on the proper selection, mounting, set-up, usage procedure for work-holding devices, and an understanding of climb and conventional milling, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the milling machine to perform the required milling and squaring operations.

f. Given required hand and precision tools, instruction/demonstration on the proper set-up and procedures used to perform tramming operations on the vertical milling machine, and the process used to indicate a vise, the apprentice will adjust the milling machine head perpendicular to the table within +/- .001 inch, and indicate a vise maintaining parallelism and perpendicularity measurement of .002 inch over 4.5 inches.

g. Given instruction/demonstration on the proper set-up and procedures used to perform the squaring up operation, the apprentice will square up six primary surfaces of a raw cut block within the tolerance of ± .002 inch maintaining parallelism and perpendicularity measurement with a TIR of .002 inch over 4.5 inches.

h. Given raw material, process plan, print, and hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the process plan and the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within +/- .005 inch, and have three steps controlled by tolerances of +/-.005 inch.

j. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce three bores to specification. The holes will be between ¾ inch and 1-1/2 inches and their locations are to be held within +/- .001 inch and diameters within +/-.005 inch. One hole is to be counterbored to a decimal depth holding within +/-.002 inch and counterbore diameter within +/-.005 inch.

k. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications using appropriate trade techniques and speeds and feeds. The part specified would require milling two keyseats whose characteristics match the ANSI B17.1 keys and keyseat standards.

l. Given raw material, process plan, part print, and hand, precision, and cutting tools, as well as access to an appropriate milling machine and its accessories, produce a part matching the process plan and the part print specifications. The part specified will require the milling of three deep slots- two parallel to one another, the third at right angles to the first two.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Manual Milling: Vertical and Horizontal, Level I Machining Skills*** **and** ***Manual Milling: Vertical and Horizontal, Level II Machining Skills*** credentialing exams are as follows:

Applying the *Machinery's Handbook*: The apprentice must be able to reference and to apply information found in the handbook to solve applied problems. Referencing thread percentage, tap drill diameters, speeds, feeds and cutting tool parameters are some of the skills required.

Basic Mathematics: The exam will assess basic math knowledge of fraction/decimal conversion, addition and subtraction of decimals, and an understanding of percentage. Processing basic formulas to solve for the given known or another part of the formula is an additional skill required for this module.

Vertical Milling Machine Components: The exam presents questions asking the apprentice to identify components of vertical milling machines. Apprentices must be able to identify essential components, their functions and basic machine adjustments.

Threads and Tapping: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Safety Practices: Areas of knowledge include knowledge of basic safety, cutting tool safety, and basic machine maintenance and housekeeping. Apprentices must know some elementary first-aid procedures they can perform on themselves.

Milling Operations Set-up: The apprentice must know the procedure for adjusting the mill head to be perpendicular to the table (tramming). Other areas of importance include centering various details or shapes and the proper procedure for utilizing center-finding tools. The importance of layout lines and machining to the lines as well as the application of the sine bar are included within milling operations set-up.

Core Competency

20. Surface Grinding: Grinding Wheel Safety, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Ring test grinding wheels, perform visual safety inspection, mount and dress a grinding wheel in preparation for surface grinding.

Performance Standard: Given a selection of wheels in various conditions, determine which are suitable for use, mount one on the spindle, and dress it in preparations for surface grinding. Include the understanding of the grinding wheel code.

PERFORMANCE STANDARD: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments on grinding wheel selection and the standard wheel marking system, the apprentice will determine the proper wheel selection to perform all grinding tasks from information obtained from the part print and process plan.

b. Given instruction/demonstration and reading assignments, the apprentice will demonstrate the proper procedure used for visual safety inspection of the grinding wheel, and perform a ring testing to determine the wheel's soundness prior to mounting.

c. Given instruction/demonstration and reading assignments, the apprentice will demonstrate the proper procedure used for balancing (where applicable), mounting, and dressing the grinding wheel on the surface grinder to perform required grinding operations.

Related Instruction

The knowledge and skills the apprentice will need concerning **Grinding Wheel Safety to pass the *Level I Machining Skills Surface Grinding*** credentialing exam are as follows:

Grinding Safety: Basic shop practices should be applied in grinding operations. Proper housekeeping and cleanup procedures are critical in safe grinding applications. Proper dress and lifting techniques are also important. Grinding wheel safety is the first step in any grinding procedure. The grinding wheel should be checked for cracks and fractures. Proper installation and wheel dressing are also important factors.

Measurement: Grinding is often considered a finishing operation after milling or rough turning. Grinding operations are usually applied in situations where high accuracy is desired. The apprentice must be able to read a micrometer or vernier micrometer (capable of measuring to .001 inches). Proper application of dial indicators and height gauges is important in measuring ground surfaces of different heights. Comprehension of surface finish specifications and measuring tool selection are essential inspection skills necessary to ensure quality.

Grinding Wheel Dressing: In order to achieve satisfactory surface finishes and to safely use a grinding wheel, the apprentice must understand and apply proper grinding wheel dressing techniques. Knowledge of the types of grinding wheels that can and cannot be dressed with a diamond dresser is essential for safe machining. Understanding the process of wheel trueing and wheel dressing and the effects of a poorly dressed grinding wheel provide the apprentice with basic troubleshooting knowledge for assessing the root cause of some grinding problems.

Types of Abrasives: Proper identification and application knowledge of the types of abrasives used in grinding operations provides an apprentice with the proper foundation for determining which type of abrasive is the most effective for a given grinding application. The apprentice should know the most common grinding abrasive as well as the hardest natural abrasive.

Pedestal Grinders: The pedestal grinder is a free-standing grinding machine used for among other applications, roughing, snagging castings, and sharpening high-speed lathe tool bits. Guard location and wheel dressing techniques differ for a pedestal grinder when compared to a surface grinder. The type of grinding wheel installed on the pedestal grinder is dependent on the application and the type of material being ground.

Work Holding: Proper work holding and piece part set-up is important in any grinding operation. The apprentice must know how to hold both ferrous and non-ferrous materials. The set-up for grinding angles and radii must be solid and accurate. The apprentice must know the purpose, theory and proper set-up of magnetic parallels when grinding ferrous materials.

Grinding Machine Components: To intelligently discuss grinding problems, grinding machine problems and setups, the apprentice must be familiar with the names of the grinding machine components. The spindle nut on the grinder must be turned in the correct direction to either install or remove the grinding wheel from the spindle. Most machines will have a left-handed thread to self-tighten from the inertia of the grinding wheel. However, some older machines have the nut tighten by rotating in the same direction as the wheel.

Grinding Carbide and Carbide Tooling: Carbide can be ground by two types of grinding wheel material. The best abrasive for machining carbide is diamond. However, due to expense, some carbide grinding applications will use a green silicon carbide wheel. The silicon carbide wheel is inferior to diamond. Diamond wheels, if properly trued and dressed, will yield surface finishes that surpass surface finishes produced by silicon carbide grinding wheels.

Core Competency

21. Surface Grinding: Horizontal Spindle, Reciprocating Table, Level I Machining Skills

NIMS DUTY & PERFORMANCE STANDARD

Duty: Set-up and operate manual surface grinders. Perform routine surface grinding, location of surfaces, and squaring of surfaces. Perform wheel dressing.

Performance Standard: Given a block squared up on a mill, a process plan, part print, hand and precision tools, and choice of a grinding wheel, as well as access to a surface grinder and its accessories, dress the wheel, produce a part matching the process plan and the part print specifications using appropriate trade techniques. The part specified will be in the semi-finished state having been squared up. Finishing the part will require the precision finishing of the six faces of the block to tolerances common to precision grinding for squareness, size, and surface finish characteristics.

Core Competency

22. Surface Grinding: Horizontal Spindle, Reciprocating Table, Level II Machining Skills

NIMS DUTIES & PERFORMANCE STANDARDS

Duty: Finish Flats to +/-.005

Grind a block's six faces to finished dimensions having tolerances of +/-.005 inch and squareness of .0005 inch over 4 inches, and 32 micro inch surface finish. Dress the wheel as necessary.

Performance Standard: Finish Flats to +/-.005

Given a block squared up on a mill, hardened to 55 to 60 Rc, a process plan, part print, hand and precision tools, and choice of grinding wheels, as well as access to a surface grinder and its accessories, dress the wheel, produce a part matching the process plan and the part print specifications using appropriate trade techniques. The part specified will be in the semi-finished state having been squared up. Finishing the part will require the precision finishing of the six faces of the block to tolerances common to precision grinding for squareness, size, and surface finish characteristics.

Duty: Finish Flats at Simple Angles and Grind Contour Radii.

Set-up and perform the finish surface grinding of flat surfaces at simple angles with respect to one another. Dress the wheel as necessary.

Performance Standard: Finish Flats at Simple Angles and Grind Contour Radii. Given a block roughed out on a mill, a process plan, part print, hand and precision tools, and choice of grinding wheels, as well as access to a surface grinder and its accessories, dress the wheel, grind the specified radii and angled surfaces to a

finish matching the process plan and the part print specifications using appropriate trade techniques. The part specified will be in the semi-finished state having been roughed out. Finishing the part will require the precision finishing of the specified surfaces of the block to tolerances common to precision grinding for squareness, size, and surface finish characteristics.

Duty: Grinding Wheel Preparation and Balancing.

Set-up and perform the preparation and balancing of a grinding wheel 14 inches diameter or greater. Place the wheel into service.

Performance Standard: Grinding Wheel Preparation and Balancing

Given a wheel and appropriate equipment, prepare the wheel to go into service. Mount the wheel. Produce a surface finish of 32 micro-inches or better on a cylinder or flat surface of CRS.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. Given instruction/demonstration and reading assignments on grinding wheel selection and the standard wheel marking system, the apprentice will determine the proper wheel selection to perform all grinding tasks from information obtained from the part print and process plan.

b. Given instruction/demonstration and reading assignments the apprentice will demonstrate the proper procedure used for visual safety inspection of the grinding wheel, and perform a ring testing to determine the wheels soundness prior to mounting.

c. Given instruction/demonstration and reading assignments, the apprentice will demonstrate the proper procedure used for balancing a wheel (14 inches or greater), mounting, and dressing the grinding wheel on the surface grinder to perform required grinding operations.

d. Given instruction/demonstration and reading assignments, the apprentice will demonstrate knowledge of surface grinder safety procedures, and the identification of surface grinder parts, and their function.

e. Given instruction/demonstration on the proper selection, mounting, set-up, and usage procedure for necessary work-holding devices on the surface grinder, the apprentice will select, mount, set-up, hold, and align work using work holding devices on the surface grinder to perform the required grinding operations.

f. Given instruction/demonstration, a block squared up on a mill hardened to 55 to 60 Rc, a process plan, part print, precision tools, choice of grinding wheels, and access to a surface grinder and its accessories, choose the appropriate wheel, dress a wheel, and produce a part matching the process plan and the part print specifications using the appropriate techniques. Grind a block's six faces to finished dimensions having a tolerance of ± .005 inches and perpendicularity TIR of .005 inches over 4 inches holding a surface finish of 32 micro inches or better.

g. Given instruction/demonstration a block squared up on a surface grinder, a process plan, part print, precision measuring tools, a choice of grinding wheels, and access to a surface grinder and its accessories, set a radius dresser, dress the wheel, grind the specified radii, angled surfaces, and slot to a finish matching the process plan and print specifications using appropriate grinding techniques. Use the appropriate work holding devices to grind all surfaces, angles and contours.

h. Given instruction/demonstration, the apprentice will dress and grind an internal or external radius tangent to an angle other than 90° or 0° holding tolerances correlated to the NIMS credentialing print for Machining – Level II Surface Grinding.

Related Instruction

The knowledge and skills the apprentice will need to pass the ***Surface Grinding: Horizontal Spindle, Reciprocating Table, Level I and Level II Machining Skills*** credentialing exams are as follows:

Grinding Safety: Basic shop practices should be applied in grinding operations. Proper housekeeping and cleanup procedures are imperative in safe grinding applications. Proper dress and lifting techniques are also important. Grinding wheel safety is the first step in any grinding procedure. The grinding wheel should be checked for cracks and fractures. Proper installation and wheel dressing are also important factors.

Measurement: Grinding is often considered a finishing operation after milling or rough turning. Grinding operations are usually applied in situations where high accuracy is desired. The apprentice must be able to read a micrometer or vernier micrometer (capable of measuring to .001 inches). Proper application of dial indicators and height gauges is important in measuring ground surfaces of different heights. Comprehension of surface finish specifications and measuring tool selection are essential inspection skills necessary to ensure quality.

Grinding Wheel Dressing: In order to achieve satisfactory surface finishes and to safely use a grinding wheel, the apprentice must understand and apply proper grinding wheel dressing techniques. Knowledge of the types of grinding wheels that can and cannot be dressed with a diamond dresser is essential for safe machining. Understanding the processes of wheel trueing and wheel dressing, as well as the effects of a poorly dressed grinding wheel, provides the apprentice with basic troubleshooting knowledge for assessing the root cause of some grinding problems.

Types of Abrasives: Proper identification and application knowledge of the types of abrasives used in grinding operations provides an apprentice with the proper foundation for determining which type of abrasive is the most effective for a given grinding application. The apprentice should know the most common grinding abrasive as well as the hardest natural abrasive.

Pedestal Grinder: The pedestal grinder is a free-standing grinding machine used for among other applications, roughing, snagging castings and sharpening high- speed lathe tool bits. Guard location and wheel dressing techniques differ for a pedestal grinder when compared to a surface grinder. The type of grinding wheel installed on the pedestal grinder is dependent on the application and the type of material being ground.

Work Holding: Proper work holding and piece part set-up is important in any grinding operation. The apprentice must know how to hold both ferrous and non-ferrous materials. The set-up for grinding angles and radii must be solid and accurate. The apprentice must know the purpose, theory and proper set-up of magnetic parallels when grinding ferrous materials.

Grinding Machine Components: To intelligently discuss grinding problems, grinding machine problems, and setups, the apprentice must be familiar with the names of the grinding machine components. The spindle nut on the grinder must be turned in the correct direction to either install or remove the grinding wheel from the spindle. Most machines will have a left-handed thread to self-tighten from the inertia of the grinding wheel. However, some older machines have the nut tighten by rotating in the same direction as the wheel.

Grinding Carbide and Carbide Tooling: Carbide can be ground by two types of grinding wheel material. The best abrasive for machining carbide is diamond. However, due to expense, some carbide grinding applications will use a green silicon carbide wheel. The silicon carbide wheel is inferior to diamond. Diamond wheels, if properly trued and dressed, will yield surface finishes that surpass those produced by silicon carbide grinding wheels.

NIMS CREDENTIAL: Level I CNC Milling and / or CNC Turning

Core Competency

23. CNC Programming – Milling

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates, develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison, apply the principles of three dimensional coordinate planes in the development of a simple program for the production of the part on a CNC milling machine.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector) and R (radium value) methods.

e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

CNC Programming - Turning

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using the principles of Cartesian coordinates develop a program for the manufacture of a simple part.

Performance Standard: Given a computer and a basic CNC software program, and a blueprint for part comparison: apply the principles of two-dimensional coordinate planes in the development of a simple program for the production of the part on a CNC lathe or CNC turning center.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.
b. The apprentice will be able to identify coordinates on a blue print with respect to an origin.
c. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.
d. The apprentice will be able to implement circular interpolation into a program to cut true arcs and circles, using I & J (arc vector) and R (radius value) methods.
e. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

24. CNC: Write a Simple CNC Milling Program and Review Tool Path

NIMS DUTY & PERFORMANCE STANDARD

Duty: Using a computer and editor software, write simple CNC programs using M and G codes from the *Machinery's Handbook*. Simple programs are single plane, cutter centerline, linear and circular interpolation, and single cutter, with no canned cycles as specified on the print.

Performance Standard: Given a part print with the tool path shown, and computer with editor software, write a program, including speeds and feeds, to drive an end mill through a continuous path around three sides of a part requiring the development of a linear interpolation tool path as well as circular interpolation. Store the program on computer media.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to implement linear interpolation into a program to cut straight lines between two points.

e. The apprentice will be able to implement circular interpolation into a program to cut straight lines between two points.

f. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

Core Competency

25. CNC: Operate a CNC Milling Machine

NIMS DUTY & PERFORMANCE STANDARD Duty: Operate a

CNC Milling Machine

Performance Standard: Given a CNC mill, create a qualified CNC program, set-up and operate the mill, change tool values as necessary, and replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

e. The apprentice will be able to install and qualify the required tooling for the program.

f. The apprentice will be able to mount, locate, and set the origin of the work piece on a CNC milling machine.

g. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC milling machine control.

h. The apprentice will be able to safely execute a program for its first run (debugging).

CNC: Operate a CNC Lathe

NIMS DUTY & PERFORMANCE STANDARD Duty:

Operate a CNC Lathe

Performance Standard: Given a CNC lathe create a qualified CNC program, set- up and operate the lathe, change tool values as necessary, and replace and qualify tooling as necessary.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

a. The apprentice will be able to describe the functions and use of basic G and M codes.

b. The apprentice will be able to identify coordinates on a blueprint with respect to an origin.

c. The apprentice will be able to calculate and implement speeds and feeds for proper tool life and surface finish.

d. The apprentice will be able to write a program using the appropriate format for a particular machine control, and work from a process plan to get guidance for sequences, steps, procedures, machining parameters, etc., that will be used.

e. The apprentice will be able to install and qualify the required tooling for the program.

f. The apprentice will be able to mount, locate, and set the origin of the work piece on a CNC lathe.

g. The apprentice will be able to load a program, create a CNC-link, or enter a program via control keyboard into a CNC lathe control.

h. The apprentice will be able to safely execute a program for its first run (debugging).

CORE COMPETENCIES ALIGNED WITH ALL MACHINING CREDENTIALS

Core Competency

26. General Housekeeping and Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Keep the duty station clean and safe for work. Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.

Performance Standard: Given maintenance, cleaning, and housekeeping checklists, as well as verbal instructions, clean, maintain, and respond appropriately to safety hazards on all benchwork tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Core Competency

27. Preventative Maintenance - Machine Tools

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the general condition of an assigned machine tool. Make routine adjustments as necessary and as authorized. Report problems to supervision which are beyond the scope of authority. Carry out daily, weekly, and/or monthly routine upkeep chores cited on checklists for a given machine tool.

Performance Standard: Given the preventive maintenance procedures and schedules for a given machine tool, as well as sufficient instruction and experience to recognize maintenance problems, carry out routine maintenance, report problems which are beyond the scope of authority, and fill out the history forms for tracking maintenance.

28. Tooling Maintenance

NIMS DUTY & PERFORMANCE STANDARD

Duty: Inspect and assess the condition of tooling. Refurbish tooling where appropriate. Refer tooling for repair or regrind where appropriate.

Performance Standard: Given samples of tooling in various conditions, diagnose the tooling and take the correct steps to put the tooling back in service. The sample tooling should include turning, milling, and drilling tools. These tools should be both insert tooling as well as conventional tooling. The apprentice must demonstrate the offhand grinding of a drill between the diameter of .125 inch and 1.000 inch. The offhand regrinding of a turning tool and the correct rotation and replacement of inserts in an insert style milling cutter body must be demonstrated. The apprentice must demonstrate the ability to recognize when a cutter should be referred to a tool and cutter grinder.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

General Housekeeping and Maintenance

Given maintenance, cleaning and housekeeping checklist as well as verbal instructions, clean, maintain and respond appropriately to safety hazards on all bench work tools and conventional and CNC machine tools. Maintain the cleanliness of the general work area.

Preventative Maintenance - Machine Tools

Given a specific machine tool, the learner will locate, check and fill all applicable lubrication reservoirs, check for proper oil pressure and check that all lubrication points are functioning properly. Check the general condition of the equipment and make routine adjustments as stated in the maintenance schedule.

Tooling Maintenance

a. Diagnose tooling in various conditions and take the correct steps to put the tooling back in service.

b. Perform cutter-sharpening operations.

c. Understand insert identification nomenclature and index or change inserts.

Core Competency

29. Job Process Planning (Machine Builder)

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given a set of specifications, follow the order of procedure and the order of the operations needed for the assembly of the machine to be built. Performance Standard: Demonstrate your comprehension of the process plan for the assembly of the equipment to be built.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Follow the order of procedure and order of operations for assembly.

Core Competency

30. Job Planning - Layout (Machine Building) NIMS

DUTY & PERFORMANCE STANDARD

Duty: Given a set of prints and specifications, visualize and lay out work area.

Performance Standard: Given a set of prints for the manufacture of a specified piece of equipment, determine the foot print of the machine and the size of the work area needed in order to assemble the machine.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Core Competency

31. Parts Identification and Preparation

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given a set of prints, identify all parts needed, determine availability for any special components or parts not inventoried, and report the need. Prepare parts for assembly.

Performance Standard: Identify all tolerances and dimensions and locate any special parts that may require special machining surface finishes, or special handling. Clean, de-burr and check measurements of all critical parts.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Identify all tolerances and dimensions and locate any special parts that may require special machining surface finishes or special handling. Clean, de-burr and check measurements of all critical parts.

Core Competency

32. Preparation for Assembly - Level Base of Machine

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given proper tools and a method of adjustment, level the base of the machine. Record results as required.

Performance Standard: Using precision levels and appropriate hand tools, adjust leveling screws or pads. Adjust anchor bolts or leveling screws to eliminate base twist or unevenness. Use leveling instruments to verify accuracy of all adjustments.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Using precision levels, shims, and appropriate hand tools, adjust leveling screws or pads. Adjust anchor bolts or leveling screws or shims to eliminate base twist or unevenness. Use leveling instruments to verify accuracy of all adjustments.

Level and adjust equipment to specification using leveling instruments.

Core Competency

33. Measure and Verify Bearing Surfaces

NIMS DUTY & PERFORMANCE STANDARD

Duty: Check all bearing surfaces for flatness and alignment. Document results as required and notify supervision about any surfaces in need of correction.

Performance Standard: Verify flatness and alignment of all bearing surfaces. Document results as required and notify supervision about any surfaces in need of correction.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Verify flatness and alignment of all bearing surfaces. Document results as required and notify supervision about any surfaces in need of correction.

Core Competency

34. Surface Preparation

NIMS DUTY & PERFORMANCE STANDARD

Duty: Clean and prepare all surfaces. File, hone, and stone to remove burrs, knicks, and scratches.

Performance Standard: File, stone, and hone to fit all mating surfaces. Record results as required.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

File, stone, and hone to fit all mating surfaces. Record results as required.

Core Competency

35. Bolt Hole Preparation

NIMS DUTY & PERFORMANCE STANDARD

Duty: Lay out and mark dowel and bolt hole positions. Drill, tap, or ream holes as needed.

Performance Standard: Given a job plan and blueprints, locate all dowel and bolt hole positions as specified. Drill, tap, or ream needed holes.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Given a job plan and blueprints, locate all dowel and bolt hole positions as specified. Drill, tap, or ream needed holes.

Core Competency

36. Install Bearings and Shafts to Housing

NIMS DUTY & PERFORMANCE STANDARD

Duty: Fit shafts to bearings, and bearings to bores in housing. Apply appropriate lubricants. Install bearings and shafts in housing. Check alignment of bearings and shafts. Set preload on bearings.

Performance Standard: Given a process plan, select the correct bearing to fit the bore. Check alignment. Apply specified lubricants and set specified pre-load on bearings.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Select bearings to fit the bore and shaft.
Check alignment.
Apply lubrication.
Set pre-load for bearings

Core Competency

37. Select and Install Gears; Match, Align, Secure and Pin Mating Parts

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given a process plan, select and install gears; match, align, secure, and pin mating parts using backlash spacers, or special fittings where needed.

Performance Standard: Determine the best method and properly install all sub-assembly gearing according to the process plan.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Apprentice will identify mounting locations for sub-assemblies.

Apprentice will identify the type of actuators required for a given application. Apprentice will install actuators according to prints, specifications, and job process plans.

Install sub-assembly gearing according to specifications, job process plan, and best practice.

Core Competency

38. Install Components for Fluids and Air

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given an assembly drawing, locate and install lubrication oil lines, hydraulic and pneumatic units and lines.

Performance Standard: Install oil lines, hydraulic and pneumatic units and lines, bending and flaring lines to fit ends. Check system for leaks.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Verify that all pinch points, cutting surfaces, and other safety hazards are guarded in a manner that prevents entry into the machine while it is operating.

Core Competency

39. Install Mechanical Components on Machine

NIMS DUTY & PERFORMANCE STANDARD
Duty: Install mechanical components such as slides, spindles, ball and lead screws on the machine base. Check alignment, fit, and backlash, as required.

Performance Standard: Verify alignment of components and apply proper torque as specified.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Verify alignment of components.

All backlash is adjusted and torque is applied according to specifications.

Core Competency

40. Install Drive Systems

NIMS DUTY & PERFORMANCE STANDARD

Duty: Align actuators and electric and hydraulic motors as called for in the assembly print.

Performance Standard: Align and verify that actuators, motors, and drive components are within the requirements of the job process plan.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Align and verify that all drive components are within specification and according to job process plan.

Understand the specification and operation of actuators (electric, hydraulic, and pneumatic).

Understand the specification and operation of electric motors.

Core Competency

41. Performance Test Sub-Assembly

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given the machine's operations manual and specifications, test sub- assembly operation.

Performance Standard: Given a test stand, check operation of the sub-assembly for heat build-up, vibration, growth, and oil (fluids) flow. Adjust for proper operation as called for in the performance specifications.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Check the operation of sub-assembly for heat build-up, vibration, growth and fluid flow.

Adjust sub-assembly for operation and conformance to performance specifications.

Core Competency

42. Mount, Align and Secure Sub-Assemblies

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given completed and tested sub-assemblies, mount them on the machine base.

Performance Standard: Align all assemblies to specifications for squareness and parallelism and secure for operation.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Check the operation of sub-assembly for heat build-up, vibration, growth and fluid flow.

Adjust sub-assembly for operation and conformance to performance specifications

Given a test stand, check operation of the sub-assembly for heat build-up, vibration, growth, and oil (fluids) flow. Adjust for proper operation as called for in the performance specifications.

Core Competency

43. Set Machine Adjustments

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given a completely assembled machine, adjust and verify hydraulic pressures and stroke, valves, electrical switches, actuators, and feedback systems are operating to performance requirements.

Performance Standard: Verify and adjust switches, valves and pressure limits, and all basic machine settings.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Read machine and sub-system specifications.

Adjust all hydraulic and electrical systems to specification.

Verify operation of all hydraulic and electrical systems for action and feedback.

Verify the operation of all hydraulic and electrical systems to performance requirements.

Core Competency

44. Install Machine Guarding

NIMS DUTY & PERFORMANCE STANDARD

Duty: Fit to size and install all guards and covers to assure operator protection. Install switches and other safety control devices to prevent operation with guards removed.

Performance Standard: Verify that all pinch points, cutting surfaces, and other safety hazards are guarded in a manner that prevents entry into the machine while it is operating.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Install guards for all pinch points, cutting surfaces, and other safety hazards.

Core Competency

45. Verify Machine Operation

NIMS DUTY & PERFORMANCE STANDARD

Duty: Given a completed machine, conduct a reliability run. Verify leveling, alignment, speed and repeatability, proper machine geometrics to minimize yaw, pitch and roll, and proper guarding and safety stops.

Performance Standard: Set-up machine for operation, confirm machine geometry, machine accuracy and repeatability, document performance tests, diagnose and correct any problems. Conduct a dry run and perform a cycle time test (run test) to machine specifications. Document any need for corrective action.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Diagnose correct problems and confirm machine geometry, accuracy and repeatability.

Run performance, cycle time, and dry-run tests.

Core Competency

46. Tear Down Machine for Shipment (if applicable) NIMS DUTY

& PERFORMANCE STANDARD

Duty: Given a completed machine, tear down machine for shipment.

Performance Standard: Tear down machine for shipment. Drain all fluids; lubricants, hydraulic oil, air, etc. Plug all piping. Clean and rust proof machine components and pack per company procedures. Utilize pick-up points per manufacturer's recommendations - if available. Check all safety control devices and verify documentation for safe and efficient operation of machine.

PERFORMANCE OBJECTIVES: (What an apprentice must know and/or do to perform the work competently).

Drain, dispose of, or store all fluids.
Plug piping.
Rustproof all machine parts per company procedures.
Use rigging techniques.
Check all safety control devices.

COMPETENCY ASSESSMENT FORM
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MACHINE BUILDER CORE

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Core Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED MACHINE BUILDER CORE COMPETENCIES

1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Process Control	
6.	Process Adjustment – Single Part Production	
7.	Participation in Processes Improvement	
8.	Manual Operations: Layout	
9.	Manual Operations: Benchwork	
10.	Sawing	
11.	Job Process Planning	
12.	Drilling Operations	
13.	Turning Operations: Turning Between Centers - Level I Machining Skills	
14.	Turning Operations: Turning Between Centers - Level II Machining Skills	
15.	Turning Operations: Chucking - Level I Machining Skills	
16.	Turning Operations: Chucking - Level II Machining Skills	
17.	Milling: Square Up a Block	
18.	Manual Milling: Vertical and Horizontal - Level I Machining Skills	
19.	Manual Milling: Vertical and Horizontal - Level II Machining Skills	
20.	Surface Grinding, Grinding Wheel Safety	
21.	Surface Grinding, Horizontal Spindle, Reciprocating Table - Level I Machining Skills	
22.	Surface Grinding, Horizontal Spindle, Reciprocating Table - Level II Machining Skills	
23.	CNC Programming - Milling and / or CNC Programming - Turning - Level I Machining Skills	
24.	CNC: Write a Simple CNC Milling and / or Turning Program and Review Tool Path - Level I Machining	
25.	CNC: Operate a CNC Milling Machine and / or CNC Lathe - Level I Machining Skills	
26.	General Housekeeping & Maintenance	
27.	Preventative Maintenance - Machine Tools	
28.	Tooling Maintenance	

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

CORE COMPETENCY ASSESSMENT FORM
NIMS COMPETENCY BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MACHINE BUILDER

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Core Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED MACHINE BUILDER CORE COMPETENCIES

29.	Job Process Planning	
30.	Job Planning--Layout	
31.	Parts Identification and Preparation	
32.	Preparation for Assembly--Level Base of Machine	
33.	Measure and Verify Bearing Surfaces	
34.	Surface Preparation	
35.	Bolt Hole Preparation	
36.	Install Bearings and Shafts to Housing	
37.	Select and Install Gears; Match, Align, Secure, and Pin Mating Parts	
38.	Install Components for Fluids and Air	
39.	Install Mechanical Components on Machine	
40.	Install Drive Systems	
41.	Performance Test Sub-Assembly	
42.	Mount, Align, and Secure Sub-Assemblies	
43.	Set Machine Adjustments	
44.	Install Machine Guarding	
45.	Verify Machine Operation	
46.	Tear Down Machine for Shipment (IF APPLICABLE)	
47.		
48.		
49.		
50.		
51.		
52.		
53.		
54.		
55.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

CORE COMPETENCY RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MACHINE BUILDER

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each NIMS Core Competency, the *Date the NIMS Core Competency was attained* for the apprentice to attain each NIMS Core Competency.

NIMS Certified– Machine Builder CORE COMPETENCIES

1. Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2. Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4. Part Inspection

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5. Process Control

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6. Process Adjustment – Single Part Production

   _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

7. Participation in Processes Improvement

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

8. Manual Operations: Layout

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

9. Manual Operations: Benchwork

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

10. Sawing

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

11. Job Process Planning

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

12. Drilling Operations

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

13. Turning Operations: Turning Between Centers - Level I Machining

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

14. Turning Operations: Turning Between Centers - Level I Machining

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

15. Turning Operations: Chucking - Level I Machining Skills

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

16. Turning Operations: Chucking - Level II Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

17. Milling: Square Up a Block - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

18. Manual Milling: Vertical and Horizontal - Level I Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

19. Manual Milling: Vertical and Horizontal - Level II Machining Skills

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

20. Surface Grinding, Grinding Wheel Safety

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

21. Surface Grinding, Horizontal Spindle, Reciprocating Table - Level I

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

22. Surface Grinding, Horizontal Spindle, Reciprocating Table - Level II

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

23. CNC Programming - CNC Milling and/or CNC Turning - Level I

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

24. CNC: Write a Simple CNC Program and Review Tool Path - Level I

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

25. CNC: Operate a CNC Milling Machine and/or CNC Lathe - Level I

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

26. General Housekeeping & Maintenance

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

27. Preventative Maintenance - Machine Tools

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

28. Tooling Maintenance

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

29. Job Process Planning (Machine Builder)

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

30. Job Planning--Layout

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

31. Parts Identification and Preparation

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

32. Preparation for Assembly--Level Base of Machine

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

33. Measure and Verify Bearing Surfaces

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

34. Surface Preparation

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

35. Bolt Hole Preparation

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

36. Install Bearings and Shafts to Housing

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

37. Select and Install Gears; Match, Align, Secure, and Pin Mating Parts

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

38. Install Components for Fluids and Air

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

39. Install Mechanical Components on Machine

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

40. Install Drive Systems

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

41. Performance Test Sub-Assembly

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

42. Mount, Align, and Secure Sub-Assemblies

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

43. Set Machine Adjustments

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

44. Install Machine Guarding

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

45. Verify Machine Operation

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

46. Tear Down Machine for Shipment (If Applicable)

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

47.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

48.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

49.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

50.

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
SPECIFIC COMPETENCY ASSESSMENT
NIMS CERTIFIED MACHINE BUILDER COMPANY

APPRENTICE: _____EMPLOYEE NUMBER: _____
SUPERVISOR: _____DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED MACHINE BUILDER COMPANY SPECIFIC COMPETENCIES

47.		
48.		
49.		
50.		
51.		
52.		
53.		
54.		
55.		
56.		
57.		
58.		
59.		
60.		
61.		
62.		
63.		
64.		
65.		
66.		
67.		
68.		
69.		
70.		

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY BASED APPRENTICESHIP SYSTEM
COMPANY SPECIFIC COMPETENCY RECORD
NIMS CERTIFIED MACHINE BUILDER

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained*, for the apprentice to attain each company specific competency.

47.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

48.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

49.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

50.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

51.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

52.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

53.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

54.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

55.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

56.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

57.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

58.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

59.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

60.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

61.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

62.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

63.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

64.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

65.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

66.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

67.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

68.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

69.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

70.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

71.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

72.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

73.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

74.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

75.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MACHINE BUILDER

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED MACHINE BUILDER RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM

CREDENTIALING RECORD
NIMS CERTIFIED MACHINE BUILDER

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials, and Safety - Level I Machining Skills	
2.	Job Planning, Benchwork, and Layout - Level I Machining Skills	
3.	Drill Press Skills - Level I Machining Skills	
4.	Turning Between Centers - Level I Machining Skills	
5.	Turning Between Centers - Level II Machining Skills	
6.	Turning Operations: Chucking - Level I Machining Skills	
7.	Turning Operations: Chucking - Level II Machining Skills	
8.	Milling - Level I Machining Skills	
9.	Milling - Level II Machining Skills	
10.	Grinding - Level I Machining Skills	
11.	Grinding - Level II Machining Skills	
12.	CNC Milling and / or CNC Turning - Level I Machining Skills	
13.	Machine Builder Credentialing Achievement Record Level II	
14.	Machine Builder Credentialing Achievement Record Level III	
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
15.		
16.		
17.		
18.		
19.		
20.		

COMMENTS: _____

_____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

JOB PERFORMANCE ASSESSMENT FORM
NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MACHINE BUILDER

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and the completion of all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machine Builder.

NIMS CERTIFIED MACHINE BUILDER JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE:_____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified Machine Builder**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified Machine Builder**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

Appendix A.9

Core Competency Requirements
NIMS Certified CNC Operator - Turning

I. CNC OPERATOR – TURNING: BASIC COMPETENCIES
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Core Competency Assessment: CNC Operator – Turning Basic Competencies

Task Code	Task	Date Completed	Supervisor Signature
A	*Inspect Materials & Parts*		
A1	Measure and Verify Length, Width & Diameter of Raw Materials		
A5	Measure Material Thickness		
A13	Record Quality/Compliance (Inspection) Data		
A15	Measure ID/OD		
A19	Weigh Parts		
A20	Verify & Test Calibration of Inspection Instruments		
B	*Plan Job & Prepare for Production*		
B13	Stage Material, Tooling & Fixtures at Work Center		
B14	Inspect Crane/Hoist & Rigging for Safety and Function		
C	*Maintain CNC Milling/Turning Equipment*		
C1	Check Level & Replenish Coolants/Oils		
C2	Check Coolant Cleanliness & Adjust Concentration		
C3	Check & Replenish Hydraulic/Way-Lube Fluids & Spindle Oils		
C4	Check/Empty Tramp Oil Collectors		
C5	Monitor/Adjust Coolant Chillers		
C6	Change Filters		
C7	Empty & Segregate Chips		
C9	Check & Tighten Tooling		
C10	Grease Chucks & Vises		
C11	Replace Probe Batteries		
C12	Check Lockouts & Safeguarding Devices for Function		
C13	Cleanout Inside of Machine		
C15	Clean Tool/Mill Carousel		

Core Competency Assessment: CNC Operator – Turning Basic Competencies (cont.)

O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Duty Area	Task	Date Completed	Supervisor Signature
E	*Set-up CNC for Turning Operations*		
E16	Check, Position & Verify Delivery of Coolant & Fluids for Turning Operations		
E17	Start-up & Home Machine for Turning Operations, Run Warm-up Cycle & Shut Down		
E23	Set-up Chip/Scrap Bins or Containers		
E24	Set-up Packaging or Staging to Finished (Turned) Parts		
G	*Operate & Control CNC Turning Processes*		
G1	Load, Feed & Unload Turned Work pieces		
G7	Control Chip Flow & Empty Chip Bins or Containers		
G8	Tag Turned Parts for Traceability		
G9	Separate Good Turned Parts From Bad Parts		
G10	Collect Run/Production Data & Information (Turning Operations)		
G11	Benchwork Turned Parts		
G12	Housekeep Work Center/Work Station		
G13	Package/Stage Finished Turned Parts		
G14	Conduct Shift Change Duties & Exchange Information (Turning Operations)		
G15	Shutdown CNC Turning Operations		
H	*Perform Benchwork*		
H1	Deburr Finished Parts		
H2	Deburr/Clean Raw Materials		
H3	Tap Holes		
H4	Hone Holes		
H6	Wash/Clean/Degrease Parts		
H7	Assemble & Fit Components Onto Part		
H8	Prepare Parts for Secondary Operations		
H9	Lap Parts		
H10	Polish Parts		
H11	Engrave, Stamp or Etch Part ID's or Spec's on Work pieces		
H12	Apply Protective Coatings or Material to Parts		

CNC OPERATOR – TURNING: INTERMEDIATE COMPETENCIES
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Materials & Parts*		
A2	Determine Hardness of Materials		
A3	Identify Materials by Type		
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A6	Measure Part Features, Profiles & Dimensions Optically or Comparatively		
A7	Measure Surface Finish		
A8	Measure Threads		
A9	Measure Bores		
A10	Measure Tapers		
A11	Measure Radius/Radii		
A12	Measure GD&T		
A14	Measure Point-to-Point Distances (e.g., hole-to-hole)		
A16	Measure Temperature of Parts		
A17	Measure Part/Feature Height/Depth		
A18	Measure Angles		
B	*Plan Job & Prepare for Production*		
B1	Determine Type of Tooling for Job		
B2	Obtain & Stage Tooling at Work Center		
B3	Determine Workholders		
B4	Identify Raw Material Needs for Job		
B	*Plan Job & Prepare for Production*		
B5	Obtain, Review & Verify Part Print and Job Packet		
B7	Determine Appropriateness & Availability of Equipment		
B8	Identify CNC Program to be Downloaded		
B10	Order or Obtain Raw Material & Tooling		
B15	Obtain & Stage Inspection & Gaging Devices		
B17	Check Machine for Pre-Production Maintenance Needs		
B18	Determine Packaging or Staging for Finished Parts		

Core Competency Assessment: CNC Operator – Turning Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Duty Area	Task	Date Completed	Supervisor Signature
E	*Setup CNC for Turning Operations*		
E1	Install/Indicate Chucking Devices		
E2	Install/Indicate Turning Work holding Fixtures		
E3	Bore Soft Jaws		
E4	Install "Live" Tooling		
E5	Pre-Set or Assemble Tooling (Turning)		
E6	Prepare, Adjust & Load Bar Feeder		
E7	Position/Adjust Tail Stock		
E8	Install/Set Tooling (Turning)		
E9	Update Tool Offsets (Turning)		
E10	Update Work Offsets (Turning)		
E11	Load/Download CNC Turning Programs		
E12	Dry Run/Prove-Out CNC Turning Programs		
E14	Set/Verify Hydraulic Pressures		
E15	Load First Article Work piece for Turning Operations		
E18	Turn First Part(s)		
E19	Inspect First Piece part(s)		
E21	Adjust/Edit Tool & Turning Work Offsets		
E22	Establish Cycle Time (Turning)		
E25	Verify (Validate) Part Cosmetics, Quality & Compliance		

Core Competency Assessment: CNC Operator – Turning Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Duty Area	Task	Date Completed	Supervisor Signature
F	*Operate & Control CNC Milling Processes*		
F10	Separate Good Milled Parts from Bad Parts		
F11	Collect Run Data & Information (Milling)		
G	*Operate & Control CNC Turning Processes*		
G2	Index/Change Tooling (Turning)		
G3	Identify/Replace Worn Tooling (Turning Operations)		
G4	Establish Tool Life Benchmarks (Turning Operations)		
G5	Inspect Turned Parts in Accordance With Inspection/Process Plan		
G6	Monitor, Control & Adjust Turning Processes		
G16	Re-Start CNC for Turning Operations		
H	*Perform Benchwork*		
H5	Extract Broken Tooling Manually		
J	*Troubleshoot Equipment & Compliance/Quality Problems (Selected Examples)*		
J2	Find Out Why Tooling Has Broken or Showing Premature Wear		
J3	Find Out Why Holes Are Oversized		
J4	Isolate the Cause Why Concentricity is Out of Tolerance		
J5	Respond to (Isolate the Cause of) Over or Under Sized Threads		
J6	Isolate the Cause of Machine Control Alarms		
J7	Respond to (Isolate the Cause of) Missing or Out-of-Tolerance Features on a Part		
J8	Find Out Why Part Has Excessive Burr		
J9	Determine Why Machine Won't Start or Re-Start		
J10	Find Out Why a Part Left or Moved Out of Work holder or Fixture		

CNC OPERATOR – TURNING: ADVANCED COMPETENCIES
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Duty Area	Task	Date Completed	Supervisor Signature
B	*Plan Job & Prepare for Production*		
B12	Determine Sequence of Machining & Secondary Operations		
B16	Calculate Machinability Data		
E	*Setup CNC for Turning Operations*		
E13	Calibrate Tool & Turret Probes (Optional)		
E20	Adjust/Edit CNC Turning Programs		
J	*Troubleshoot & Compliance/Quality Problems (Selected Examples)*		
J1	Determine Why Chatter Has Occurred		

Required NIMS Credentials

In order to demonstrate proficiency in all of the competencies listed in this appendix, the apprentice will have completed all of the following NIMS Credentials.

Name of Credential	Date Completed	Supervisor Signature
Measurement, Materials and Safety		
Job Planning, Benchwork and Layout		
CNC Operations - Turning		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
CORE COMPETENCY ASSESSMENT FORM
NIMS CERTIFIED CNC OPERATOR – TURNING
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

APPRENTICE:_____ EMPLOYEE NUMBER:_____
SUPERVISOR:_____ DEPARTMENT:_____

INSTRUCTIONS: CHECK-OFF EACH CORE COMPETENCY AS THE APPRENTICE DEMONSTRATES A LEVEL OF PROFICIENCY THAT IS EQUIVALENT TO THE APPROPRIATE LEVEL

CNC OPERATOR – TURNING: BASIC WORK PROCESS SCHEDULE
(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
F13/G	Housekeep Work Center/Work Stations		
H6	Wash, Clean & Degrease Parts (Benchwork)		
C13	Cleanout Inside of Machines (Equip. Maintenance)		
D18/E	Set-up Chip (Scrap) Bins & Containers (Milling/Turning)		
G7/F	Control Chip Flow & Empty Chip Bins or Containers (Milling/Turning)		
H2	Deburr/Clean Raw Materials (Benchwork)		
C2	Check Cleanliness of Coolants & Adjust Concentration (Equip. Maintenance)		
C1	Check Levels & Replenish Coolants (Equip. Maintenance)		
C10	Grease Chucks & Vices (Equip. Maintenance)		
A1	Measure Length, Width & Depth of Raw Materials (Inspection)		
A14 **A15** **A18**	**Measure Point-to-Point Distances (hole-to-hole, edge-to-hole, etc.)** **Measure ID/OD (Inspection)** **Measure Angles**		
A11	Measure radius/radii (Inspection)		
A2	Determine Hardness of Materials (Inspection)		
C12	**Verify Safeguarding Devices for Function (Equip. Maintenance)**		

CNC OPERATOR – TURNING: INTERMEDIATE LEVEL TRAINING REQUIREMENTS ASSESSMENT
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Training Requirements Assessment: CNC Operator – Turning Intermediate Checklist

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A20 A17 A8	Test & Verify Calibrations of Inspection Instruments Measure Part/Feature Height/Depth (Inspection) Measure Threads		
A10	Measure Tapers (Inspection)		
A9	Measure Bores (Inspection)		
A7	Measure/Check Surface Finish (Inspection)		
A13	Record Quality/Compliance (Inspection) Information & Data		
B15	Obtain & Stage Inspection Instruments and Gaging Devices (Job Planning & Prep		
B13	Stage Material, Tooling & Fixtures at Work Center (Job Planning & Prep)		
B5	Obtain, Review & Verify Part Print and Job Packet (Job Planning & Prep)		
D6/E	Load/Download Existing CNC Programs (Milling & Turning)		
B14	Inspect Crane/Hoist & Rigging for Safety and Function (Job Planning & Pre		
F15/G	Conduct Shift Change & Exchange Information		

Training Requirements Assessment: CNC Operator – Turning Intermediate Checklist (cont.)

O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
E17	Startup Machine, Run Warm-up Cycle & Shut Down Machine (Set-up)		
G16	Re-start CNC for Turning Operations		
E1	Install/Indicate Chucking Devices (Set-up)		
E3	Bore Soft Jaw (Turning)		
E8 E21 E4	Install/Setup Tooling (Set-up) Adjust/Edit Tool & Turning Work Offsets Install "Live" Tooling		
E2	Install/Indicate Turning Workholding Fixtures (Set-up)		
E16	Check Position & Verify Delivery of Coolants and Fluids for Turning Operations (Set-up)		
E6	Prepare, Adjust & Load Bar Feeder (Set-up)		
E14	Set/Verify Hydraulic Pressures (Set-up)		
G5	Inspect Turned Parts in Accordance With Inspection/Process Plan		
G6	Monitor, Control & Adjust Turning Processes (Turning Operations)		
G3	Identify/Replace Worn Tooling (Turning Operations)		
G1	Load, Feed & Unload Turned Workpieces (Turning Operations)		
F10/G	Separate/Segregate Good Parts From Bad Parts (Milling & Turning)		
F9/G	Tag Parts for Traceability (Milling & Turning)		
A12 A6	Measure GD&T (Inspection) Measure Part Features, Profiles & Dimensions Optically, Comparatively or Using CMM (Inspection)		

WORK PROCESS SCHEDULE
CNC OPERATOR – TURNING INTERMEDIATE CHECKLIST
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB
(Prep Checks in Bold)

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A20 **A17** ✓ **A8**	**Test & Verify Calibrations of Inspection Instruments** **Measure Part/Feature Height/Depth (Inspection)** **Measure Threads**		
A10	Measure Tapers (Inspection)		
A9	Measure Bores (Inspection)		
A7	Measure/Check Surface Finish (Inspection)		
A13	Record Quality/Compliance (Inspection) Information & Data		
B15	Obtain & Stage Inspection Instruments and Gaging Devices (Job Planning & Prep		
B13	Stage Material, Tooling & Fixtures at Work Center (Job Planning & Prep)		
B5	Obtain, Review & Verify Part Print and Job Packet (Job Planning & Prep)		
D6/E	Load/Download Existing CNC Programs (Milling & Turning)		
B14	Inspect Crane/Hoist & Rigging for Safety and Function (Job Planning & Pre		
F15/G	Conduct Shift Change & Exchange Information		

WORK PROCESS SCHEDULE
CNC OPERATOR – TURNING
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB
INTERMEDIATE CHECKLIST (CONT.)

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
	Turning Set-up & Operations	n/a	
E17 ✓	**Startup Machine, Run Warm-up Cycle & Shut Down Machine (Set-up)**		
G16 ✓	**Re-start CNC for Turning Operations**		
E1	Install/Indicate Chucking Devices (Set-up)		
E3	**Bore Soft Jaw (Turning)**		
E8 **E21** ✓ **E4**	**Install/Setup Tooling (Set-up)** **Adjust/Edit Tool & Turning Work Offsets** **Install "Live" Tooling**		
E2	Install/Indicate Turning Workholding Fixtures (Set-up)		
E16	Check Position & Verify Delivery of Coolants and Fluids for Turning Operations (Set-up)		
E6	Prepare, Adjust & Load Bar Feeder (Set-up)		
E14	Set/Verify Hydraulic Pressures (Set-up)		
G5 ✓	**Inspect Turned Parts in Accordance With Inspection/Process Plan**		
G6	Monitor, Control & Adjust Turning Processes (Turning Operations)		
G3	Identify/Replace Worn Tooling (Turning Operations)		
G1	Load, Feed & Unload Turned Workpieces (Turning Operations)		
F10/G	Separate/Segregate Good Parts From Bad Parts (Milling & Turning)		
F9/G	Tag Parts for Traceability (Milling & Turning)		
A12 **A6** ✓	**Measure GD&T (Inspection)** **Measure Part Features, Profiles & Dimensions Optically, Comparatively or Using CMM (Inspection)**		

WORK PROCESS SCHEDULE
CNC OPERATOR – TURNING: ADVANCED LEVEL
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB
Training Requirements Assessment: CNC Operator - Turning Advanced Checklist

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
E15	Load Workpiece for First Article training Operations (Set-up)		
E12	Dry Run/Prove Out CNC Turning Programs (Set-up)		
E18 E19 E20	Turn First Part/s (Set-up) Inspect First (Article) Piece part/s for Quality and Compliance Adjust/Edit CNC Turning Programs		
E13	Calibrate Tool and Turning Probes (Turning Set-up)		
G4	Establish Tool Life Benchmarks (Turning Operation)		
J2	Find Out Why Tooling has Broken Or Showing Premature Wear		
J1	Determine (Isolate the cause of) why Chatter has Occurred		
J6	Respond to (Isolate the cause of) Machine Control Alarms		
J7	Respond to (Isolate the cause of) Missing or Out-of-Tolerance features on a Part		
J8	Find Out Why a Part has Excessive Burr		

WORK PROCESS SCHEDULE
CNC OPERATOR – TURNING ADVANCED CHECKLIST
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB
(Prep Checks in Bold)

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
B12	Sequence Machining and Secondary Operations (Job Planning)		
B4	Determine Raw Material Needs for Job (Job Planning)		
E15	Load Work piece for First Article training Operations (Set-up)		
E12	Dry Run/Prove Out CNC Turning Programs (Set-up)		
E18 **E19** ✓ **E20**	**Turn First Part/s (Set-up)** **Inspect First (Article) Piece part/s for Quality and Compliance** **Adjust/Edit CNC Turning Programs**		
E13	Calibrate Tool and Turning Probes (Turning Set-up)		
J2	Find Out Why Tooling has Broken Or Showing Premature Wear		
J1 ✓	**Determine (Isolate the cause of) why Chatter has Occurred**		
J6	Respond to (Isolate the cause of) Machine Control Alarms		
J7	Respond to (Isolate the cause of) Missing or Out-of-Tolerance features on a Part		
J8	Find Out Why a Part has Excessive Burr		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM

NIMS CERTIFIED CNC OPERATOR – TURNING

O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC OPERATOR – TURNING COMPANY SPECIFIC COMPETENCIES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM

COMPANY SPECIFIC COMPETENCY RECORD

NIMS CERTIFIED CNC OPERATOR – TURNING

O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained* for the apprentice to attain each company specific competency.

1.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6. _____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

7.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

8.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

9.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

10.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

11.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

12.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

13.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

14.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

15.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

16.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

17.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

18.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

19.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

20.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

21.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

22.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

23.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

24.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

25.

DDATE TRAINING STARTED

DATE COMPETENCY ATTAINED

26.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

27.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

28.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD
NIMS CERTIFIED CNC OPERATOR – TURNING
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED CNC OPERATOR – TURNING RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

CREDENTIALING RECORD

NIMS CERTIFIED CNC OPERATOR – TURNING

O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials, and Safety	
2.	CNC Operations - Turning	
3.	Job Planning, Benchwork, and Safety	
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

JOB PERFORMANCE ASSESSMENT FORM
NIMS CERTIFIED CNC OPERATOR – TURNING
O*NET-SOC CODE: 51-4.34.00 RAPIDS CODE: 1093CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED CNC OPERATOR – TURNING JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified CNC Operator- Turning**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified CNC Operator- Turning**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

Appendix A.10

Core Competency Requirements
NIMS Certified CNC Operator- Milling

I. CNC OPERATOR – MILLING: BASIC COMPETENCIES
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Core Competency Assessment: CNC Operator – Milling Basic Competencies

Task Code	Task	Date Completed	Supervisor Signature
A	*Inspect Materials & Parts*		
A1	Measure and Verify Length, Width & Diameter of Raw Materials		
A5	Measure Material Thickness		
A13	Record Quality/Compliance (Inspection) Data		
A15	Measure ID/OD		
A19	Weigh Parts		
A20	Verify & Test Calibration of Inspection Instruments		
B	*Plan Job & Prepare for Production*		
B13	Stage Material, Tooling & Fixtures at Work Center		
B14	Inspect Crane/Hoist & Rigging for Safety and Function		
C	*Maintain CNC Milling/Turning Equipment*		
C1	Check Level & Replenish Coolants/Oils		
C2	Check Coolant Cleanliness & Adjust Concentration		
C3	Check & Replenish Hydraulic/Way-Lube Fluids & Spindle Oils		
C4	Check/Empty Tramp Oil Collectors		
C5	Monitor/Adjust Coolant Chillers		
C6	Change Filters		
C7	Empty & Segregate Chips		
C9	Check & Tighten Tooling		
C10	Grease Chucks & Vises		
C11	Replace Probe Batteries		
C12	Check Lockouts & Safeguarding Devices for Function		
C13	Cleanout Inside of Machine		
C15	Clean Tool/Mill Carousel		

Core Competency Assessment: CNC Operator – Milling Basic Competencies (cont.)

O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Duty Area	Task	Date Completed	Supervisor Signature
D	*Set-up CNC for Milling Operations*		
D9	Check/Verify & Position Delivery of Coolants and Fluids		
D10	Start & Home Mill, Run Warm-up Cycle & Shut Down Mill		
D18	Set-up Chip Bins/Containers		
D19	Set-up Packaging/Staging for Finished Parts		
F	*Operate & Control CNC Milling Processes*		
F1	Load, Feed & Unload Milled		
F3	Replace (or Identify) Worn Tooling (Milling)		
F8	Empty Chip Bins/Containers		
F9	Tag Milled Parts for Traceability		
F12	Perform Benchwork on Milled Parts		
F13	Housekeep Work Center/Work Station		
F14	Package/Stage Finished Milled Parts		
F15	Conduct Shift Change & Exchange Information		
F16	Shutdown CNC Milling Process		
H	*Perform Benchwork*		
H1	Deburr Finished Parts		
H2	Deburr/Clean Raw Materials		
H3	Tap Holes		
H4	Hone Holes		
H6	Wash/Clean/Degrease Parts		
H7	Assemble & Fit Components Onto Part		
H8	Prepare Parts for Secondary Operations		
H9	Lap Parts		
H10	Polish Parts		
H11	Engrave, Stamp or Etch Part ID's or Spec's on Work pieces		
H12	Apply Protective Coatings or Material to Parts		

CNC OPERATOR – MILLING: INTERMEDIATE COMPETENCIES
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Materials & Parts*		
A2	Determine Hardness of Materials		
A3	Identify Materials by Type		
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A6	Measure Part Features, Profiles & Dimensions Optically or Comparatively		
A7	Measure Surface Finish		
A8	Measure Threads		
A9	Measure Bores		
A10	Measure Tapers		
A11	Measure Radius/Radii		
A12	Measure GD&T		
A14	Measure Point-to-Point Distances (e.g., hole-to-hole)		
A16	Measure Temperature of Parts		
A17	Measure Part/Feature Height/Depth		
A18	Measure Angles		
B	*Plan Job & Prepare for Production*		
B1	Determine Type of Tooling for Job		
B2	Obtain & Stage Tooling at Work Center		
B3	Determine Workholders		
B4	Identify Raw Material Needs for Job		
B5	Obtain, Review & Verify Part Print and Job Packet		
B7	Determine Appropriateness & Availability of Equipment		
B8	Identify CNC Program to be Downloaded		
B10	Order or Obtain Raw Material & Tooling		
B15	Obtain & Stage Inspection & Gaging Devices		
B17	Check Machine for Pre-Production Maintenance Needs		
B18	Determine Packaging or Staging for Finished Parts		

Core Competency Assessment: CNC Operator – Milling Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Duty Area	Task	Date Completed	Supervisor Signature
C	*Maintain CNC Milling/Turning Equipment*		
C8	Check Draw Bar Force		
C14	Clean Machine Tool Tapers		
D	*Set-up CNC for Milling Operations*		
D1	Install & Indicate Workholding Fixtures		
D2	Pre-Set or Assemble Tooling		
D3	Install/Set Tooling		
D4	Update Tool Offsets		
D5	Update Work Offsets		
D6	Load/Download CNC Programs		
D7	Dry Run/Prove-Out CNC Programs		
D8	Load First Article Work piece to be Milled		
D13	Run First Piece(s)		
D14	Inspect First Piece part(s)		
D16	Adjust/Edit Tool Offsets & Work Offsets		
D17	Establish Cycle Time		
D20	Verify Milled Parts Quality and Compliance (inspect parts)		
F	*Operate & Control CNC Milling Processes*		
F2	Index/Change Tooling (Milling)		
F4	Establish Tool Life Benchmarks (Milling)		
F5	Inspect Milled Parts for Compliance While Adhering to Frequency of Inspections		
F6	Monitor, Adjust & Control Milling Process		
F7	Control Chip Flow		

Core Competency Assessment: CNC Operator – Milling Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Duty Area	Task	Date Completed	Supervisor Signature
F	*Operate & Control CNC Milling Processes*		
F10	Separate Good Milled Parts from Bad Parts		
F11	Collect Run Data & Information (Milling)		
F17	Re-Start CNC Milling Process		
H	*Perform Benchwork*		
H5	Extract Broken Tooling Manually		
J	*Troubleshoot Equipment & Compliance/Quality Problems (Selected Examples)*		
J2	Find Out Why Tooling Has Broken or Showing Premature Wear		
J3	Find Out Why Holes Are Oversized		
J4	Isolate the Cause Why Concentricity is Out of Tolerance		
J5	Respond to (Isolate the Cause of) Over or Under Sized Threads		
J6	Isolate the Cause of Machine Control Alarms		
J7	Respond to (Isolate the Cause of) Missing or Out-of-Tolerance Features on a Part		
J8	Find Out Why Part Has Excessive Burr		
J9	Determine Why Machine Won't Start or Re-Start		
J10	Find Out Why a Part Left or Moved Out of Workholder or Fixture		

CNC OPERATOR – MILLING: ADVANCED COMPETENCIES
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Duty Area	Task	Date Completed	Supervisor Signature
B	*Plan Job & Prepare for Production*		
B12	Determine Sequence of Machining & Secondary Operations		
B16	Calculate Machinability Data		
D	*Set-up CNC for Milling Operations*		
D11	Calibrate Spindle & Tool Probes		
D12	Program Independent Rotary Head/Indexer		
D15	Adjust/Edit Milling CNC Programs		
J	*Troubleshoot & Compliance/Quality Problems (Selected Examples)*		
J1	Determine Why Chatter Has Occurred		

Required NIMS Credentials

In order to demonstrate proficiency in all of the competencies listed in this appendix, the apprentice will have completed all of the following NIMS Credentials.

Name of Credential	Date Completed	Supervisor Signature
Measurement, Materials and Safety		
Job Planning, Benchwork and Layout		
CNC Operations - Milling		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC OPERATOR – MILLING
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB
CORE COMPETENCY ASSESSMENT FORM

APPRENTICE:_____ EMPLOYEE NUMBER:_____
SUPERVISOR:_____ DEPARTMENT:_____

INSTRUCTIONS: CHECK-OFF EACH CORE COMPETENCY AS THE APPRENTICE DEMONSTRATES A LEVEL OF PROFICIENCY THAT IS EQUIVALENT TO THE APPROPRIATE LEVEL

CNC OPERATOR – MILLING: BASIC WORK PROCESS SCHEDULE
(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
F13/G	Housekeep Work Center/Work Stations		
H6	Wash, Clean & Degrease Parts (Benchwork)		
C13	Cleanout Inside of Machines (Equip. Maintenance)		
D18/E	Setup Chip (Scrap) Bins & Containers (Milling/Turning)		
G7/F	Control Chip Flow & Empty Chip Bins or Containers (Milling/Turning)		
H2	Deburr/Clean Raw Materials (Benchwork)		
C2	Check Cleanliness of Coolants & Adjust Concentration (Equip. Maintenance)		
C1	Check Levels & Replenish Coolants (Equip. Maintenance)		
C10	Grease Chucks & Vices (Equip. Maintenance)		
A1	Measure Length, Width & Depth of Raw Materials (Inspection)		
A14 **A15** **A18**	**Measure Point-to-Point Distances (hole-to-hole, edge-to-hole, etc.)** **Measure ID/OD (Inspection)** **Measure Angles**		
A11	Measure radius/radii (Inspection)		
A2	Determine Hardness of Materials (Inspection)		
C12	**Verify Safeguarding Devices for Function (Equip. Maintenance)**		
D19	Set-up Packaging/Staging for Finished Parts (Set-up)		

CNC OPERATOR – MILLING: INTERMEDIATE LEVEL TRAINING REQUIREMENTS ASSESSMENT
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Training Requirements Assessment: CNC Operator – Milling Intermediate Checklist

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A20 A17 A8	Test & Verify Calibrations of Inspection Instruments Measure Part/Feature Height/Depth (Inspection) Measure Threads		
A10	Measure Tapers (Inspection)		
A9	Measure Bores (Inspection)		
A7	Measure/Check Surface Finish (Inspection)		
A13	Record Quality/Compliance (Inspection) Information & Data		
B15	Obtain & Stage Inspection Instruments and Gaging Devices (Job Planning & Prep		
B13	Stage Material, Tooling & Fixtures at Work Center (Job Planning & Prep)		
C3	Check & Replenish Hydraulic/Way-Lube Fluids & Spindle Oils (Equip. Maintenance		
B5	Obtain, Review & Verify Part Print and Job Packet (Job Planning & Prep)		
D6/E	Load/Download Existing CNC Programs (Milling & Turning)		
B14	Inspect Crane/Hoist & Rigging for Safety and Function (Job Planning & Pre		
C9	Check & Tighten Tooling (Equip. Maintenance)		
F15/G	Conduct Shift Change & Exchange Information		

Training Requirements Assessment: CNC Operator – Milling Intermediate Competencies (cont.)
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
E17	Startup Machine, Run Warm-up Cycle & Shut Down Machine (Set-up)		
	Milling Setup & Operations		
D10	Start Mill, Run Warm-up Cycle & Shut Down Machine (Set-up)		
F17	Re-start CNC Milling Operations (Milling Operations)		
D1	Install & indicate Work holding Fixtures (Set-up)		
D3 D16	Install/Set Tooling (Set-up) Adjust/Edit Tool Offsets & Work Offsets		
F1	Load, Feed & Unload Milled Work pieces (Milling Operations)		
F3	Replace or Identify Worn Tooling (Milling Operations)		
F5	Inspect Milled Parts for Compliance While Adhering to Frequency of Inspections (Milling Operations)		

Training Requirements Assessment: CNC Operator – Milling Intermediate Competencies (cont.)
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
F6	Monitor, Adjust & Control Milling Processes (Milling Operations)		
H8	Prepare Parts for Secondary Operations (Benchwork)		
H1	Deburr Finished Parts (Benchwork)		
H11	Engrave, Stamp or Etch Part ID's or Spec's on Work pieces (Benchwork)		
F10/G	Separate/Segregate Good Parts From Bad Parts (Milling & Turning)		
F9/G	Tag Parts for Traceability (Milling & Turning)		
A12 A6	Measure GD&T (Inspection) Measure Part Features, Profiles & Dimensions Optically, Comparatively or Using CMM (Inspection)		

WORK PROCESS SCHEDULE
CNC OPERATOR – MILLING INTERMEDIATE COMPETENCIES
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB
(Prep Checks in Bold)

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A20 A17 ✓ A8	**Test & Verify Calibrations of Inspection Instruments Measure Part/Feature Height/Depth (Inspection) Measure Threads**		
A10	Measure Tapers (Inspection)		
A9	Measure Bores (Inspection)		
A7	Measure/Check Surface Finish (Inspection)		
A13	Record Quality/Compliance (Inspection) Information & Data		
B15	Obtain & Stage Inspection Instruments and Gaging Devices (Job Planning & Prep		
B13	Stage Material, Tooling & Fixtures at Work Center (Job Planning & Prep)		
C3	Check & Replenish Hydraulic/Way-Lube Fluids & Spindle Oils (Equip. Maintenance		
B5	Obtain, Review & Verify Part Print and Job Packet (Job Planning & Prep)		
D6/E	Load/Download Existing CNC Programs (Milling & Turning)		
B14	Inspect Crane/Hoist & Rigging for Safety and Function (Job Planning & Pre		
C9	Check & Tighten Tooling (Equip. Maintenance)		
F15/G	Conduct Shift Change & Exchange Information		

WORK PROCESS SCHEDULE
CNC Operator – Milling Intermediate Competencies (cont.)
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
	Milling Set-up & Operations	n/a	
D10 ✓	**Start Mill, Run Warm-up Cycle & Shut Down Machine (Set-up)**		
F17 ✓	**Re-start CNC Milling Operations (Milling Operations)**		
D1 ✓	**Install & indicate Work holding Fixtures (Set-up)**		
D3 **D16** ✓	**Install/Set Tooling (Set-up)** **Adjust/Edit Tool Offsets & Work Offsets**		
F1	Load, Feed & Unload Milled Work pieces (Milling Operations)		
F3	Replace or Identify Worn Tooling (Milling Operations)		
F5	Inspect Milled Parts for Compliance While Adhering to Frequency of Inspections (Milling Operations)		
F6	Monitor, Adjust & Control Milling Processes (Milling Operations)		
H8	Prepare Parts for Secondary Operations (Benchwork)		
H1 ✓	**Deburr Finished Parts (Benchwork)**		
H11	Engrave, Stamp or Etch Part ID's or Spec's on Work pieces (Benchwork)		
F10/G	Separate/Segregate Good Parts From Bad Parts (Milling & Turning)		
F9/G	Tag Parts for Traceability (Milling & Turning)		
A12 **A6** ✓	**Measure GD&T (Inspection)** **Measure Part Features, Profiles & Dimensions Optically, Comparatively or Using CMM (Inspection)**		

CNC OPERATOR – MILLING: ADVANCED LEVEL WORK PROCESS SCHEDULE
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

Training Requirements Assessment: CNC Operator Advanced Competencies

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
D8	Load Work piece for First Article Milling Operations (Set-up)		
D7	Dry-Run/Prove Out CNC Milling Programs (Set-up)		
D13 D14 D15	Mill First Part/s (Set-up) Inspect First (Articles) Piece parts for Quality and Compliance Adjust/Edit CNC Milling Programs (Set-up)		
D11	Calibrate Spindle & Tool Probes (Milling Set-up)		
F4	Establish Tool Life Benchmarks (Milling Operations)		
J2	Find Out Why Tooling has Broken Or Showing Premature Wear		
J1	Determine (Isolate the cause of) why Chatter has Occurred		
J6	Respond to (Isolate the cause of) Machine Control Alarms		
J7	Respond to (Isolate the cause of) Missing or Out-of-Tolerance features on a Part		
J8	Find Out Why a Part has Excessive Burr		

WORK PROCESS SCHEDULE
CNC Operator – Milling: Advanced Competencies
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB
(Prep Checks in Bold)

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
B12	Sequence Machining and Secondary Operations (Job Planning)		
B4	Determine Raw Material Needs for Job (Job Planning)		
G4	Establish Tool Life Benchmarks (Turning Operation)		
D8	Load Work piece for First Article Milling Operations (Set-up)		
D7	Dry-Run/Prove Out CNC Milling Programs (Setup)		
D13 **D14** ✓ **D15**	**Mill First Part/s (Set-up)** **Inspect First (Articles) Pieceparts for Quality and Compliance** **Adjust/Edit CNC Milling Programs (Set-up)**		
D11	Calibrate Spindle & Tool Probes (Milling Setup)		
F4	Establish Tool Life Benchmarks (Milling Operations)		
J2	Find Out Why Tooling has Broken Or Showing Premature Wear		
J1 ✓	**Determine (Isolate the cause of) why Chatter has Occurred**		
J6	Respond to (Isolate the cause of) Machine Control Alarms		
J7	Respond to (Isolate the cause of) Missing or Out-of-Tolerance features on a Part		
J8	Find Out Why a Part has Excessive Burr		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
SPECIFIC COMPETENCY ASSESSMENT
NIMS CERTIFIED CNC OPERATOR – MILLING
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC OPERATOR – MILLING COMPANY SPECIFIC COMPETENCIES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC OPERATOR – MILLING
O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB
COMPANY SPECIFIC COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained* for the apprentice to attain each company specific competency.

1.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

7.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

8.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

9.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

10.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

11.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

12.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

13.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

14.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

15.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

16.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

17.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

18.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

19.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

20.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

21.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

22.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

23.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

24.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

25.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

26.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

27.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

28.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD

O*NET-SOC CODE: 51-4035.00 RAPIDS CODE: 1097CB

NIMS CERTIFIED CNC OPERATOR – MILLING

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED CNC OPERATOR – MILLING RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED CNC OPERATOR – MILLING
CREDENTIALING RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials, and Safety	
2.	CNC Operations - Milling	
3.	Job Planning, Benchwork, and Safety	
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

JOB PERFORMANCE ASSESSMENT FORM
NIMS CERTIFIED CNC OPERATOR – MILLING

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED CNC OPERATOR – MILLING JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified CNC Operator- Milling**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified CNC Operator- Milling**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

Appendix A.11

Core Competency Requirements
NIMS Certified CNC Operator- Milling and Turning

I. CNC OPERATOR – MILLING AND TURNING: BASIC COMPETENCIES
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Core Competency Assessment: CNC Operator – Milling and Turning Basic Competencies

Task Code	Task	Date Completed	Supervisor Signature
A	*Inspect Materials & Parts*		
A1	Measure and Verify Length, Width & Diameter of Raw Materials		
A5	Measure Material Thickness		
A13	Record Quality/Compliance (Inspection) Data		
A15	Measure ID/OD		
A19	Weigh Parts		
A20	Verify & Test Calibration of Inspection Instruments		
B	*Plan Job & Prepare for Production*		
B13	Stage Material, Tooling & Fixtures at Work Center		
B14	Inspect Crane/Hoist & Rigging for Safety and Function		
C	*Maintain CNC Milling/Turning Equipment*		
C1	Check Level & Replenish Coolants/Oils		
C2	Check Coolant Cleanliness & Adjust Concentration		
C3	Check & Replenish Hydraulic/Way-Lube Fluids & Spindle Oils		
C4	Check/Empty Tramp Oil Collectors		
C5	Monitor/Adjust Coolant Chillers		
C6	Change Filters		
C7	Empty & Segregate Chips		
C9	Check & Tighten Tooling		
C10	Grease Chucks & Vises		
C11	Replace Probe Batteries		
C12	Check Lockouts & Safeguarding Devices for Function		
C13	Cleanout Inside of Machine		
C15	Clean Tool/Mill Carousel		

Core Competency Assessment: CNC Operator – Milling and Turning Basic Competencies (cont.)

O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Duty Area	Task	Date Completed	Supervisor Signature
D	*Set-up CNC for Milling Operations*		
D9	Check/Verify & Position Delivery of Coolants and Fluids		
D10	Start & Home Mill, Run Warm-up Cycle & Shut Down Mill		
D18	Set-up Chip Bins/Containers		
D19	Set-up Packaging/Staging for Finished Parts		
E	*Set-up CNC for Turning Operations*		
E16	Check, Position & Verify Delivery of Coolant & Fluids for Turning Operations		
E17	Start-up & Home Machine for Turning Operations, Run Warm-up Cycle & Shut Down		
E23	Set-up Chip/Scrap Bins or Containers		
E24	Set-up Packaging or Staging to Finished (Turned) Parts		
F	*Operate & Control CNC Milling Processes*		
F1	Load, Feed & Unload Milled Work pieces		
F3	Replace (or Identify) Worn Tooling (Milling)		
F8	Empty Chip Bins/Containers		
F9	Tag Milled Parts for Traceability		
F12	Perform Benchwork on Milled Parts		
F13	Housekeep Work Center/Work Station		
F14	Package/Stage Finished Milled Parts		
F15	Conduct Shift Change & Exchange Information		
F16	Shutdown CNC Milling Process		

Core Competency Assessment: CNC Operator – Milling and Turning Basic Competencies (cont.)

O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Duty Area	Task	Date Completed	Supervisor Signature
G	*Operate & Control CNC Turning Processes*		
G1	Load, Feed & Unload Turned Work pieces		
G7	Control Chip Flow & Empty Chip Bins or Containers		
G8	Tag Turned Parts for Traceability		
G9	Separate Good Turned Parts From Bad Parts		
G10	Collect Run/Production Data & Information (Turning Operations)		
G11	Benchwork Turned Parts		
G12	Housekeep Work Center/Work Station		
G13	Package/Stage Finished Turned Parts		
G14	Conduct Shift Change Duties & Exchange Information (Turning Operations)		
G15	Shutdown CNC Turning Operations		
H	*Perform Benchwork*		
H1	Deburr Finished Parts		
H2	Deburr/Clean Raw Materials		
H3	Tap Holes		
H4	Hone Holes		
H6	Wash/Clean/Degrease Parts		
H7	Assemble & Fit Components Onto Part		
H8	Prepare Parts for Secondary Operations		
H9	Lap Parts		
H10	Polish Parts		
H11	Engrave, Stamp or Etch Part ID's or Spec's on Work pieces		
H12	Apply Protective Coatings or Material to Parts		

CNC OPERATOR – MILLING AND TURNING: INTERMEDIATE COMPETENCIES
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Materials & Parts*		
A2	Determine Hardness of Materials		
A3	Identify Materials by Type		
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A6	Measure Part Features, Profiles & Dimensions Optically or Comparatively		
A7	Measure Surface Finish		
A8	Measure Threads		
A9	Measure Bores		
A10	Measure Tapers		
A11	Measure Radius/Radii		
A12	Measure GD&T		
A14	Measure Point-to-Point Distances (e.g., hole-to-hole)		
A16	Measure Temperature of Parts		
A17	Measure Part/Feature Height/Depth		
A18	Measure Angles		
B	*Plan Job & Prepare for Production*		
B1	Determine Type of Tooling for Job		
B2	Obtain & Stage Tooling at Work Center		
B3	Determine Workholders		
B4	Identify Raw Material Needs for Job		
B5	Obtain, Review & Verify Part Print and Job Packet		
B7	Determine Appropriateness & Availability of Equipment		
B8	Identify CNC Program to be Downloaded		
B10	Order or Obtain Raw Material & Tooling		
B15	Obtain & Stage Inspection & Gaging Devices		
B17	Check Machine for Pre-Production Maintenance Needs		
B18	Determine Packaging or Staging for Finished Parts		

Core Competency Assessment: CNC Operator – Milling and Turning Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Duty Area	Task	Date Completed	Supervisor Signature
C	*Maintain CNC Milling/Turning Equipment*		
C8	Check Draw Bar Force		
C14	Clean Machine Tool Tapers		
D	*Set-up CNC for Milling Operations*		
D1	Install & Indicate Workholding Fixtures		
D2	Pre-Set or Assemble Tooling		
D3	Install/Set Tooling		
D4	Update Tool Offsets		
D5	Update Work Offsets		
D6	Load/Download CNC Programs		
D7	Dry Run/Prove-Out CNC Programs		
D8	Load First Article Work piece to be Milled		
D13	Run First Piece(s)		
D14	Inspect First Piece part(s)		
D16	Adjust/Edit Tool Offsets & Work Offsets		
D17	Establish Cycle Time		
D20	Verify Milled Parts Quality and Compliance (inspect parts)		
E	*Set-up CNC for Turning Operations*		
E1	Install/Indicate Chucking Devices		
E2	Install/Indicate Turning Workholding Fixtures		
E3	Bore Soft Jaws		
E4	Install "Live" Tooling		
E5	Pre-Set or Assemble Tooling (Turning)		
E6	Prepare, Adjust & Load Bar Feeder		
E7	Position/Adjust Tail Stock		
E8	Install/Set Tooling (Turning)		
E9	Update Tool Offsets (Turning)		
E10	Update Work Offsets (Turning)		
E11	Load/Download CNC Turning Programs		
E12	Dry Run/Prove-Out CNC Turning Programs		
E14	Set/Verify Hydraulic Pressures		
E15	Load First Article Work piece for Turning Operations		
E18	Turn First Part(s)		
E19	Inspect First Piece part(s)		
E21	Adjust/Edit Tool & Turning Work Offsets		
E22	Establish Cycle Time (Turning)		
E25	Verify (Validate) Part Cosmetics, Quality & Compliance		

Core Competency Assessment: CNC Operator – Milling and Turning Intermediate Competencies (cont.)

O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Duty Area	Task	Date Completed	Supervisor Signature
F	*Operate & Control CNC Milling Processes*		
F2	Index/Change Tooling (Milling)		
F4	Establish Tool Life Benchmarks (Milling)		
F5	Inspect Milled Parts for Compliance While Adhering to Frequency of Inspections		
F6	Monitor, Adjust & Control Milling Process		
F7	Control Chip Flow		
F10	Separate Good Milled Parts from Bad Parts		
F11	Collect Run Data & Information (Milling)		
F17	Re-Start CNC Milling Process		
G	*Operate & Control CNC Turning Processes*		
G2	Index/Change Tooling (Turning)		
G3	Identify/Replace Worn Tooling (Turning Operations)		
G4	Establish Tool Life Benchmarks (Turning Operations)		
G5	Inspect Turned Parts in Accordance With Inspection/Process Plan		
G6	Monitor, Control & Adjust Turning Processes		
G16	Re-Start CNC for Turning Operations		
H	*Perform Benchwork*		
H5	Extract Broken Tooling Manually		
J	*Troubleshoot Equipment & Compliance/Quality Problems (Selected Examples)*		
J2	Find Out Why Tooling Has Broken or Showing Premature Wear		
J3	Find Out Why Holes Are Oversized		
J4	Isolate the Cause Why Concentricity is Out of Tolerance		
J5	Respond to (Isolate the Cause of) Over or Under Sized Threads		
J6	Isolate the Cause of Machine Control Alarms		
J7	Respond to (Isolate the Cause of) Missing or Out-of-Tolerance Features on a Part		
J8	Find Out Why Part Has Excessive Burr		
J9	Determine Why Machine Won't Start or Re-Start		
J10	Find Out Why a Part Left or Moved Out of Workholder or Fixture		

CNC OPERATOR – MILLING AND TURNING: ADVANCED COMPETENCIES
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Duty Area	Task	Date Completed	Supervisor Signature
B	*Plan Job & Prepare for Production*		
B12	Determine Sequence of Machining & Secondary Operations		
B16	Calculate Machinability Data		
D	*Set-up CNC for Milling Operations*		
D11	Calibrate Spindle & Tool Probes		
D12	Program Independent Rotary Head/Indexer		
D15	Adjust/Edit Milling CNC Programs		
E	*Set-up CNC for Turning Operations*		
E13	Calibrate Tool & Turret Probes (Optional)		
E20	Adjust/Edit CNC Turning Programs		
J	*Troubleshoot & Compliance/Quality Problems (Selected Examples)*		
J1	Determine Why Chatter Has Occurred		

Required NIMS Credentials

In order to demonstrate proficiency in all of the competencies listed in this appendix, the apprentice will have completed all of the following NIMS Credentials.

Name of Credential	Date Completed	Supervisor Signature
Measurement, Materials and Safety		
Job Planning, Benchwork and Layout		
CNC Operations - Milling		
CNC Operations - Turning		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
CORE COMPETENCY ASSESSMENT FORM
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB
NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING

APPRENTICE:_____ EMPLOYEE NUMBER:_____
SUPERVISOR:_____ DEPARTMENT:_____

INSTRUCTIONS: CHECK-OFF EACH CORE COMPETENCY AS THE APPRENTICE DEMONSTRATES A LEVEL OF PROFICIENCY THAT IS EQUIVALENT TO THE APPROPRIATE LEVEL

CNC OPERATOR – MILLING AND TURNING: BASIC WORK PROCESS SCHEDULE
(PREP CHECKS IN BOLD)

Task Code	OJL Activity	Date Competency Started	Date Competency Gained
F13/G	Housekeep Work Center/Work Stations		
H6	Wash, Clean & Degrease Parts (Benchwork)		
C13	Cleanout Inside of Machines (Equip. Maintenance)		
D18/E	Setup Chip (Scrap) Bins & Containers (Milling/Turning)		
G7/F	Control Chip Flow & Empty Chip Bins or Containers (Milling/Turning)		
H2	Deburr/Clean Raw Materials (Benchwork)		
C2	Check Cleanliness of Coolants & Adjust Concentration (Equip. Maintenance)		
C1	Check Levels & Replenish Coolants (Equip. Maintenance)		
C10	Grease Chucks & Vices (Equip. Maintenance)		
A1	Measure Length, Width & Depth of Raw Materials (Inspection)		
A14 **A15** **A18**	**Measure Point-to-Point Distances (hole-to-hole, edge-to-hole, etc.) Measure ID/OD (Inspection)** **Measure Angles**		
A11	Measure radius/radii (Inspection)		
A2	Determine Hardness of Materials (Inspection)		
C12	**Verify Safeguarding Devices for Function (Equip. Maintenance)**		
D19	Setup Packaging/Staging for Finished Parts (Set-up)		

CNC OPERATOR – MILLING AND TURNING: INTERMEDIATE LEVEL TRAINING REQUIREMENTS ASSESSMENT

O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Training Requirements Assessment: CNC Operator – Milling and Turning Intermediate Competencies

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A20 A17 A8	Test & Verify Calibrations of Inspection Instruments Measure Part/Feature Height/Depth (Inspection) Measure Threads		
A10	Measure Tapers (Inspection)		
A9	Measure Bores (Inspection)		
A7	Measure/Check Surface Finish (Inspection)		
A13	Record Quality/Compliance (Inspection) Information & Data		
B15	Obtain & Stage Inspection Instruments and Gaging Devices (Job Planning & Prep)		
B13	Stage Material, Tooling & Fixtures at Work Center (Job Planning & Prep)		
C3	Check & Replenish Hydraulic/Way-Lube Fluids & Spindle Oils (Equip. Maintenance)		
B5	Obtain, Review & Verify Part Print and Job Packet (Job Planning & Prep)		
D6/E	Load/Download Existing CNC Programs (Milling & Turning)		
B14	Inspect Crane/Hoist & Rigging for Safety and Function (Job Planning & Pre		
C9	Check & Tighten Tooling (Equip. Maintenance)		
F15/G	Conduct Shift Change & Exchange Information		

Training Requirements Assessment: CNC Operator – Milling and Turning
Intermediate Competencies (cont.)
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
E17	Startup Machine, Run Warm-up Cycle & Shut Down Machine (Set-up)		
G16	Re-start CNC for Turning Operations		
E1	Install/Indicate Chucking Devices (Set-up)		
E3	Bore Soft Jaw (Turning)		
E8 E21 E4	Install/Set-up Tooling (Set-up) Adjust/Edit Tool & Turning Work Offsets Install "Live" Tooling		
E2	Install/Indicate Turning Work holding Fixtures (Set-up)		
E16	Check Position & Verify Delivery of Coolants and Fluids for Turning Operations (Set-up)		
E6	Prepare, Adjust & Load Bar Feeder (Set-up)		
E14	Set/Verify Hydraulic Pressures (Set-up)		
G5	Inspect Turned Parts in Accordance With Inspection/Process Plan		
G6	Monitor, Control & Adjust Turning Processes (Turning Operations)		
G3	Identify/Replace Worn Tooling (Turning Operations)		
G1	Load, Feed & Unload Turned Work pieces (Turning Operations)		
	Milling Set-up & Operations		
D10	Start Mill, Run Warm-up Cycle & Shut Down Machine (Set-up)		
F17	Re-start CNC Milling Operations (Milling Operations)		
D1	Install & indicate Work holding Fixtures (Set-up)		
D3 D16	Install/Set Tooling (Set-up) Adjust/Edit Tool Offsets & Work Offsets		
F1	Load, Feed & Unload Milled Work pieces (Milling Operations)		
F3	Replace or Identify Worn Tooling (Milling Operations)		
F5	Inspect Milled Parts for Compliance While Adhering to Frequency of Inspections (Milling Operations)		

Training Requirements Assessment: CNC Operator – Milling and Turning
Intermediate Competencies (cont.)
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
F6	Monitor, Adjust & Control Milling Processes (Milling Operations)		
H8	Prepare Parts for Secondary Operations (Benchwork)		
H1	Deburr Finished Parts (Benchwork)		
H11	Engrave, Stamp or Etch Part ID's or Spec's on Workpieces (Benchwork)		
F10/G	Separate/Segregate Good Parts From Bad Parts (Milling & Turning)		
F9/G	Tag Parts for Traceability (Milling & Turning)		
A12 A6	Measure GD&T (Inspection) Measure Part Features, Profiles & Dimensions Optically, Comparatively or Using CMM (Inspection)		

WORK PROCESS SCHEDULE
CNC OPERATOR – MILLING AND TURNING INTERMEDIATE COMPETENCIES
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB
(Prep Checks in Bold)

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
A4	Review Part Prints & Identify Critical Dimensions (match part to print)		
A20 **A17** ✓ **A8**	**Test & Verify Calibrations of Inspection Instruments Measure Part/Feature Height/Depth (Inspection) Measure Threads**		
A10	Measure Tapers (Inspection)		
A9	Measure Bores (Inspection)		
A7	Measure/Check Surface Finish (Inspection)		
A13	Record Quality/Compliance (Inspection) Information & Data		
B15	Obtain & Stage Inspection Instruments and Gaging Devices (Job Planning & Prep		
B13	Stage Material, Tooling & Fixtures at Work Center (Job Planning & Prep)		
C3	Check & Replenish Hydraulic/Way-Lube Fluids & Spindle Oils (Equip. Maintenance		
B5	Obtain, Review & Verify Part Print and Job Packet (Job Planning & Prep)		
D6/E	Load/Download Existing CNC Programs (Milling & Turning)		
B14	Inspect Crane/Hoist & Rigging for Safety and Function (Job Planning & Pre		
C9	Check & Tighten Tooling (Equip. Maintenance)		
F15/G	Conduct Shift Change & Exchange Information		

WORK PROCESS SCHEDULE
CNC OPERATOR – MILLING AND TURNING INTERMEDIATE COMPETENCIES (CONT.)
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
	Turning Set-up & Operations	n/a	
E17 ✓	**Startup Machine, Run Warm-up Cycle & Shut Down Machine (Set-up)**		
G16 ✓	**Re-start CNC for Turning Operations**		
E1	Install/Indicate Chucking Devices (Set-up)		
E3	**Bore Soft Jaw (Turning)**		
E8 **E21** ✓ **E4**	**Install/Setup Tooling (Set-up)** **Adjust/Edit Tool & Turning Work Offsets** **Install "Live" Tooling**		
E2	Install/Indicate Turning Workholding Fixtures (Set-up)		
E16	Check Position & Verify Delivery of Coolants and Fluids for Turning Operations (Set-up)		
E6	Prepare, Adjust & Load Bar Feeder (Set-up)		
E14	Set/Verify Hydraulic Pressures (Set-up)		
G5 ✓	**Inspect Turned Parts in Accordance With Inspection/Process Plan**		
G6	Monitor, Control & Adjust Turning Processes (Turning Operations)		
G3	Identify/Replace Worn Tooling (Turning Operations)		
G1	Load, Feed & Unload Turned Work pieces (Turning Operations)		
	Milling Set-up & Operations	n/a	
D10 ✓	**Start Mill, Run Warm-up Cycle & Shut Down Machine (Set-up)**		
F17 ✓	**Re-start CNC Milling Operations (Milling Operations)**		
D1 ✓	**Install & indicate Work holding Fixtures (Set-up)**		
D3 **D16** ✓	**Install/Set Tooling (Setup)** **Adjust/Edit Tool Offsets & Work Offsets**		
F1	Load, Feed & Unload Milled Work pieces (Milling Operations)		
F3	Replace or Identify Worn Tooling (Milling Operations)		

WORK PROCESS SCHEDULE
CNC OPERATOR – MILLING AND TURNING INTERMEDIATE COMPETENCIES (CONT.)
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
F5	Inspect Milled Parts for Compliance While Adhering to Frequency of Inspections (Milling Operations)		
F6	Monitor, Adjust & Control Milling Processes (Milling Operations)		
H8	Prepare Parts for Secondary Operations (Benchwork)		
H1 ✓	**Deburr Finished Parts (Benchwork)**		
H11	Engrave, Stamp or Etch Part ID's or Spec's on Work pieces (Benchwork)		
F10/G	Separate/Segregate Good Parts From Bad Parts (Milling & Turning)		
F9/G	Tag Parts for Traceability (Milling & Turning)		
A12 **A6** ✓	**Measure GD&T (Inspection)** **Measure Part Features, Profiles & Dimensions Optically, Comparatively or Using CMM (Inspection)**		

WORK PROCESS SCHEDULE
CNC OPERATOR – MILLING AND TURNING: ADVANCED LEVEL
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB
Training Requirements Assessment: CNC Operator Advanced Competencies

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
E15	Load Work piece for First Article training Operations (Set-up)		
E12	Dry Run/Prove Out CNC Turning Programs (Setup)		
E18 E19 E20	Turn First Part/s (Set-up) Inspect First (Article) Piece part/s for Quality and Compliance Adjust/Edit CNC Turning Programs		
E13	Calibrate Tool and Turning Probes (Turning Set-up)		
G4	Establish Tool Life Benchmarks (Turning Operation)		
D8	Load Work piece for First Article Milling Operations (Set-up)		
D7	Dry-Run/Prove Out CNC Milling Programs (Set-up)		
D13 D14 D15	Mill First Part/s (Set-up) Inspect First (Articles) Piece parts for Quality and Compliance Adjust/Edit CNC Milling Programs (Set-up)		
D11	Calibrate Spindle & Tool Probes (Milling Set-up)		
F4	Establish Tool Life Benchmarks (Milling Operations)		
J2	Find Out Why Tooling has Broken Or Showing Premature Wear		
J1	Determine (Isolate the cause of) why Chatter has Occurred		
J6	Respond to (Isolate the cause of) Machine Control Alarms		
J7	Respond to (Isolate the cause of) Missing or Out-of-Tolerance features on a Part		
J8	Find Out Why a Part has Excessive Burr		

WORK PROCESS SCHEDULE
CNC OPERATOR – MILLING AND TURNING ADVANCED COMPETENCIES
O*NET-SOC CODE: 51-4034.00 RAPIDS CODE: 1094CB
(Prep Checks in Bold)

Task Code	OJL Activity	Date Competency Started	Date Competency Completed
B12	Sequence Machining and Secondary Operations (Job Planning)		
B4	Determine Raw Material Needs for Job (Job Planning)		
E15	Load Work piece for First Article training Operations (Set-up)		
E12	Dry Run/Prove Out CNC Turning Programs (Set-up)		
E18 **E19** ✓ **E20**	**Turn First Part/s (Setup)** **Inspect First (Article) Piecepart/s for Quality and Compliance** **Adjust/Edit CNC Turning Programs**		
E13	Calibrate Tool and Turning Probes (Turning Set-up)		
G4	Establish Tool Life Benchmarks (Turning Operation)		
D8	Load Workpiece for First Article Milling Operations (Set-up)		
D7	Dry-Run/Prove Out CNC Milling Programs (Set-up)		
D13 **D14** ✓ **D15**	**Mill First Part/s (Set-up)** **Inspect First (Articles) Piece parts for Quality and Compliance** **Adjust/Edit CNC Milling Programs (Set-up)**		
D11	Calibrate Spindle & Tool Probes (Milling Set-up)		
F4	Establish Tool Life Benchmarks (Milling Operations)		
J2	Find Out Why Tooling has Broken Or Showing Premature Wear		
J1 ✓	**Determine (Isolate the cause of) why Chatter has Occurred**		
J6	Respond to (Isolate the cause of) Machine Control Alarms		
J7	Respond to (Isolate the cause of) Missing or Out-of-Tolerance features on a Part		
J8	Find Out Why a Part has Excessive Burr		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
SPECIFIC COMPETENCY ASSESSMENT
NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING COMPANY SPECIFIC COMPETENCIES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
COMPANY SPECIFIC COMPETENCY RECORD
NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained*, are required for the apprentice to attain each company specific competency.

1.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

2.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

3.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

4.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

5.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

6.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

7.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

8.

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

9.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

10.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

11.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

12.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

13.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

14.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

15.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

16.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

17.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

18.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

19.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

20.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

21.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

22.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

23.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

24.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

25.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

26.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

27.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

28.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD

NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING CREDENTIALING RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials, and Safety	
2.	CNC Operations - Milling	
3.	CNC Operations - Turning	
4.	Job Planning, Benchwork, and Safety	
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING
JOB PERFORMANCE ASSESSMENT FORM

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED CNC OPERATOR – MILLING AND TURNING JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR

DATE OF LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified CNC Operator- Milling and Turning**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified CNC Operator- Milling and Turning**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

Appendix A.12

Core Competency Requirements
NIMS Certified CNC Machinist

I. CNC MACHINIST SKILL LEVEL: BASIC COMPETENCIES

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Parts for Quality & Compliance*		
A1	Select & Stage Measuring Tools, Devices and Gages		
A2	Verify Calibration of Instruments & Gages		
A4	Measure Hole Locations, Diameters & Depth		
A7	Measure ID/OD		
A8	Determine/Test Material Hardness		
A10	Measure Counterbore/Countersink		
A12	Complete QC/Inspection Reports		
A15	Measure Height, Width & Diameter of Part		
A16	Check In-Process Material/Parts for Flaws & Defects		
A18	Segregate Bad Parts From Good Parts		
A20	Tag Parts for Traceability		
A21	Adhere to Pre/Post & In-Process Inspection Requirements		
B	*Plan Job and Prepare Materials, Work Station & Safety Devices*		
B1	Select/Verify Material by Type		
B2	Cut Material to Rough Size		
B3	Measure Material Thickness, Diameter & Length		
B4	Move/Stage Raw Material		
B6	Obtain, Review & Verify Print or CAD Drawing (Job Packet)		
B10	Clean & Housekeep Workstations		
B11	Check Chip Shields for Function		
B12	Check Overall Condition of Machines		
B13	Inspect Crane & Rigging for Capacity and Function		
B14	Remove Wrapping, Packaging or Banding From Raw Materials		
B15	Determine, Prepare & Set-up Scrap or Chip Bins/Containers		
B16	Remove & Store Previous Tooling and Job Articles		
B17	Clean & Check Splash Guards		
B19	Lubricate Machines		

I. CNC Machinist Basic Competencies (cont.)

Duty Area	Task	Date Completed	Supervisor Signature
C	*Perform Benchwork & Layout Activities*		
C1	Deburr Material & Parts		
C2	Polish Parts		
C4	Tap Parts by Hand		
C5	Ream Parts by Hand		
C7	Blue Part & Scribe Shape		
C8	Layout & Center-Punch Hole Locations		
C10	Press Pins, Sleeves & Bushings (In or Out)		
C11	Cut Thread With Die		
D	*Milling Set-up, Operations & Processes (CNC/Non-CNC)*		
D2	Indicate & Install Mill Work Holding Devices		
D3	Tram Milling Head		
D4	Locate Origin of Work piece		
D5	Square Block		
D6	Drill/Cut Holes on Work piece		
D7	Ream/Tap Holes		
D8	Counterbore/Countersink Holes		
D11	Cut Slots		
D15	Set Mill Speeds & Feeds		
D17	Program CNC Mill (Conventional & G/M Codes)		
D18	Monitor & Control CNC Milling Operations		
D19	Startup/Stop CNC Mill		
E	*Turning Setup, Operations & Processes (CNC/Non-CNC)*		
E1	Install Turning Workholders		
E3	Set Turning Speeds & Feeds		
E7	Drill/Cut Holes on Work piece		
E8	Drill, Ream & Tap Holes		
E9	Indicate Work piece		
E11	Cut Diameters (ID/OD)		
E12	Cut Face to Length		
E17	Deburr or Polish Work piece on Lathe		
E21	Start-up/Stop CNC Lathe		
E22	Monitor & Control CNC Lathe Operations		
G	*Troubleshoot Equipment, Process and Part Compliance Problems (Selected Examples)*		
G3	Respond to a Tool Break Situation		

II. CNC MACHINIST SKILL LEVEL: INTERMEDIATE COMPETENCIES

Duty Area	Task	Date Completed	Supervisor Signature
A	*Inspect Parts for Quality & Compliance*		
A3	Measure Angles & Tapers		
A5	Determine Finishing Requirements		
A6	Check/Measure Finishing Specifications & Cosmetics		
A9	Measure/Verify GD&T		
A11	Measure Threads & Gears		
A13	Measure Profiles (Shadow or Reflection)		
A14	Measure Radius/Radii & Chamfer		
A17	Collect & Review SPC Data		
A19	Determine & Separate Parts for Rework		
B	*Plan Job and Prepare Materials, Work Station & Safety Devices*		
B5	Locate & Inspect Available Workstations		
B7	Calculate Speeds & Feeds		
B8	Review/Establish Sequence of Operations		
B9	Calculate Unknown or Hidden Dimensions or Features		
B18	Determine & Obtain Cutting Tools		
B20	Service/Replenish Coolant & Cutting Fluids		
B21	Select & Download an Existing CNC Program		
C	*Perform Benchwork & Layout Activities*		
C3	Lap Parts		
C6	Broach Parts by Hand		
C12	Straighten Material or Part		
D	*Milling Set-up, Operations & Processes (CNC/Non-CNC)*		
D9	Cut Angles		
D10	Cut Keyways/Keyseats		
D12	Cut Radius & Profiles (ID/OD)		
D13	Cut ID/OD With Boring Head		
D16	Edit CNC Program		
E	*Turning Setup, Operations & Processes (CNC/Non-CNC)*		
E2	Assemble & Install Toolholders and Posts (Includes "Live" Tooling)		
E4	Chase Threads (ID/OD)		
E5	Knurl OD		
E6	Groove OD/ID, Face & Cutoff		
E10	Cut Tapers (ID/OD)		

II. Precision Machinist Intermediate Competencies (cont.)

Duty Area	Task	Date Completed	Supervisor Signature
E	*Turning Setup, Operations & Processes (CNC/Non-CNC)*		
E13	Cut Radius & Profiles (ID/OD)		
E14	Bore/Cut Soft Jaws		
E15	Install & Position Steady-Rest I Follower-Rest		
E16	Adjust & Monitor Bar Feeder		
E18	Turn Between Centers		
E20	Edit CNC Lathe Program		
E24	Program CNC Lathe		
F	*Grind Parts, Components & Surfaces*		
F1	Check/Position Tool Rests		
F2	Select & Mount Grinding Wheel		
F3	Dress & True Grinding Wheel		
F4	Balance Wheel		
F5	Re-Surface Chuck Faces		
F6	Install & Set Grinder Workholders		
F7	Spark/Touch-Off Work piece		
F8	Square-Off Work piece		
F9	Grind OD/ID		
F10	Grind Angles & Profiles		
F11	Cut Off Work piece		
F12	Edit or Program CNC Grinder		
F13	Start-up/Shut Down CNC Grinder		
F14	Monitor & Control CNC Grinding Operations		
G	*Troubleshoot Equipment, Process and Part Compliance Problems (Selected Examples)*		
G1	Determine Why Surface Finish is Out of Spec (e.g., Chatter)		
G2	Find Out Why Tooling is Under Performing or Showing Premature Wear		
G4	Determine Why Cycle Time is Too Long		
G5	Find Out Why Critical Dimensions or GD&T is Out of Tolerance		
G6	Isolate the Cause of Why a CNC Program Will Not Download		
G7	Analyze Why SPC is Not Meeting Stated Standard or Limits		
G8	Determine Why Grinding Wheel Has Premature or Excessive Wear		
G9	Isolate the Cause of Excessive Burr on a Work piece		
G10	Find Out Why Lathe Chips Will Not Break		

III. CNC MACHINIST SKILL LEVEL: ADVANCED COMPETENCIES

Duty Area	Task	Date Completed	Supervisor Signature
D	*Milling Set-up, Operations & Processes (CNC/Non-CNC)*		
D14	Calculate & Prepare a CNC Thread Milling Operations		
D24	Modify Tooling		
E	*Turning Set-up, Operations & Processes (CNC/Non-CNC)*		
E23	Modify Tooling		

Required NIMS Credentials

In order to demonstrate proficiency in all of the competencies listed in this appendix, the apprentice will have completed all of the following NIMS Credentials.

Name of Credential	Date Completed	Supervisor Signature
Measurement, Materials and Safety		
Job Planning, Benchwork, and Layout		
Grinding Skills I (Optional)		
Drill Press Skills		
CNC Milling: Operations		
CNC Turning: Operations		
Surface Grinding Skills II (Optional)		
Cylindrical Grinding Skills II (Optional)		
CNC Milling: Programming Set-up and Operations		
CNC Turning: Programming Set-up and Operations		
EDM – Plunge (Optional)		
EDM – 2 Axis Wire (Optional)		
CNC Milling Skills II		
CNC Turning Skills II		

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC MACHINIST
CORE COMPETENCY ASSESSMENT FORM

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Core Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED MACHINIST CORE COMPETENCIES

1.	Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	
2.	Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirements and Guidelines	
3.	Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	
4.	Part Inspection	
5.	Process Control	
6.	Process Adjustment – Single Part Production	
7.	Participation in Processes Improvement	
8.	Manual Operations: Layout	
9.	Manual Operations: Benchwork	
10.	Sawing	
11.	Job Process Planning	
12.	Drilling Operations	
13.	CNC Operations – Turning Level I	
14.	CNC Operations – Milling Level I	
15.	CNC Operations – Turning Level II	
16.	CNC Operations – Milling Level II	
17.	Milling: Square Up a Block	
18.	CNC Turning: Programming Setup and Operations Level I	
19.	CNC Milling: Programming Setup and Operations Level I	
20.	CNC Turning: Programming Setup and Operations Level II	
21.	CNC Milling: Programming Setup and Operations Level II	
22.	Surface Grinding, Grinding Wheel Safety (Optional)	
23.	Surface Grinding, Horizontal Spindle, Reciprocating Table - Level I Machining Skills (Optional)	
24.	Surface Grinding, Horizontal Spindle, Reciprocating Table - Level II Machining Skills (Optional)	
25.	CNC Programming - Milling and / or CNC Programming - Turning - Level I Machining Skills	
26.	CNC: Write a Simple CNC Milling and / or CNC Turning Program and Review Tool Path - Level I	
27.	CNC: Operate a CNC Milling Machine and / or Operate a CNC Lathe - Level I Machining Skills	
28.	General Housekeeping & Maintenance	
29.	Preventative Maintenance - Machine Tools	
30.	Tooling Maintenance	

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED MACHINIST CORE COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each NIMS Core Competency, the *Date the NIMS Core Competency was attained*, are required for the apprentice to attain each NIMS Core Competency.

---

1. Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

---

2. Demonstrate Compliance with Lock-out/Tag-out Procedures and OSHA Requirements and Guidelines

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

---

3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

---

4. Part Inspection

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

---

5. Process Control

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

---

6. Process Adjustment – Single Part Production

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

---

7. Participation in Processes Improvement

_____ DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED

8. Manual Operations: Layout

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

9. Manual Operations: Benchwork

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

10. Sawing

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

11. Job Process Planning

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

12. Drilling Operations

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

13. CNC Operations – Turning Level I

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

14. CNC Operations – Milling Level 1

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

15. CNC Operations – Turning Level II

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

16. CNC Operations – Milling Level II

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

17. Milling: Square Up a Block

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

18. CNC Turning: Programming Set-up and Operations Level I

DATE TRAINING STARTED | DATE COMPETENCY ATTAINED

19. CNC Milling: Programming Set-up and Operations Level I

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

20. CNC Turning: Programming Set-up and Operations Level II

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

21. CNC Milling: Programming Set-up and Operations Level II

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

22. Surface Grinding, Grinding Wheel Safety (Optional)

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

23. Surface Grinding, Horizontal Spindle, Reciprocating Table - Level I Machining Skills (Optional)

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

24. Surface Grinding, Horizontal Spindle, Reciprocating Table - Level II Machining Skills (Optional)

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

25. CNC Programming - Milling and/or CNC Programming - Turning - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

26. CNC: Write a Simple CNC Milling and/or CNC Turning Program and Review Tool Path - Level I

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

27. CNC: Operate a CNC Milling Machine and / or Operate a CNC Lathe - Level I Machining Skills

DATE TRAINING STARTED _____ DATE COMPETENCY ATTAINED _____

28. General Housekeeping & Maintenance

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

29. Preventative Maintenance - Machine Tools

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

30. Tooling Maintenance

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC MACHINIST
COMPANY SPECIFIC COMPETENCY ASSESSMENT

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each Company Specific Competency as the apprentice demonstrates a level of proficiency that is equivalent to a journeyworker level employee.

NIMS CERTIFIED CNC MACHINIST COMPANY SPECIFIC COMPETENCIES

31.		
32.		
33.		
34.		
35.		
36.		
37.		
38.		
39.		
40.		
41.		
42.		
43.		
44.		
45.		
46.		
47.		
48.		
49.		
50.		
51.		
52.		
53.		
54.		
55.		
56.		

COMMENTS: _____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS COMPETENCY-BASED APPRENTICESHIP SYSTEM
NIMS CERTIFIED CNC MACHINIST
COMPANY SPECIFIC COMPETENCY RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Provide the *Date the Training Started* for each company specific competency, the *Date the Competency was attained* for the apprentice to attain each company specific competency.

31.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

32.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

33.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

34.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

35.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

36.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

37.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

38.

_____ _____
DATE TRAINING STARTED DATE COMPETENCY ATTAINED

39.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

40.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

41.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

42.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

43.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

44.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

45.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

46.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

47.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

48.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

49.

DATE TRAINING STARTED DATE COMPETENCY ATTAINED

50.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

51.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

52.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

53.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

54.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

55.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

56.

DATE TRAINING STARTED

DATE COMPETENCY ATTAINED

RELATED INSTRUCTION RECORD
NIMS CERTIFIED CNC MACHINIST

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off each completed Related Instruction Course. Satisfactory completion may be determined by the apprentice's ability to attain the required Core and company specific competencies and corresponding NIMS Credentials.

NIMS CERTIFIED CNC MACHINIST RELATED INSTRUCTION COURSES

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED CNC MACHINIST CREDENTIALING RECORD

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the NIMS Credential when the apprentice meets both the hands-on assessment and theoretical examination requirements and is awarded the NIMS Credential.

NIMS CREDENTIALS ALIGNED WITH CORE COMPETENCIES

1.	Measurement, Materials and Safety	
2.	Job Planning, Benchwork, and Layout	
3.	Grinding Skills I (Optional)	
4.	Drill Press Skills	
5.	CNC Milling: Operations	
6.	CNC Turning: Operations	
7.	Surface Grinding Skills II (Optional)	
8.	Cylindrical Grinding Skills II (Optional)	
9.	CNC Milling: Programming Set-up and Operations	
10	CNC Turning: Programming Set-up and Operations	
11.	EDM – Plunge (Optional)	
12.	EDM – 2 Axis Wire (Optional)	
13.	CNC Milling Skills II	
14.	CNC Turning Skills II	
	NIMS CREDENTIALS ALIGNED WITH COMPANY SPECIFIC COMPETENCIES	
15.		
16.		
17.		
18.		
19.		
20.		
21.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

NIMS CERTIFIED CNC MACHINIST JOB PERFORMANCE ASSESSMENT FORM

APPRENTICE: _____ EMPLOYEE NUMBER: _____

SUPERVISOR: _____ DEPARTMENT: _____

INSTRUCTIONS: Check-off the Job Performance Criteria as the apprentice meets the terms and conditions contained within the Standards of Apprenticeship, including the Sponsor's rules and policies, and completes all assignments as the Sponsor may deem necessary to develop a level of competency and proficiency equivalent to a journeyworker Machinist.

NIMS CERTIFIED MACHINIST JOB PERFORMANCE ASSESSMENT CRITERIA

1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
26.		
27.		
28.		

COMMENTS: _____

_____

_____

APPRENTICE'S SIGNATURE: _____ DATE: _____

SUPERVISOR'S SIGNATURE: _____ DATE: _____

SAMPLE COMPLETION MEMO

LETTERHEAD OF APPRENTICESHIP SPONSOR DATE OF

LETTER

MEMORANDUM FOR: REGISTRATION AGENCY

ADDRESS OF REGISTRATION AGENCY

FROM: APPRENTICESHIP SPONSOR

SUBJECT: **Request for Certificate of Completion of Apprenticeship**

The following apprentice has satisfactorily completed the requirements of the Standards of Apprenticeship registered with the ***REGISTRATION AGENCY*** for the occupation of **NIMS Certified CNC Machinist**. See the attached **Application for Certification of Completion of Apprenticeship** for details.

The apprentice has completed all on-the-job learning and related instruction requirements, and attained the required Core Competencies and corresponding NIMS Credentials as defined in the Core Competency Requirements for a **NIMS Certified CNC Machinist**. In addition, the apprentice has demonstrated a level of competency and proficiency equivalent to a journeyworker level employee.

It is recommended that a **Certificate of Completion of Apprenticeship** be awarded to the completing apprentice.

Thank you for your continued cooperation.

_____
SIGNATURE OF SPONSOR

_____
SPONSOR'S PRINTED NAME

_____
TITLE

APPENDIX B

ETA-671 Apprenticeship Agreement
AER SPONSOR MANUAL

Program Registration and
Apprenticeship Agreement
Office of Apprenticeship

U.S. Department of Labor
Employment and Training Administration

APPRENTICE REGISTRATION-SECTION II OMB No. 1205-0223 Expires: 01/31/2012

Warning: This agreement does not constitute a certification under Title 29, CFR, Part 5 for the employment of the apprentice on Federally financed or assisted construction projects. Current certifications must be obtained from the Office of Apprenticeship (OA) or the recognized State Apprenticeship Agency shown below. (Item 22)

The program sponsor and apprentice agree to the terms of the Apprenticeship Standards incorporated as part of this Agreement. The sponsor will not discriminate in the selection and training of the apprentice in accordance with the Equal Opportunity Standards in Title 29 CFR Part 30.3, and Executive Order 11246. This agreement may be terminated by either of the parties, citing cause(s), with notification to the registration agency, in compliance with Title 29, CFR, Part 29.6

PART A: TO BE COMPLETED BY APPRENTICE. NOTE TO SPONSOR: PART A SHOULD ONLY BE FILLED OUT BY APPRENTICE

1. Name (Last, First, Middle) and Address *Social Security Number
- -
(No., Street, City, State, Zip Code, Telephone Number)

2. Date of Birth (Mo., Day, Yr.)

3. Sex (Mark one)
☐ Male ☐ Female

Answer Both A and B **(Voluntary)**
(Definitions on reverse)

4. a. Ethnic Group (Mark one)
☐ Hispanic or Latino
☐ Not Hispanic or Latino

b. Race (Mark one or more)
☐ American Indian or Alaska native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or other Pacific Islander
☐ White

5. Veteran Status (Mark one)
☐ Non-Veteran
☐ Veteran

6. Education Level (Mark one)
☐ 8th grade or less
☐ 9th to 12th grade
☐ GED
☐ High School Graduate or Greater
☐ Post Secondary or Technical Training

7. Career Linkage or Direct Entry (Mark one) (Instructions on reverse) ☐ None ☐ Incumbent Worker ☐ Adult ☐ Youth
☐ Dislocated Worker ☐ Trade Adjustment Assistance ☐ Job Corps ☐ School-to-Registered Apprenticeship
☐ YouthBuild ☐ HUD/STEP-UP ☐ Direct Entry:_____

8. Signature of Apprentice Date

9. Signature of Parent/Guardian (if minor) Date

PART B: SPONSOR:

10. Sponsor Program No.

Sponsor Name and Address (No. Street, City, County, State, Zip Code

11a. Trade/Occupation (The work processes listed in the standards are part of this agreement).

11b. Occupation Code

12. Term (Hrs., Mos., Yrs.)

13. Probationary Period (Hrs., Mos., Yrs.)

14. Credit for Previous Experience (Hrs., Mos., Yrs.)

15. Term Remaining (Hrs., Mos., Yrs.)

16. Date Apprenticeship Begins

17a. Related Instruction (Number of Hours Per Year)

17b. Apprentice Wages for Related Instruction
☐ Will Be Paid
☐ Will Not Be Paid

17c. Related Training Instruction Source

18. Wages: (Instructions on reverse)

18a. Pre-Apprenticeship Hourly Wage $ _____ Apprentice's Entry Hourly Wage 18b. $_____ Journeyworker's Hourly Wage18c. $_____

Check Box	Period 1	2	3	4	5	6	7	8	9	10
18d. Term ☐ Hrs., ☐ Mos., or ☐Yrs.										
18e. Wage Rate (Mark one) % ☐ or $ ☐										

19. Signature of Sponsor's Representative(s) Date Signed

20. Signature of Sponsor's Representative(s) Date Signed

21. Name and Address of Sponsor Designee to Receive Complaints (If applicable)

PART C: TO BE COMPLETED BY REGISTRATION AGENCY

22. Registration Agency and Address

23. Signature (Registration Agency)

24. Date Registered

25. Apprentice Identification Number (Definition on reverse):

Item 4.a. Definitions:

Hispanic or Latino. A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race. The term, "Spanish origin," can be used in addition to "Hispanic or Latino."

Item 4.b. Definitions:

American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa. Terms such as "Haitian" or "Negro" can be used in addition to "Black or African American."

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

Item 7. Instructions:

Indicate any career linkage (definitions follow) or direct entry. Enter "None" if no career linkage or direct entry apply. Enter "Incumbent Worker" if the individual before becoming an apprentice was currently employed full-time by the sponsor or entities participating in the apprenticeship program (Military). Career linkage includes participation in programs that provided employment, training and other services to adults, youth and dislocated workers. Funds for these activities are provided by the U.S. Department of Labor/Employment and Training Administration (U.S. DOL/ETA) to states and local communities.

Adult. Also includes individuals participating in Native American Programs, and/or Migrant and Seasonal Farmworker Programs.

Youth. Includes Youth ages 16-21 years, and other concentrated Youth programs in designated areas.

Dislocated Worker. Includes an individual that has been terminated or laid off and is unlikely to return to the industry or occupation. It also includes a displaced homemaker who has been providing unpaid services to family members in the home, is no longer supported, and is unemployed or underemployed.

Trade Adjustment Assistance. Includes trade-affected workers who have become unemployed as a result of increased imports or shifts in production out of the United States.

Job Corps. Youth ages 16-24 years usually receiving services in a residential setting.

School-to-Registered Apprenticeship. Program designed to allow high school youth ages 16 - 17 to enter a Registered Apprenticeship program and continue after graduation with full credit given for the high school portion.

YouthBuild. Program transferred from the U.S. Department of Housing and Urban Development (HUD) to U.S. DOL/ETA in September 2006. It assists youth ages 16-24 to obtain education and skill training and advance toward post-secondary education and career pathways in construction and other high growth, high demand occupations while building affordable housing in their communities.

HUD/STEP-UP. Developed in conjunction with the U.S. Department of Housing and Urban Development (HUD). The program provides the actual apprenticeship experience and the framework for moving into high-skill Registered Apprenticeship.

Direct Entry. A graduate from an accredited technical training school, Job Corps training program, Youth Build Program, or a participant in a military apprenticeship program, any of which training is specifically related to the occupation and incorporated in the Registered Apprenticeship standards. Also, fill in the name of the program.

Item 18. Wage Instructions:

18a. Pre-Apprentice hourly wage, sponsor enters the individual's hourly wage in the quarter prior to becoming an apprentice.

18b. Journeyworker's wage, sponsor enters wage per hour.

18c. Apprentice's entry hourly wage, (hourly dollar amount paid), sponsor enters this apprentice's entry hourly wage.

18d. Term, sponsor enters in each box the apprentice schedule of pay for each advancement period.

18e. Percent or dollar amount, sponsor marks one.

Note: 18b. If the employer is signatory to a collective bargaining agreement, the journeyworker's wage rate in the applicable collective bargaining agreement is identified. Apprenticeship program sponsors not covered by a collective bargaining agreement must identify a minimum journeyworker's hourly wage rate that will be the basis for the progressive wage schedule identified in item 18e. of this agreement.

18d. The employer agrees to pay the hourly wage rate identified in this section to the apprentice each period of the apprenticeship based on the successful completion of the on-the-job learning and the related instructions outlined in the Apprenticeship Standards. The period may be expressed in hours, months, or years.

18e. The wage rates are expressed either as a percent or in dollars and cents of the journeyworker's wage depending on the industry.

Example - 3 YEAR APPRENTICESHIP PROGRAM

Term	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
hrs., mos., yrs.	1000 hrs.	1000 hrs.	1000 hrs.	1000 hrs.	1000 hrs.	1000 hrs.
%	55	60	65	70	80	90

Example - 4 YEAR APPRENTICESHIP PROGRAM

Term	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8
hrs., mos., yrs.	6 mos.	6 mos.	6 mos.	6 mos.	6 mos.	6 mos.	6 mos.	6 mos.
%	50	55	60	65	70	75	80	90

Item 21. Identifies the individual or entity responsible for receiving complaints (Code of Federal Regulations, CFR, Title 29 part 29.6(k)).

Item 25. Definition: The Registered Apprenticeship Partners Information Data System (RAPIDS), formerly known as the Registered Apprenticeship Information System (RAIS), encrypts the apprentice's social security number and generates a unique identification number to identify the apprentice. It replaces the social security number to protect the apprentice's privacy.

*The submission of your social security number is requested. The apprentice's social security number will only be used to verify the apprentice's periods of employment and wages for purpose of complying with the Program Assessment Rating Tool (2005) of the Office of Management and Budget related to common measures of the Federal job training and employment programs fo measuring performance outcomes and for purposes of the Government Performance and Results Act. The Office of Apprenticeship needs the apprentice's social security number to match th number against the employers' wage records. Also, the apprentice's social security number will be used, if appropriate, for purposes of the Davis Bacon Act of 1931, as amended, U.S. Code Titl 40, Sections 276a to 276a-7, and Title 29 CFR 5, to verify and certify to the U.S. Department of Labor, Employment Standards Administration, that you are a registered apprentice to ensure tha the employer is complying with the geographic prevailing wage of your occupational classification. Failure to disclose your social security number on this form will not affect your right to b registered as an apprentice. Civil and criminal provisions of the Privacy Act apply to any unlawful disclosure of your social security number, which is prohibited.

The collection and maintenance of the data on ETA-671, Apprentice Registration – Section II Form, is authorized under the National Apprenticeship Act, 29 U.S.C. 50, and CFR 29 Part 29.1. Th data is used for apprenticeship program statistical purposes and is maintained, pursuant to the Privacy Act of 1974 (5 U.S.C. 552a.), in a system of records entitled, DOL/ETA-4, Apprenticeshi Information Management System (AIMS), which is now known as (RAPIDS) at the Office of Apprenticeship, U.S. Department of Labor. Data may be disclosed to a State Apprenticeship Counc to determine an assessment of skill needs and program information, and in connection with federal litigation or when required by law.

Persons are not required to respond to this collection of information unless it displays a currently valid OMB control number. Public reporting burden for this collection of information is estimate to average five minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing th collection of information. The obligation to respond is required to obtain or retain benefits under 29 USC 50. Send comments regarding this burden estimate or any other aspect of this collectio of information, including suggestions for reducing this burden, to the U.S. Department of Labor, Office of Apprenticeship, 200 Constitution Avenue, N.W., Room N-5311, Washington, D.C 20210. (Paperwork Reduction Project 1205-0223).

RAPIDS

Registered Apprenticeship Partners Information Data System

SPONSOR QUICK START GUIDE

The purpose of this RAPIDS Sponsor's Quick Start Guide is to enable the new user to Access the system and perform the basic actions of registering, canceling and completing apprentices. For a more extensive and in depth discussion of the capabilities of the RAPIDS system please consult the complete edition of the RAPIDS manual.

Table of Contents

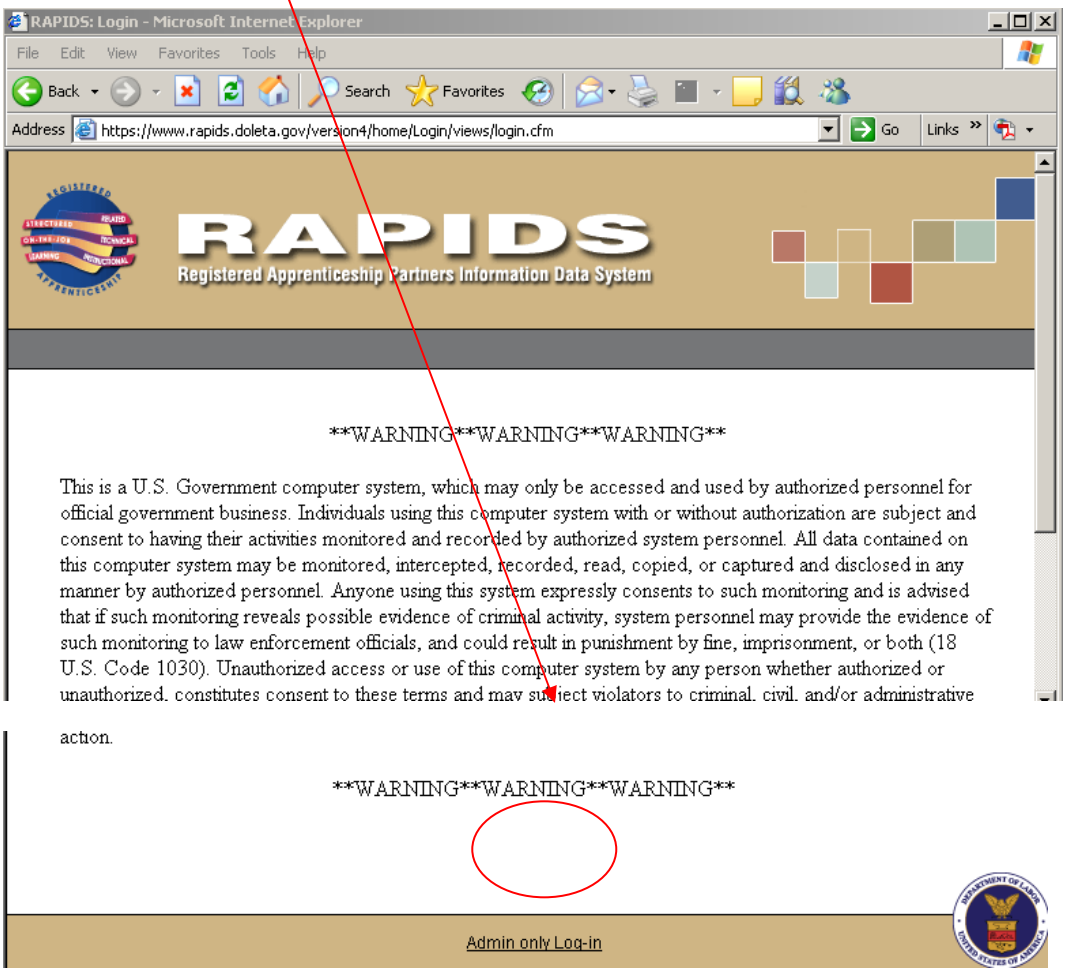
1.1 Accessing the RAPIDS System…….…. page 6
1.2 Log-in……. page 7
1.3 Register Apprentice…….…. page 9
1.4 Complete Apprentice……. page 12
1.5 Cancel Apprentice……. page 14

1.1 Accessing RAPIDS Website

Note: Before beginning the training session, please set up your computer and be ready for the training.

To access RAPIDS:

1. At your browser address box (Internet Explorer is the preferred browser), enter the following URL in the IE Address Box:
   https://www.rapids.doleta.gov
2. The "Security Warning Message" screen appears.
3. Click **Agree**.
4. The RAPIDS login screen appears



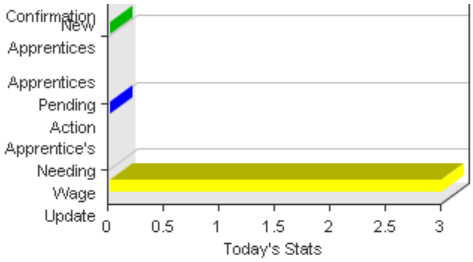
1.2 Log In

These next few steps will show a user how to log in to RAPIDS and prepare to work on the various functions necessary to register apprentices and programs. To log in, follow the steps below:

1. Enter the User ID that was assigned to you in the USER ID box.
2. Enter the password that was assigned to you in the Password box.
3. Click on the **Login** button or press the **Enter** key on your keyboard.

Result: The Home page will display, as shown below:

Apprentices Waiting for Registration Confirmation:	0
Apprentices Registered Today:	0
Incomplete Registrations:	0
Apprentices with changes pending:	0
Apprentice's Needing Wage Update:	3



Totals (Fiscal Year to Date)

Program	Total Active Occupations	Total New Occupations FY To Date	Total Active Apprentices	Total New Apprentices FY To Date	Total Apprentices Completed FY To Date	Total Apprentices Suspended FY To Date
AK000710001	1	0	10	0	0	1

Quick Links

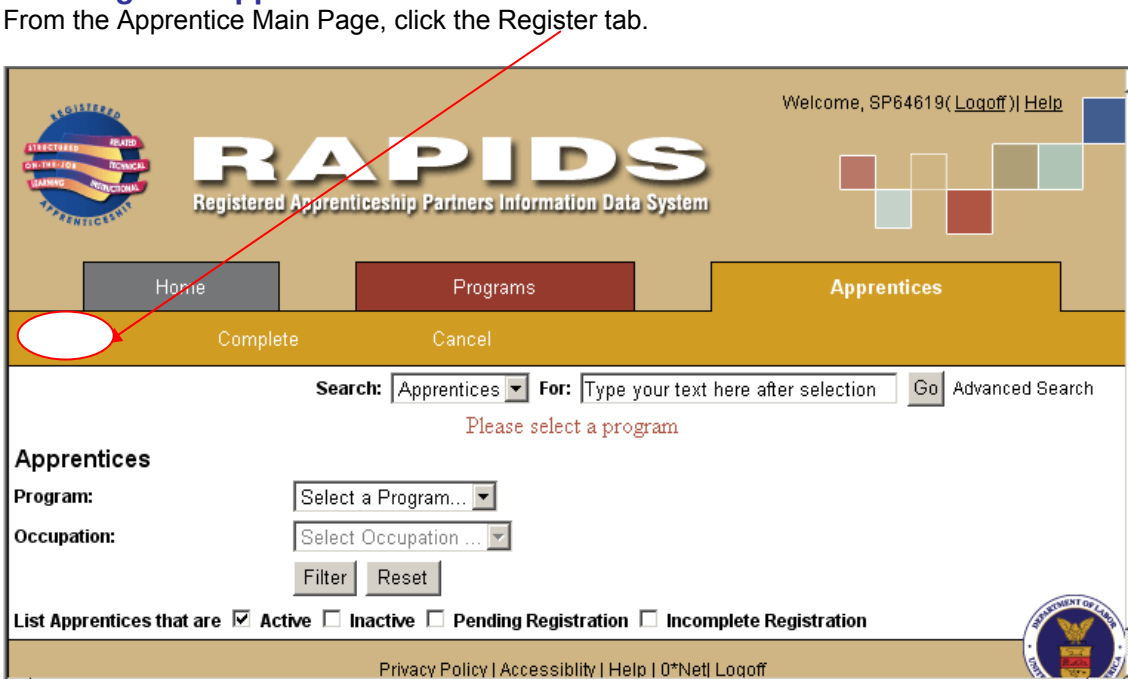
- Register an apprentice

What's New

Privacy Policy | Accessiblity | Help | 0*Net| Logoff

1.3 Register Apprentice

From the Apprentice Main Page, click the Register tab.



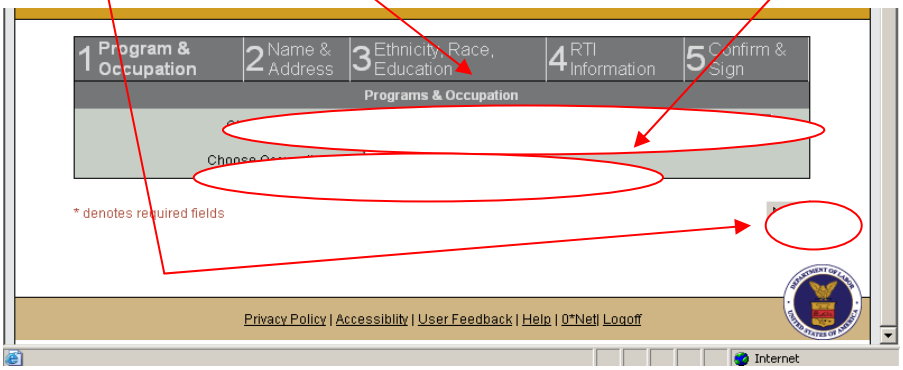
This function allows you to create a new apprentice record. The data elements of an apprentice record are organized into five sub-tabs:

- Program & Occupation
- Name & Address Info
- Ethnicity, Race, Education
- RTI Info
- Confirm & Sign

To create a new apprentice record, follow the steps for each section below:
Note: Entry is required in all fields with an asterisk (*) beside the field name.

On the Program & Occupation Section

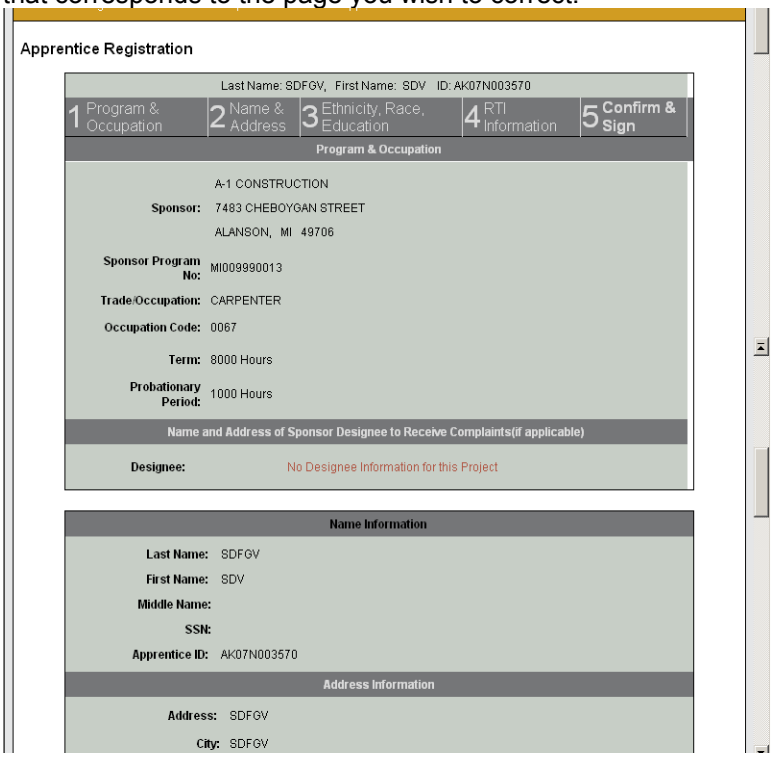
- Select a Program from the drop-down list.
- The system will display the occupation drop-down list. Select the occupation on the drop-down list.
- Click **Next** to proceed to Name & Address section.

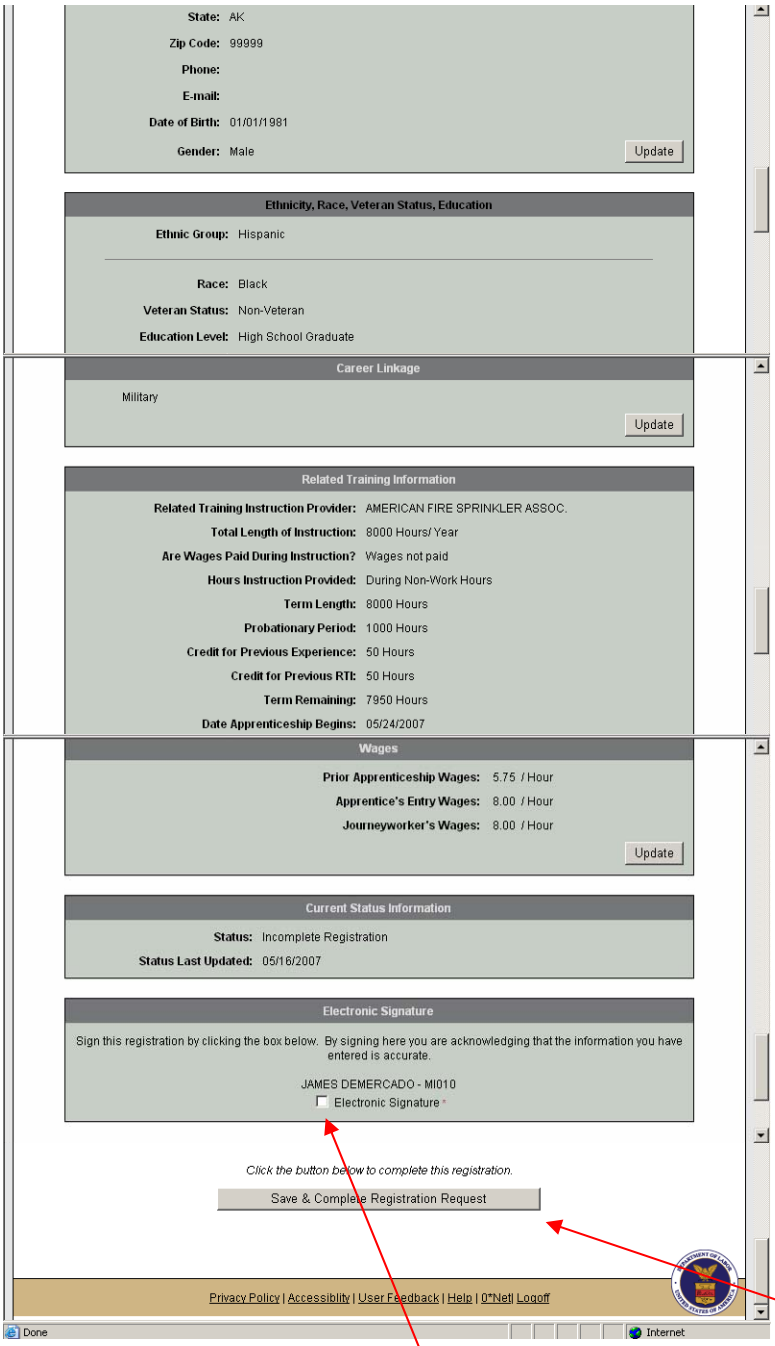


Confirm & Sign Section

Continue entering registration data. In order to complete the process of registering an apprentice, you must confirm by attaching your electronic signature as shown on the next page. When you have completed the last page of data entry, you will be taken to the bottom of a page showing the information you entered, with the Confirm & Sign function at the bottom.

If you wish to change or correct any of the data you entered before confirming, click the **Update** button that corresponds to the page you wish to correct.



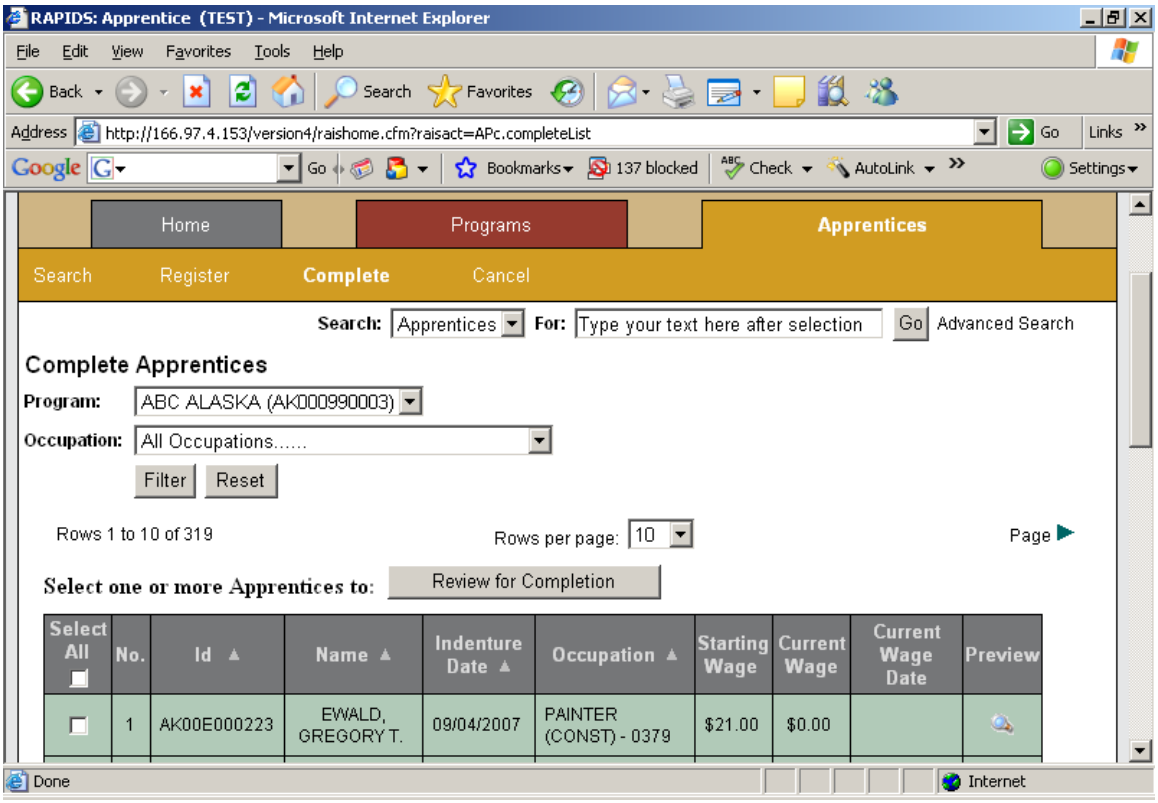


To complete the registration, **check the Electronic Signature box,** and then click the **Save & Complete Registration Request** button. You will be returned to the Apprentice List View page, with the new record added to the list.

Note: After the Apprentice Registration Request is complete, the ATR will review it. If it was approved, then the process is completed. If the ATR declines the Apprentice Registration, the Sponsor can review it on the List View and will have the option to re-submit it.

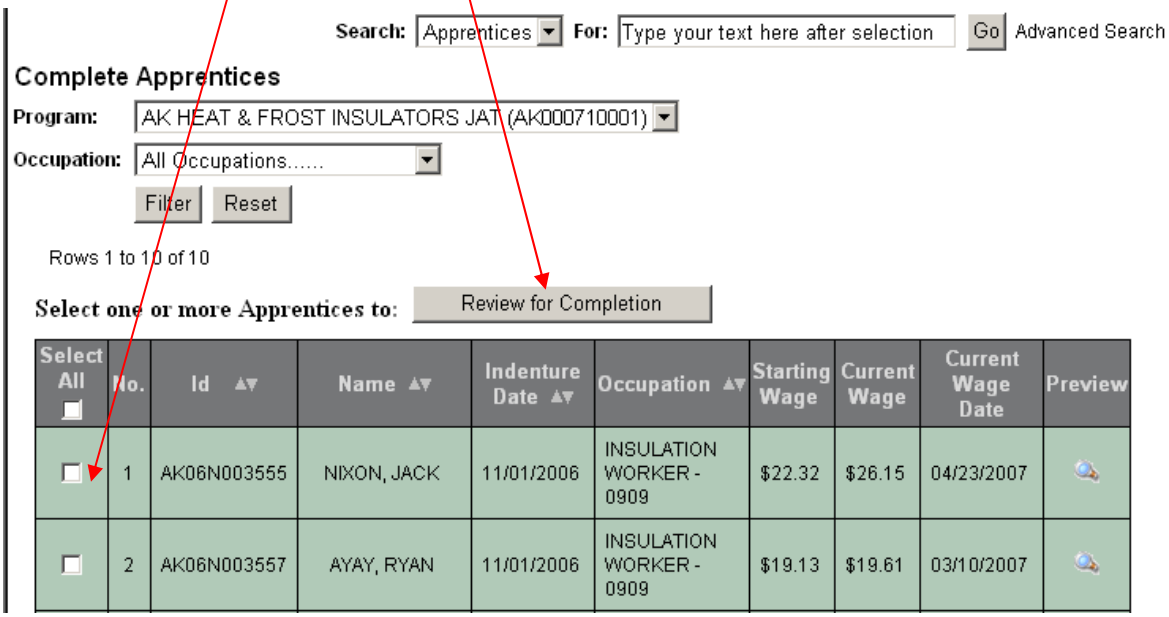
1.4 Complete Apprentice

This function allows you to modify one or more apprentice records to reflect the completion of his or her apprenticeship. To complete an apprenticeship, click the Apprentice tab, then click the Complete sub tab. Select a program and occupation (optional). You will see the table of all active apprentices for which you are responsible, with a preview icon for each one, and a "Select" column on the left containing check-boxes with which to select apprentices for completion.

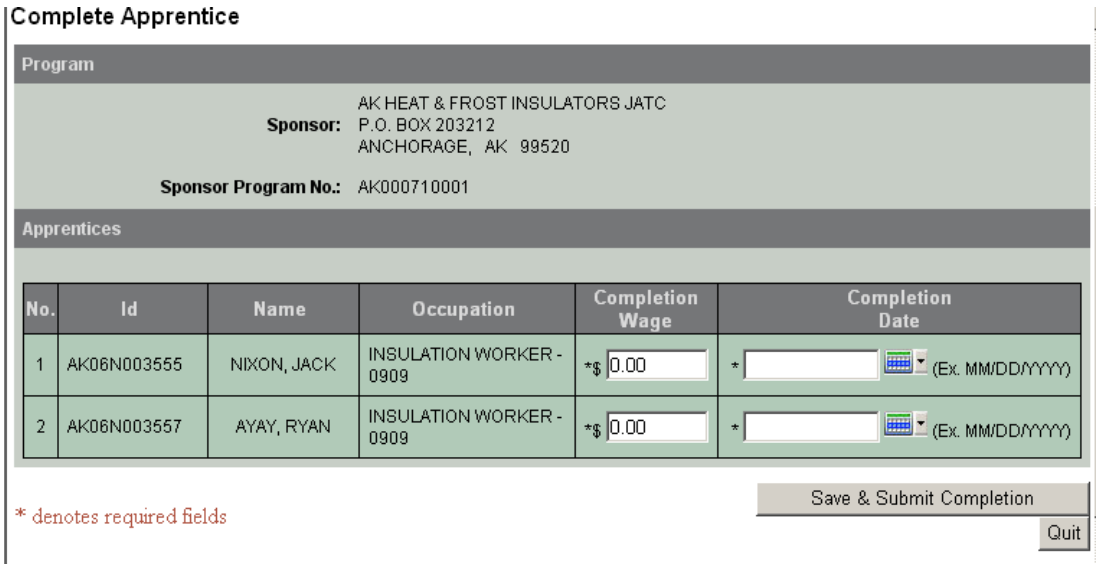


To complete apprentices:

1. Check the box for each apprentice you wish to complete. To complete all of the apprentices in your list, click the Select All box at the top of the column.
2. Click the **Review for Completion** button above the table. You will be shown a table of all of the apprentices you have selected for completion.



Result: System displays the Complete Apprentice form



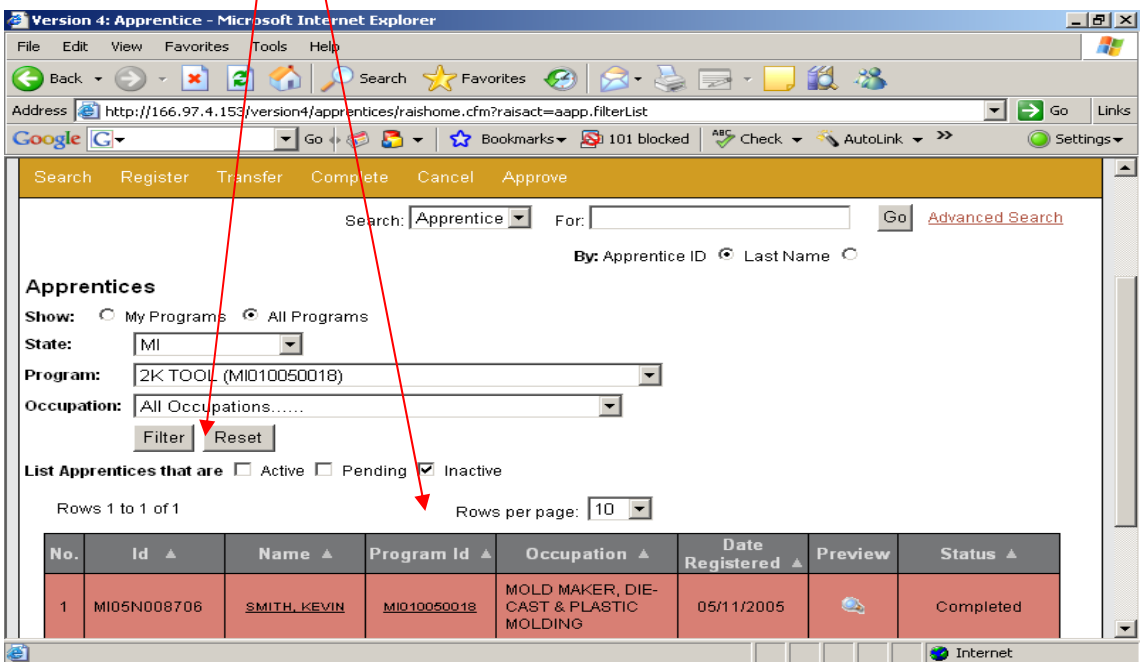
Note: Entry is required in *all* fields with an asterisk (*) beside the field name.

3. Enter the Completion Wage for each apprentice.
4. Enter the Completion Date for each apprentice, in MM/DD/YYYY format; or click the calendar icon to select a date.
5. Click **Save & Submit Completion** to save your request, or **Quit** to cancel the operation.

To verify the Completion Record:

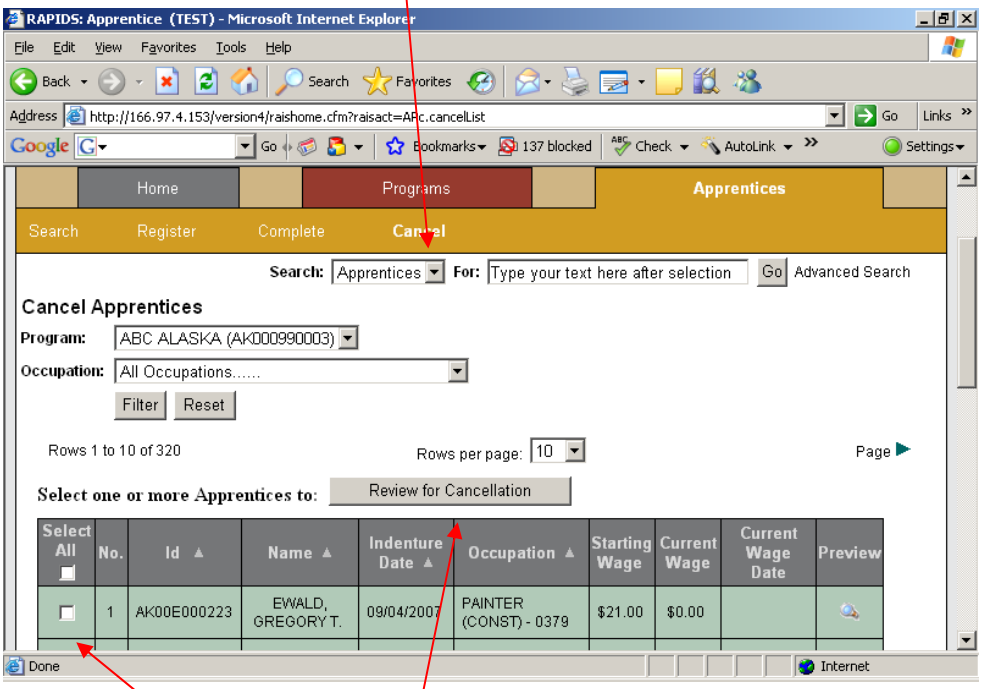
1. Click the Apprentice tab.
2. Select the Program name from the drop down list.
3. Select the occupation from the drop down list (option)
4. Select the “Inactive” option.

Result: The system will display the completed record(s) on the list



1.5 Cancel Apprentice

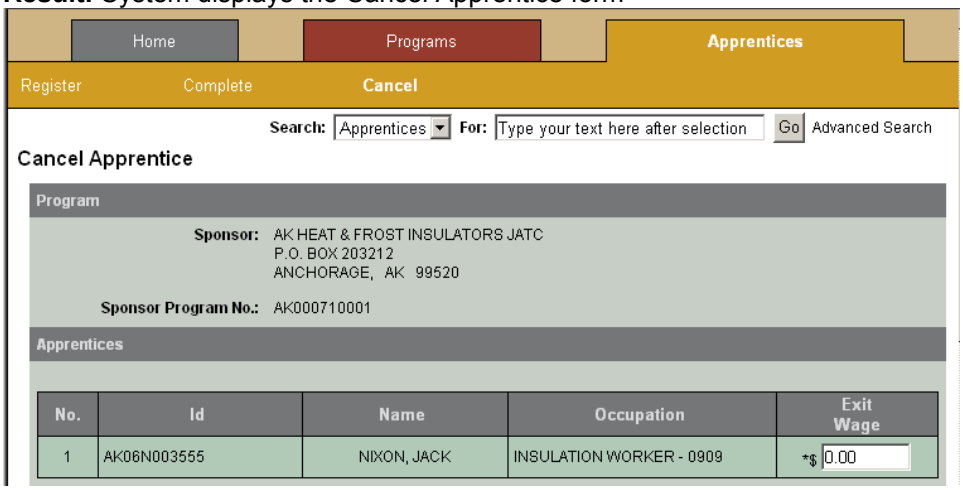
This function allows you to cancel an apprentice's participation in an apprenticeship program. To cancel an apprentice, click the Apprentice tab, then click the **Cancel** sub tab. Select a program and occupation (optional). You will see the list of all active apprentices for which you are responsible, and a "Select" column on the left containing check-boxes with which to select apprentices for cancellation.

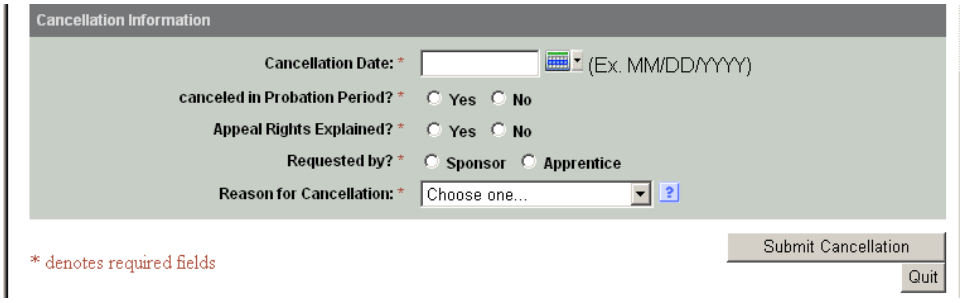


To cancel apprentices:

1. Check the box for each apprentice you wish to cancel. To cancel all of the apprentices in your list, click the **Select All** box at the top of the column.
2. Click the **Review for Cancellation** button above the list. You will be shown a list of all of the apprentices you have selected for cancellation, showing the apprentice's information, and the information about his/her program and occupation.

Result: System displays the Cancel Apprentice form





Note: Entry is required in *all* fields with an asterisk (*) beside the field name.

3. Enter the Cancellation Date for each apprentice, in MM/DD/YYYY format; or click the calendar icon to select a date.
4. Check whether the apprentice is being cancelled within his/her Probation Period.
5. Check whether the apprentice's Appeal Rights were explained.
6. Select the Reason for Cancellation from the drop-down list.
7. Click **Submit Cancellation** to complete the request for cancellation, or **Quit** to cancel the operation.

APPENDIX C

(SAMPLE)
AFFIRMATIVE ACTION PLAN

ADOPTED BY

(INSERT NAME OF SPONSOR)

AS REQUIRED UNDER TITLE 29, CODE OF FEDERAL REGULATIONS, PART 30
AMENDED MAY 12, 1978

DEVELOPED IN COOPERATION WITH THE
U.S. DEPARTMENT OF LABOR
OFFICE OF APPRENTICESHIP

APPROVED BY: _____
REGISTRATION AGENCY

DATE APPROVED: _____

SECTION I – INTRODUCTION

The Sponsor enters this Affirmative Action Plan (AAP) with good faith for the purpose of promoting equality of opportunity into its registered apprenticeship program. The Sponsor seeks to increase the recruitment of qualified women and/or minorities for possible selection into the apprenticeship program in the event women and/or minorities are underutilized in the apprenticeship program. The Sponsor hereby adopts the following nondiscriminatory pledge and AAP.

This AAP is a supplement to the Apprenticeship Standards. Any changes made by the sponsor will become part of this written AAP, once approved by the Registration Agency.

SECTION II - EQUAL OPPORTUNITY PLEDGE

The Sponsor commits to the following Equal Opportunity Pledge:

"The recruitment, selection, employment, and training of apprentices during their apprenticeship, shall be without discrimination because of race, color, religion, national origin, or sex. The sponsor will take affirmative action to provide equal opportunity in apprenticeship and will operate the apprenticeship program as required under Title 29 of the Code of Federal Regulations, part 30."

SECTION III - UTILIZATION AND ANALYSIS, GOALS AND TIMETABLES

In order to allow positive recruitment and full utilization of minorities and women in the apprenticeship program, the Sponsor pledges to identify outreach efforts under Section IV which will be undertaken. The purpose of the analysis is to determine the minority and women's labor force in the Sponsor's labor market area. Once the labor force is determined, the Sponsor can determine if deficiencies exist in terms of underutilization of minorities and/or women in the occupations registered with the Registration Agency. (See attached Affirmative Action Plan Workforce Analysis Worksheet)

SECTION IV - OUTREACH AND POSITIVE RECRUITMENT

The Sponsor's AAP includes the following "checked" outreach and positive recruitment efforts that would reasonably be expected to increase minority and women's participation in apprenticeship by expanding the opportunity of minorities and women to become eligible for apprenticeship selection. **Once those efforts have been checked, the Sponsor will set forth the specific steps they intend to take under each identified effort.** The Sponsor will identify **a significant number of activities** in order to enable it to meet its obligation under Title 29 CFR, part 30.4(c).

A. An announcement of specific apprenticeship openings must be disseminated thirty (30) days in advance of the earliest date for application at each interval to the following agencies/organizations:

- Registration Agency
- Women's Organizations/Centers
- Local Schools
- Employment Service Centers
- One Stop Centers
- Vocational Education Schools
- Other Organizations/Centers (which can effectively reach minorities and women)
- Newspapers (which are circulated in the minority community and among women)

The announcement will include the nature of the apprenticeship, requirements for admission to apprenticeship, availability of apprenticeship opportunities, sources of apprenticeship applications, and the Sponsor's equal opportunity policy. The Sponsor will establish the period when applications will be accepted.

The Sponsor will include the established period for accepting applications with the announcement of apprenticeship openings.

B. Participation in annual workshops conducted by employment service agencies for the purpose of familiarizing school, employment service and other appropriate personnel with the apprenticeship program and current opportunities.

C. Cooperation with school boards and vocational educational systems to develop programs for preparing students to meet the standards and criteria required to qualify for entry into the apprenticeship program.

D. Internal communication of the Sponsor's equal opportunity policy should be conducted in such a manner to foster understanding, acceptance, and support among the Sponsor various officers, supervisors, employees, and members, and to encourage such persons to take the necessary action to aid in meeting its obligation under Title 29 CFR, Part 30.

E. Engaging in programs such as outreach for the positive recruitment and preparation of potential applicants for apprenticeships; where appropriate and feasible, such programs will provide for pre-testing experience and training. In initiating and conducting these programs, the Sponsor may be required to work with other sponsors and appropriate community organizations. The Sponsor will also initiate programs to prepare women and encourage women to enter traditionally male programs.

F. ☐ Encouraging the establishment and utilization of programs of pre-apprenticeship, preparatory trade training, or others designed to afford related work experience or prepare candidates for apprenticeship. The Sponsor will make appropriate provisions in its affirmative action plan to assure that those who complete such programs are afforded full and equal opportunity for admission into the apprenticeship program.

G. ☐ Utilizing journeyworkers to assist in the implementation of affirmative action in the apprenticeship program.

H. ☐ Granting advance standing or credit on the basis of previously acquired experience, training, skills, or aptitude for all applicants equally.

I. ☐ Other appropriate action to ensure that the recruitment, selection, employment, and training of apprentices during their apprenticeship will be without discrimination because of race, color, religion, national origin, or sex (e.g., general publication of apprenticeship opportunities and advantages in advertisements, industry reports, articles, etc., use of present minority and women apprentices and journeyworkers as recruiters; career counseling; development of reasonable procedures to ensure employment opportunity, including reporting systems, on-site reviews, briefing sessions).

(Identify Action:)

_____
_____
_____
_____
_____
_____
_____
_____

FOR EACH ITEM CHECKED IN SECTION IV, LIST EACH SPECIFIC STEP THAT THE SPONSOR WILL UNDERTAKE TO FULFILL THAT OUTREACH AND RECRUITMENT STEP

_____
_____
_____
_____
_____
_____
_____
_____
_____

(*add additional pages as necessary*)

SECTION V - ANNUAL REVIEW OF AFFIRMATIVE ACTION PLAN

The Sponsor will make an annual review of its current AAP and its overall effectiveness and institute any revisions or modifications warranted. The review will analyze (independently and collectively) the affirmative action steps taken by the Sponsor for evaluating the positive impact, as well as the adverse impact in the areas of outreach and recruitment, selection, employment, and training. They will work diligently to identify the cause and effect that result from their affirmative action measures. The Sponsor will continually monitor these processes in order to identify the need for a new affirmative action effort and/or deletion of ineffective existing activity(ies). All changes to the AAP must be submitted to the Registration Agency for approval. The Sponsor will continually monitor the participation rates of minorities and women in the apprenticeship program in an effort to identify any type of underutilization. If underutilization exists, corrective action will be immediately implemented. The goals and timetables also will be reviewed periodically as determined by the Registration Agency and updated where necessary.

SECTION VI - OFFICIAL ADOPTION

The *(Insert Name of Sponsor)* hereby officially adopts this Affirmative Action Plan on this _____day of _____, (INSERT YEAR).

_____

SIGNATURE OF SPONSOR

_____

PRINTED NAME

_____

Sponsor(s) may designate the appropriate person(s) to sign the Standards on their behalf.

AFFIRMATIVE ACTION PLAN
WORKFORCE ANALYSIS WORKSHEET

A. SPONSOR INFORMATION

Program Number:	
Name of Sponsor:	
Address:	
City/State/Zip Code:	
Contact Person:	
Phone Number:	FAX Number:
E-Mail Address:	

B. OCCUPATIONAL INFORMATION

Occupational Title: *	
RAPIDS Code:	O*NET/SOC Code:
Type of selection method used:	
Labor Market Area description:	

C. LABOR MARKET AREA DATA

Total Labor Force in Labor Market Area *		
Number of Women:		% of labor force
Number of Minorities:		% of labor force
Working Age Population in Labor Market Area *		
Number of Women:		% of labor force
Number of Minorities:		% of labor force
Apprentices in Particular Craft in Labor Market Area **		
Number of Women:		% of apprentices
Number of Minorities:		% of apprentices
The General Availability of Minorities and Women with the Present or Potential Capacity for Apprenticeship in Program Sponsor's Labor Market Area. ***		
Number of Women:		
Number of Minorities:		

Resources for obtaining labor market information.

* http://www.census.gov/hhes/www/eeoindex/page_c.html

** Data available from Registration Agency.

*** Program Sponsors may use any reasonable method for determining the general availability of minorities and women with the present or potential capacity for apprenticeship, including relying on the data recorded in Section C for "Total Labor Force", "Working Age Population", and "Apprentices in Particular Craft" to propose the entries for "The General Availability of Minorities and Women."

D. SPONSOR'S WORKFORCE DATA

D-1	Total Number of Journey/Craft Workers Employed:		
	Number of Women:		% of work force
	Number of Minorities:		% of work force
D-2	Total Percentage of Apprentices or of Applicant Pool (depending on selection method used)		
	Numerical percentage of Women apprentices or women in applicant pool:		%
	Numerical percentage of Minority apprentices or minorities in applicant pool:		%

E. ADDITIONAL RESOURCE DATA FOR CONSIDERATION IN ESTABLISHING GOALS

Source	Minority rate of participation	Female rate of participation
Registered Apprenticeship Partners Information Data System (RAPIDS): *		
EEOC Occupational Employment Data: **		

* Data available from Registration Agency

** http://www.eeoc.gov/stats/jobpat/jobpat.html

F. DETERMINATION OF UTILIZATION

Analysis	Yes	No
Minority Underutilization:		
Female Underutilization:		

G. SPONSOR'S GOALS:

The program sponsor proposes and agrees to make a good faith effort to attain the goal of selecting % minorities and _% women during the next EEO Review cycle. These goals will not be used to discriminate against any qualified applicant on the basis or race, color, religion, national origin or sex.

The number of new apprentices to be hired during the next year (or selection period) is estimated to be:

H. REGISTRATION AGENCY APPROVAL:

Sponsor	**Registration Agency**
_____	_____
Sponsor's Signature	Registration Agency Signature
_____	_____
Typed Name	Typed Name
_____	_____
Title	Title
_____	_____
Date Signed	Date Signed

Instructions for preparing and completing this worksheet

The purpose of this workforce analysis worksheet is to establish a benchmark against which the demographic composition of the sponsor's apprenticeship program can be compared. The sponsor must separately determine the availability of minorities and women for each occupational title represented by the program. In determining availability, the sponsor must consider, at the very least, the factors identified at 29 CFR 30.4(e) in order to determine whether barriers to equal employment opportunity may exist with a particular occupational title.

Part A The Program Sponsor information section may be prepared by the sponsor representative or servicing Registration Agency Representative.

Part B Occupational information will be taken from the registered program standards, and may be prepared by the sponsor representative or servicing Registration Agency Representative. A Workforce Analysis Worksheet must be completed for each occupational title identified.

Part C Sponsors must use the most current and discrete statistical data available in determining availability estimates for the labor market area specified by the sponsor in Part B. Census data is one example of an appropriate source of statistical information. Other sources include data from local job service offices and data from colleges or other training institutions. Where possible, the Registration Agency has provided examples of appropriate sources of data.

For purposes of this section, the term "labor force" is defined to include both those individuals who are employed and those who are unemployed but looking for employment. The term "working age population" means persons ages 15 years and over whether or not they are currently in the labor force or looking for employment.

Part D The Program Sponsor must provide current workforce data as described in Part D. If the sponsor utilizes either Selection Method §30.5(b) (1) or (2), the data in D-2 will be reflective of the "pool" from which selections will be made. If the sponsor utilizes the Selection Method under §30.5(b) (3) or (4), the data in D-2 will be reflective of the current apprentices registered in the program.

Part E Additional Resource Data for consideration in establishing reasonable goals will be provided by the Registration Agency. This data will provide a snapshot of the national labor force for the given occupation title.

Part F Utilizing the data found in Parts C, D and E, the Program Sponsor is to determine if minorities and/or women are underutilized and must check the appropriate response.

Part G If the Program Sponsor's analysis determines that minorities and/or women are underutilized, the Sponsor, utilizing the resource data found in Parts C, D and E, will establish goals which are reasonable in consideration of the results which could be expected from its good faith efforts to make its overall affirmative action program successful. The Registration Agency will review and access the proposed goals and if found to be reasonable and attainable, will acknowledge receipt of the Sponsors goals for minorities and/or women.

Proposed goals for minorities and/or women that are lower than the current participation rate under the Program Sponsor will not be approved.

APPENDIX D

(SAMPLE)

QUALIFICATIONS AND SELECTION PROCEDURES

ADOPTED BY

(INSERT SPONSOR NAME)

DEVELOPED IN COOPERATION WITH THE
U.S. DEPARTMENT OF LABOR
OFFICE OF APPRENTICESHIP

APPROVED BY: _____
REGISTRATION AGENCY

DATE APPROVED: _____

The certification of this selection procedure is not a determination that, when implemented, it meets the requirements of the Uniform Guidelines on Employee Selection Procedures (41 CFR, part 60-3) or 29 CFR part 30. Note that selection procedures may need to be modified to provide reasonable accommodations to qualified individuals with disabilities.

SECTION I. - MINIMUM QUALIFICATIONS (*EXAMPLES*)

Applicants will meet the following minimum qualifications:

A. AGE

Apprentices must not be less than 16 years of age and the Sponsor may establish qualifications regarding minimum age limits in respect to any applicable State Laws or Regulations.

B. EDUCATION

A high school diploma or GED equivalency is required. Applicant must provide an official transcript for high school and post high school education and training. All GED records must be submitted, if applicable.

Applicants must submit a DD-214 to verify military training and/or experience if they are a veteran and wish to receive consideration for such training/experience.

C. PHYSICAL

Applicants will be physically capable of performing the essential functions of the apprenticeship program, with or without a reasonable accommodation, and without posing a direct threat to the health and safety of the individual or others. Applicants may be subject to a physical examination, or screened for current illegal use of drugs, or both upon acceptance into the program and prior to being employed.

D. NIMS CREDENTIALS

Preference will be given to applicants with NIMS Credentials.

SECTION II. - APPLICATION PROCEDURES (*SAMPLE LANGUAGE*)

A. Applicants will be accepted (*throughout the year or as specified*). All persons requesting an application will have one made available upon signing the applicant log.

B. All applications will be identical in form and requirements. The application form will be numbered in sequence corresponding with the number appearing on the applicant log so that all applications can be accounted for. Columns will be provided on the applicant log to show race/ethnic and sex identification and the progress by dates and final disposition of each application.

C. Before completing the application, each applicant will be required to review the Apprenticeship Standards and will be provided information about the program. If the applicant has any additional questions on the qualifications or needs additional information to complete the application, it will be provided by the Sponsor.

D. Receipt of the properly completed application form, along with required supporting documents (proof of age, driver's license, birth certificate or other acceptable documentation) will constitute the completed application.

E. Completed applications will be checked for minimum qualifications. Applicants deficient in one or more qualifications or requirements or making false statements on their application will be notified in writing of their disqualification. The applicant will also be notified of the appeal rights available to them. No further processing of the application will be taken.

F. Applicants meeting the minimum qualifications and submitting the required documents will be notified where and when to appear for an interview (if applicable).

SECTION III. - SELECTION PROCEDURES (*EXAMPLE*)

A. The Sponsor will schedule the interview (if applicable) and evaluation session. All applicants who have met the minimum qualifications and have submitted the required documents must be notified of the date, time, and place to appear.

B. The interviewer(s) will rate each applicant during the interview on each of the factors on the applicant rating form taking into account the information on the application and required documents, if applicable. The interviewer will record the questions asked and the general nature of the applicant's answers. The interviewer will then prepare a written summary of his/her judgment of the applicant derived from the interview.

C. After completing the interview and evaluation of the applicants, the individual rating scores of the interviewer(s) will be added together and averaged to determine the applicant's final rating.

D. Applicants will be placed on a "Ranking List" according to their scores at the evaluation session, with the applicant having the highest score being at the top of the list, and all applicants then listed in descending order based on score.

E. As openings for the registration of new apprentices occur, the highest ranked applicant will be notified of selection by telephone. It will be the responsibility of the applicant to keep the Sponsor informed of their current mailing address and telephone number.

F. Selected applicants must respond to the notice of selection within (**INSERT HOURS)** hours of notice. If applicants cannot be reached by telephone, their names will be passed and notice sent to their address by "Certified Mail-Return Receipt Requested" to determine if the applicants are still interested. If no response is received in fifteen (15) working days from the written notice, the applicant's name will be removed from the list. Only one certified notice will be mailed.

G. Qualified applicants remaining on a preceding ranking list will automatically be carried forward on the new ranking list and slotted in wherever their rating score placed them for a period of two (2) years, unless the applicant has been removed from the list by their own written request or following failure to respond to an apprentice opening. Applicants who were not placed during the two (2) year period that were on the ranking list will be required to reapply.

H. During the two (2)-year period, applicants who feel that their qualifications have improved since their original rating may submit documented evidence of such additional experience or training and request reevaluation and rating at the next regular processing cycle.

SECTION IV. – DIRECT ENTRY

Sponsors who wish to invoke the direct entry provision may do so without regard to the existing selection procedure or minimum qualifications used for entry into the apprenticeship program. Individuals selected into the apprenticeship program via direct entry shall only include those individuals described below who have received training or employment in an occupation directly or indirectly related to the occupation(s) registered in these Standards. The Sponsors will award Credit for Previous Experience in accordance with Section XII of these Standards, and will pay the apprentice(s) at the wage rate commensurate with their skill attainment. The Credit for Previous Experience shall be awarded without regard to race, color, religion, national origin or sex. The methods for direct entry shall include the following:

A. Youth who complete a Job Corps training program in any occupation covered in these Standards, who meet the minimum qualifications of the apprenticeship program, may be admitted directly into the program, or if no apprentice opening is available, the Job Corps graduate may be placed at the top of the current applicant ranking list and given first opportunity for placement. The Sponsor will evaluate the Job Corps training received for granting appropriate credit on the term of apprenticeship. Entry of Job Corps graduates will be done without regard to race, color, religion, national origin, or sex. ***(Note: This is a method of direct entry into the apprenticeship program.)***

B. Youth who complete a YouthBuild U.S.A. training program in any occupation covered in these Standards, who meet the minimum qualifications of the

apprenticeship program, may be admitted directly into the program, or if no apprentice opening is available, the YouthBuild U.S.A. graduate may be placed at the top of the current applicant ranking list and given first opportunity for placement. The Sponsor will evaluate the YouthBuild U.S.A. training received for granting appropriate credit on the term of apprenticeship. Entry of YouthBuild U.S.A. graduates will be done without regard to race, color, religion, national origin, or sex. ***(Note: This is a method of direct entry into the apprenticeship program.)***

C. Military Veterans who completed military technical training school and/or participated in a registered apprenticeship program or related craft while in the military in the occupations registered in the **(INSERT INDUSTRY)**, may be given direct entry into the apprenticeship program. The Sponsor shall evaluate the military training received for granting appropriate credit on the term of apprenticeship and the appropriate wage rate. The Sponsor will determine what training requirements they need to meet to ensure they receive all necessary training for completion of the apprenticeship program. Entry of Military Veterans shall be done without regard to race, color, religion, national origin, or sex. ***(Note: This is a method of direct entry into the apprenticeship program.)***

D. Former inmates of Department of Justice - Bureau of Prisons (BOP) who have participated in or have successfully completed a specific BOP apprenticeship program, where the Apprenticeship Program Sponsor agrees to admit such inmates without regard to race, color, religion, national origin, or sex and all individuals receive equal consideration. Sponsors agreeing to admit such individuals into apprenticeship must agree to do so without regard to present minimum qualifications, eligibility lists or the necessity of passing written apprenticeship entrance tests. ***(Note: This is a method of direct entry into the apprenticeship program.)***

E. An employee of a non-participating employer who becomes a new member employer of the sponsoring organization who does not qualify as a journeyworker when the employer becomes a member, will be evaluated by the Sponsor in accordance with the procedures for the granting of credit for previous experience, and registered at the appropriate period of apprenticeship based on previous work experience and related training. Any employee not eligible for receipt of credit must make application in accordance with the normal application procedures. ***(Note: This is a method of direct entry into the apprenticeship program, whereby all minimum qualifications are waived.)***

SECTION V. - COMPLAINT PROCEDURE

A. Any apprentice or applicant for apprenticeship who believes that he/she has been discriminated against on the basis of race, color, religion, national origin, or sex, with regard to apprenticeship or that the equal opportunity standards with

respect to his/her selection have not been followed in the operation of an apprenticeship program, may personally or through an authorized representative, file a complaint with the Registration Agency or, at the apprentice or applicant's election, with the private review body established by the Sponsor (if applicable).

B. The complaint will be in writing and will be signed by the complainant. It must include the name, address, and telephone number of the person allegedly discriminated against, the Sponsor involved, and a brief description of the circumstances of the failure to apply equal opportunity standards.

C. The complaint must be filed not later than 180 days from the date of the alleged discrimination or specified failure to follow the equal opportunity standards, and, in the case of complaints filed directly with the review bodies designated by the Sponsor to review such complaints, any referral of such complaint by the complainant to the Registration Agency must occur within the time limitation stated above or 30 days from the final decision of such review body, whichever is later. The time may be extended by the Registration Agency for good cause shown.

D. Complaints of harassment in the apprenticeship program may be filed and processed under Title 29, CFR Part 30, and the procedures as set forth above.

E. The Sponsor will provide written notice of their complaint procedure to all applicants for apprenticeship and all apprentices.

SECTION VI. - MAINTENANCE OF RECORDS

The Sponsor will keep adequate records including a summary of the qualifications of each applicant, the basis for evaluation and for selection or rejection of each applicant, the records pertaining to interviews of applicants, the original application for each applicant, information relative to the operation of the apprenticeship program, including, but not limited to, job assignment, promotion, demotion, layoff, or termination, rates of pay or other forms of compensation or conditions of work, hours including hours of work and, separately, hours of training provided, and any other records pertinent to a determination of compliance with the regulations at Title 29, CFR part 30, as may be required by the U.S. Department of Labor. The records pertaining to individual applicants, selected or rejected, will be maintained in such manner as to permit the identification of minority and women (minority and non-minority) participants.

Each Sponsor must retain a statement of its AAP for the prompt achievement of full and equal opportunity in apprenticeship, including all data and analysis made pursuant to the requirements of Title 29, CFR part 30.4. Each Sponsor also must maintain evidence that its qualification standards have been validated in accordance with the requirements set forth in Title 29, CFR part 30.5(b).

In addition to the above requirements, adequate records will include a brief summary of each interview and the conclusions on each of the specific factors, e.g., motivation, ambition, and willingness to accept direction which are part of the total judgment. Records will be maintained for five (5) years from the date of last action and made available upon request to the U.S. Department of Labor or other authorized representative.

SECTION VII. - OFFICIAL ADOPTION OF SELECTION PROCEDURES

The (INSERT NAME OF SPONSOR) hereby officially adopts these Selection Procedures on this _____ day of _____ (INSERT YEAR).

_____
SIGNATURE OF SPONSOR

_____
PRINTED NAME

_____
TITLE

_____
SPONSORING ORGANIZATION

Sponsor(s) may designate the appropriate person(s) to sign the Standards on their behalf

APPENDIX E

CERTIFICATE OF COMPLETION OF APPRENTICESHIP

from

THE NATIONAL INSTITUTE FOR METALWORKING SKILLS

for the completion of the

Core Competency Requirements and Corresponding NIMS Credentials

for

NIMS CERTIFIED OCCUPATIONS

National Institute for Metalworking Skills

Certificate of Completion

of the Core Competency Requirements
for the occupation of

NIMS Certified Machinist

as defined by the NIMS Expert Panel and validated by industry representative across the United States of America having successfully demonstrated all required Core competencies and completed the corresponding NIMS Credentials.

is hereby granted to

Robert H. Apprentice

this 20th day of July 2011

Registered Apprenticeship Sponsor
The Leading Edge Machine Tool Company

Robert H. Highperformer, President

NIMS Credentialing Agency
National Institute for Metalworking Skills

Stephen C. Mandes, Executive Director

National Institute for Metalworking Skills

NIMS CERTIFIED MACHINIST CORE COMPETENCIES	NIMS CREDENTIALS ATTAINED
1. Identify and Demonstrate Usage of Machine Safety and Personal Protective Equipment	Measurement, Materials, and Safety Level I
2. Demonstrate Compliance with Lock-out / Tag-out Procedures and OSHA Requirement and Guidelines	Measurement, Materials, and Safety Level I
3. Machine Operations and Material Handling, Hazardous Materials Handling and Storage, including EPA, Hazmat, and OSHA	Measurement, Materials, and Safety Level I
4. Part Inspection	Measurement, Materials, and Safety Level I
5. Process Control	Measurement, Materials, and Safety Level I
6. Process Adjustment – Single Part Production	Measurement, Materials, and Safety Level I
7. Participation in Processes Improvement	Measurement, Materials, and Safety Level I
8. Manual Operations: Layout	Job Planning, Benchwork, and Layout Level I
9. Manual Operations: Benchwork	Job Planning, Benchwork, and Layout Level I
10. Sawing	Job Planning, Benchwork, and Layout Level I
11. Job Process Planning	Job Planning, Benchwork, and Layout Level I
12. Drilling Operations	Drill Press Skills Level I
13. Turning Operations: Turning Between Centers	Turning Between Centers Level I
14. Turning Operations: Turning Between Centers	Turning Between Centers Level II
15. Turning Operations: Chucking	Chucking Level I
16. Turning Operations: Chucking	Chucking Level II
17. Milling: Square Up a Block	Milling Level I
18. Manual Milling: Vertical and Horizontal	Milling Level I
19. Manual Milling: Vertical and Horizontal	Milling Level II
20. Surface Grinding, Grinding Wheel Safety	Grinding Level I
21. Surface Grinding, Horizontal Spindle, Reciprocating Table	Grinding Level I
22. Surface Grinding, Horizontal Spindle, Reciprocating Table	Grinding Level II
23. CNC Programming - Milling and / or CNC Programming – Turning	CNC Milling and / or CNC Turning Level I
24. CNC: Write a Simple CNC Milling and / or CNC Turning Program and Review Tool Path	CNC Milling and / or CNC Turning Level I
25. CNC: Operate a CNC Milling Machine and / or Operate a CNC Lathe	CNC Milling and / or CNC Turning Level I
26. General Housekeeping & Maintenance	Included in all Machining Credentials
27. Preventative Maintenance - Machine Tools	Included in all Machining Credentials
28. Tooling Maintenance	Included in all Machining Credentials