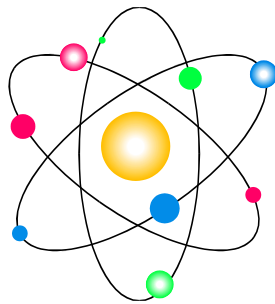

The **N**uclear **M**echanic
Apprenticeship **P**rocess
Implementation
Handbook



September 1999

TABLE OF CONTENTS

SECTION	TITLE	PAGE
I	FOREWORD	i
II	MANAGEMENT SUMMARY	iii
III	NUCLEAR MECHANIC APPRENTICESHIP PROCESS	1 - 7
	Purpose of the NMAP	
	Basis for the NMAP	
	Overview of NMAP Implementation	
	NMAP Validation	
	Compliance with Nuclear Standards	
IV	SUMMARY OF APPRENTICESHIP PROGRAM REVIEW	8
V	TRAINING PROGRAM SELF-ASSESSMENT	10
VI	EQUIVALENCY PROCESS	11
VII	STEPS FOR ADOPTING THE NMAP	12
VII	NMAP IMPLEMENTATION	13 -17
	Pre-Implementation	
	During Implementation	
	Post-Implementation	
	Application of NMAP to Work Assignments	
	Trade Specific Skills	
	Classification of Specialized Areas of Tasks	
	ACKNOWLEDGMENTS	18 - 19
	ATTACHMENTS	

I. FOREWORD

During the period from 1989 to 1991, new regulations concerning the training and qualification of nuclear power plant personnel (including contracted personnel) were proposed by the Nuclear Regulatory Commission (NRC). At the same time, the American Nuclear Society (ANS) 3.1 Committee was actively revising the ANSI/ANS-3.1- 1987 Standard, entitled *Selection, Qualification, and Training of Personnel for Nuclear Power Plants*, to address the proposed training regulations.

In response to the proposed regulations, a group of nuclear utilities associated with the Edison Electric Institute (EEI) Construction Committee, Labor Relation Subcommittee chose to take a proactive stance, and pursue a formal method to provide evidence of contracted union labor qualification. In 1990, these utilities formed a "Tripartite committee which provided representation by the three major stakeholders, the utility sector (EEI Labor Relations Subcommittee), the union sector (Building and Construction Trades department, AFL-CIO), and the contractor sector (Associated Maintenance contractors, Inc.). The Tripartite Committee consisting of representatives from:

- Utilities
 - ã Commonwealth Edison
 - ã Florida Power and Light
 - ã Duquesne Light Company
 - ã Southern California Edison Company
 - ã Northeast utilities

- Labor
 - ã Building and Construction Trades Department AFL-CIO
 - ã All unions involved in the General and Detailed Apprenticeship Program reviews

- Contractor Management
 - ã National Maintenance Agreement Policy Committee
 - ã Associated Maintenance Contractors Inc.
 - ã Stone & Webster Engineering Corporation
 - ã Bechtel
 - ã Fluor Constructors
 - ã Raytheon (United Engineers and Constructors)

The Tripartite Committee's objective was to develop and implement a formal process which takes into consideration the knowledge gained through the union apprenticeship programs and the experience of the contracted union labor force, and provide evidence of fundamental knowledge and skills qualification. The initial plan was developed in 1991, and the developmental effort (which ultimately resulted in the Nuclear Mechanic Apprenticeship Process) was carried out over the period from 1991 to 1996.

In early 1995, EEI restructured its operation such that Nuclear Mechanic Apprenticeship Process (NMAP) development no longer aligned with EEI's charter. At that point, the utilities most actively involved in developing the NMAP (Commonwealth Edison Company, Southern California Edison, and Northeast utilities) pursued the effort without formal sponsorship by a

recognized industry organization, and operated under the name of the Nuclear Mechanic Apprenticeship Process (NMAP) Committee.

In the spring of 1996, the process was first implemented on a "pilot" basis at Commonwealth Edison Company's Byron Station. Additional implementation of this process across the nuclear industry has occurred as more utilities became aware of its benefits.

This handbook:

- provides details supporting the process for nuclear utilities which are interested in the NMAP
- provides the steps to be taken for a utility to adopt the NMAP
- acts as an aid for implementing the NMAP at commercial nuclear facilities

It is recommended that this handbook be utilized in conjunction with the Nuclear Mechanic Apprenticeship Process Study Report.

II. MANAGEMENT SUMMARY

To economically address concerns for the training and qualification of contracted labor, the Nuclear Mechanic Apprenticeship Process (NMAP) Committee was formed to develop a structured approach to review craft journeyman qualifications for performing independent work activities at commercial nuclear facilities in the United States. This committee published a report on its study of the union Apprenticeship Programs being implemented for craftsmen performing independent "Safety Related" maintenance type activities. The report was called The Nuclear Mechanic Apprenticeship Process Study Report.

This report documented a review of union Apprenticeship Programs that achieved two goals:

- Determined that the scope of the craft union apprenticeship programs provide the appropriate fundamental skills for the basic types of maintenance and modification work normally assigned to contract craft labor.
- Identified a standard method for the documentation of entry level knowledge and skills information for each craftsman employed in maintenance and modification work.

Based on a review of the types of "Safety Related" work being performed by union journeyman in commercial nuclear facilities, the following union apprenticeship programs were chosen as the scope of the study:

- United Association of Journeyman and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada (UA)
- International Brotherhood of Electrical Workers (IBEW)
- International Brotherhood of Boilermakers - Ship Builders - Blacksmiths - Forgers & Helpers
- Millwrights - United Brotherhood of Carpenters and Joiners of America
- International Association of Bridge, Structural, and Ornamental Iron Workers
- Sheet Metal Workers' International Association (SMWIA)

A detailed review of these programs can be found in the Nuclear Mechanic Apprenticeship Process Study Report. This review resulted in the development of the Nuclear Mechanic Apprenticeship Process (NMAP). This process was also structured to address the equivalency of those journeyman who did not complete an apprenticeship program.

The NMAP is a formal method of providing evidence that knowledge and skills training requirements have been met by contracted craft labor union personnel on an individual basis and addresses their qualification in a cost effective manner. This process addresses only the position of the contracted maintenance worker and does not address the position of first line supervisor or higher supervisory positions. The process takes advantage of the well structured and effective craft labor union apprenticeship programs.

This handbook additionally outlines the basic Trade Specific Skills acquired through the union apprenticeship programs. These specific skills establish a baseline for both the utility in developing task specific training and the union apprenticeship program in strengthening training to meet industry expectations.

III. INTRODUCTION

Purpose of the NMAP

An issue of primary importance in the commercial nuclear power industry is the training and qualification of power plant personnel. When looking at the specific issue of qualification for contracted craft personnel, two standards currently exist which set the basic requirements for qualification at the entry point of the utility training and qualification process.

The first is ANSI 3.1 entitled *Selection, Qualification, and Training of Personnel for Nuclear Power Plants*, or its earlier version ANSI N18.1 which set the education and experience requirements for nuclear power plant personnel. The second is INPO's ACAD 92-008, entitled *Guidelines for Training and Qualification of Maintenance Personnel*, or its earlier version INPO 86-018 which provide knowledge and skills training requirements for nuclear power plant maintenance personnel.

Historically, nuclear utilities and contractors have not attempted to verify the fundamental skills qualification of craft journeyman to the same degree as utility maintenance personnel performing the same or similar work activities. Dependency on site specific training and quality control inspections has typically been used as assurance that contractor work has been completed properly. Evolving trends and changes in industry standards indicate that this approach will no longer be acceptable in assuring that work is completed within the expectations of the utility and regulatory bodies.

In anticipation of changes to certain industry training regulations, an EEI Construction Committee subcommittee developed a structured approach for the review of craft journeyman qualifications in fundamental skills. Fundamental knowledge and skills are the entry level knowledge and skills which allow an employee to perform fundamental tasks within a trade without detailed training. These skills also provide a reasonable expectation that an individual can successfully complete further detailed (site specific) training. An example is a journeyman trained in the fundamental skills of shaft alignment may need only site specific training in the alignment aspects of a particular model of rotating equipment unique to that site rather than site training in the basics of rotating equipment alignment.

The need for verification of "fundamental skills" training is based on the requirements of:

- 10CFR 50, Appendix B, Criterion 2
- INPO 92-001 (Conduct of Maintenance), Section VI.C.5
- ANSI 3.1
 - ã The April 1993 Revision of ANS 3.1 addresses contractors performing maintenance and modification work. Section 3.2.2 requires that documented evidence exist which demonstrates that contractor personnel are qualified to perform their assigned tasks.

Nuclear Power utilities are seeking ways to assure qualification of contracted personnel without incurring the costs to gain such assurance through extensive individual training/testing of contracted personnel. As described in the "Foreword" to this manual, representatives from nuclear utilities, contractors, and Building Trades labor unions developed an approach to address entry level qualification of contracted labor personnel. The Nuclear Mechanic Apprenticeship

Committee developed the Nuclear Mechanic Apprenticeship Study Report in response to these needs and requirements to provide a method of determining union craft journeyman qualifications in a cost efficient manner.

The NMAP is one approach of providing assurance of contracted craft qualification. The NMAP is a formal method to provide evidence that the entry level knowledge and skills training requirements have been met by contracted craft labor union personnel on an individual basis. The process utilizes the well structured and effective craft labor union apprenticeship programs which were developed by the national level union training organizations, and are provided to all of the local training centers for implementation.

The ideal case would be for contracted craft personnel to arrive on site with all training and qualification requirements met, such that the individual could go directly to work on any activity. The NMAP does not provide personnel of this nature. But it does provide reasonable assurance that craft labor union personnel have the fundamental knowledge and skills necessary: (1) perform a range of basic trade specific tasks without the need for additional training or testing, and (2) to enter a utilities task specific training process.

The NMAP addresses only the position of maintenance mechanic (also referred to as journeyman, maintenance personnel, or repairman), and does not address the position of first line supervisor or higher positions. The NMAP primarily covers the work activities associated with the electrical and mechanical disciplines. The process focuses on six craft trades; the Pipefitters, Electricians, Boilermakers, Millwrights, Iron Workers, & Sheet Metal Workers.

Basis for the NMAP

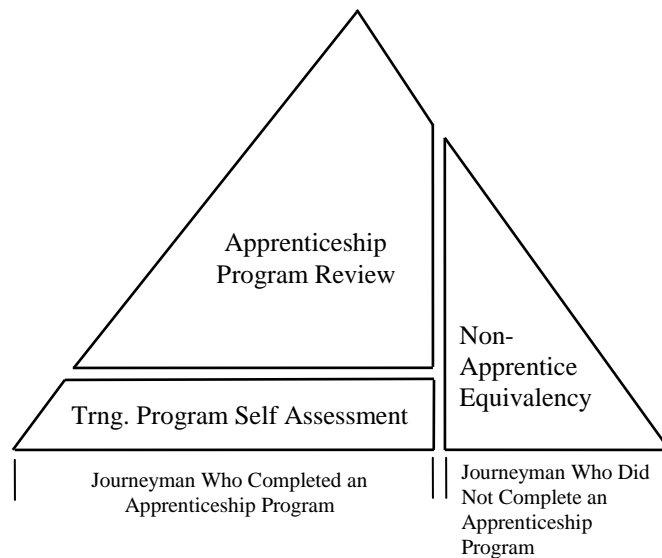


Exhibit 1- NMAP Elements

There are three elements which form the basis for the NMAP (See Exhibit 1): the apprenticeship program review (NMAP Study), the training program self assessment process, and the non-apprentice equivalency process. The largest element of the three is the apprenticeship program review. Through the NMAP Study, detailed reviews were performed on the six primary union

apprenticeship programs. The knowledge and skills requirements from INPO 86-018 were compared to the union apprenticeship programs. This comparison determined that the requirements of INPO 86-018 were met by each unions' apprenticeship program (considering the traditional work scope for the particular trade). This means that the NMAP Study provides a sound basis for stating that an individual who successfully completes the unions' apprenticeship program possesses the basic knowledge and skills described by INPO to perform work independently in a nuclear power facility. A summarized description of this study can be found in Section IV, and the actual study is printed under separate cover.

The second element is the training program self-assessment process utilized by the union. This element can be characterized as a foundational process for the NMAP Study. In addition to existing controls within each unions' program, this process assures that the apprenticeship program is being properly implemented at the local level as designed by the national level union organization, and reviewed by the NMAP Study Group. Additional information on this process can be found in Section V.

The non-apprentice equivalency process is the third element of the NMAP. To address the group of craft journeymen who did not complete an apprenticeship program (non-apprentices), an equivalency process was established which uses either experience or testing. The equivalency process provides the nuclear industry with a mechanism for utilizing the vast experience these journeymen possess. The process involves a evaluation which either allows a "one time" equivalency for a set amount of experience acquired by 1-1-96, or if this is not met, by a written and performance testing process. Additional information on this process can be found in Section VI.

Overview of NMAP Implementation

The primary steps to implement the process are provided below. Remember, this process only applies to the six unions typically involved in safety related work (Pipefitters, Electricians, Boilermakers, Sheet Metal Workers, Millwrights, Iron Workers). The primary participants of the process are the nuclear utility, the contractor, and the local union hall.

1. The utility and contractor establish the type and quantity of contracted union personnel required for the project.
2. The contractor informs the different local union halls of the needs (positions to be filled).
3. The local union hall determines which members are available for referral to this project and identifies the entry level qualification status for each of these individuals. Those who have completed the apprenticeship program or have worked the required number of hours are eligible for referral. Those who have not must successfully complete an equivalency testing process to be eligible for referral. See Exhibit 2 below.
4. The union hall provides the contractor with the entry level qualification information. The basis for qualification must be either successful completion of the apprenticeship program, verification that the individual has worked the required number of hours for equivalency, or successful completion of the equivalency testing process. This may be presented in the form of a document, card, or other method authorized by the union.

5. The contractor verifies that each individual has provided evidence of entry level qualification.
6. The union member then continues through the site specific training process.
7. Annually, the Local Joint Training Committee completes the self assessment form to evaluate whether the process is being properly implemented at the local level. A copy of the self assessment is provided to the national office for review and action, if necessary.
8. Periodically, an independent audit is to be performed of the union records to assure that qualification status is being properly evaluated at the local level. Such audits should be coordinated through the National Training Department of the union organizations.

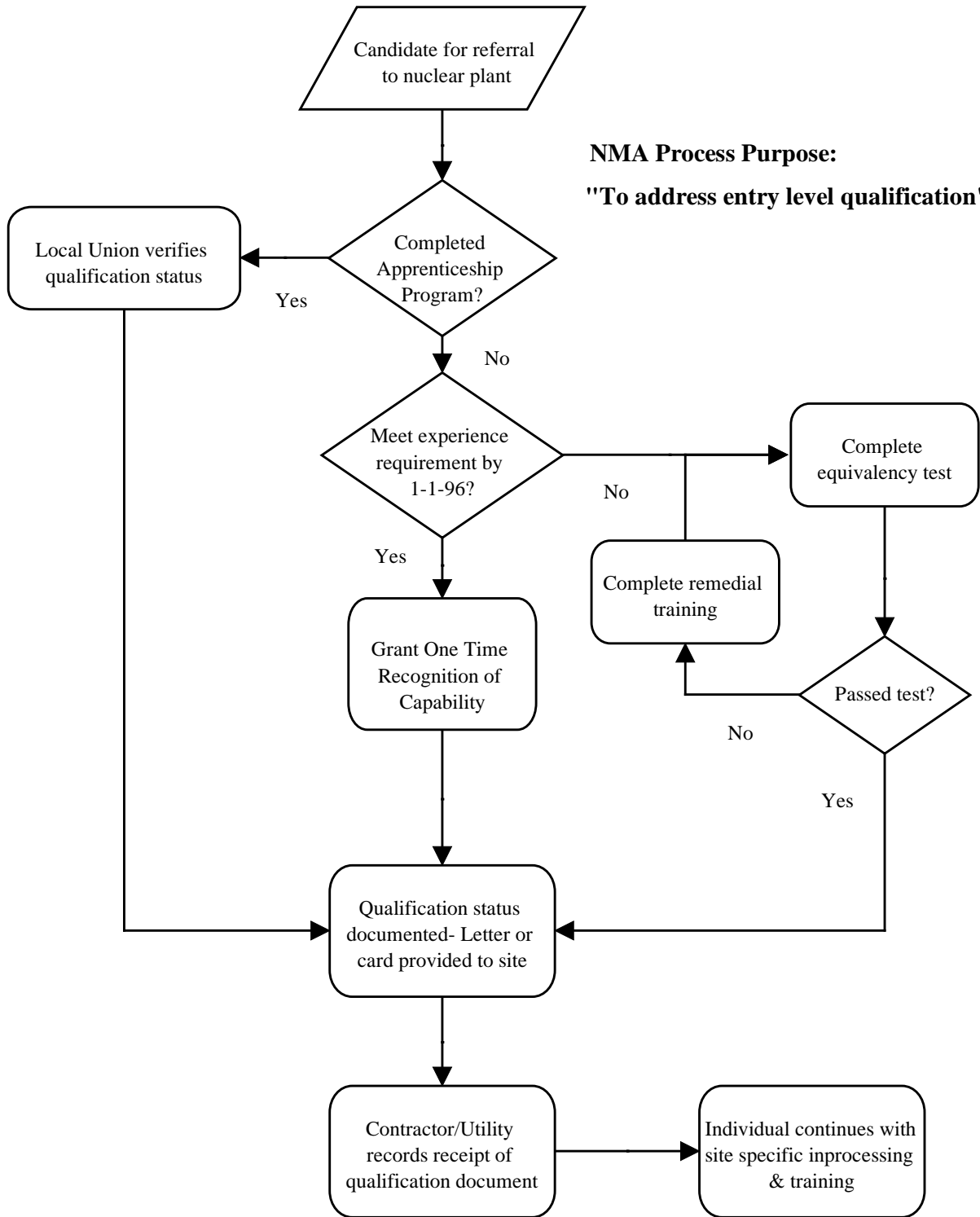


Exhibit 2- Knowledge/Skills Verification Flow Diagram

NMAP Validation

The Tripartite committee believed that the NMAP Study should be evaluated by some regulatory, rule making, or industry organization. This was desirable in order to validate both the approach and results of the study. Through this form of validation, the acceptance of the NMAP Study by other utilities would be more likely. Once the process is recognized, the need for multiple reviews of the same apprenticeship programs by other utilities wishing to exercise this approach would be eliminated.

The Tripartite committee initially pursued validation through two organizations, the American Nuclear Society (ANS) and the Institute of Nuclear Power Operations (INPO). The American Nuclear Society (the organization revising the ANSI/ANS-3.1 1978 standard) was approached to determine if the NMAP would satisfy the requirements of the new standard. In the case of INPO, a positive review of this approach would provide immediate credibility throughout the industry.

In September of 1993, a formal request for "clarification" was submitted to the ANS 3.1 Committee. This request for clarification addressed the NMAP Study element of the process, but did not address the self assessment or equivalency processes since they were not developed at that time. The ANS 3.1 Committee response in March 1994 stated that it is the responsibility of the owner organization to evaluate personnel qualification, and the NMAP Study may be used when making such evaluations. Stated another way, the NMAP Study approach satisfies the requirements of the ANS 3.1-1993 document. The actual ANS response is included as Attachment A.

In October of 1993, the Training Implementation Department of INPO was contacted to arrange for their review of the NMAP, and was provided with a copy of the Draft NMAP Report for review. A meeting between INPO and representatives of the Tripartite Committee was held on January 24, 1994. INPO was complimentary on the detailed nature of the Study and exhibited willingness to work with the Tripartite Committee to inform other utilities of this effort. However, they stated that due to their charter of addressing utility personnel training issues, they could not formally endorse the NMAP Study approach since it addresses contracted personnel.

Through these discussions with INPO, the Tripartite Committee reaffirmed that two primary issues needed to be addressed. The resolution to these issues led to the development of the equivalency process for journeymen who did not complete the apprenticeship program, and the union training program self assessment process.

Members of the NMAP Committee again met with INPO on 4-19-96 to provide a full update on progress made with the equivalency and training program self assessment processes. INPO stated that solid progress had been made on the issues identified in the previous meeting. INPO indicated that the equivalency through experience approach was reasonable and was not seen as a weakness. The self assessment process was also seen as a good stroke, and it appropriately addressed the issue of local training center implementation.

In addition to ANS and INPO, the Tripartite Committee has interfaced with the Electric Power Research Institute (EPRI) NDE Center which has developed a formal proficiency testing process

for the nuclear industry. EPRI has provided guidance for the development of the testing included in the non-apprentice equivalency process. Through interface with national level union training personnel, EPRI has gained a greater appreciation for the formal structure, professional nature, and effective controls of the union training process.

Compliance with Nuclear Standards

As previously mentioned, the two nuclear industry standards which establish the qualification requirements for maintenance personnel are ANSI 3.1 (ANSI N18.1) and ACAD 92-008 (INPO 86-018).

The requirements of ANSI 3.1 are met through the combination of secondary education, apprenticeship program completion, on the job training, and related work experience. NMAP Study Report Attachment B provides a detailed explanation of how the ANSI 3.1 requirements are met.

Sections 6 through 9 of ACAD 92-008 provide the requisite knowledge and skills for maintenance personnel. The ACAD 92-008 requirements are met through the combination of the NMAP Study and the NMAP Equivalency process. Through the NMAP Study, it was determined that apprenticeship program completion adequately assured that the requisite knowledge and skills are acquired by union personnel, considering their scope of work. The NMAP equivalency process was specifically designed to provide a reasonable level of assurance that the requisite knowledge and skills are held by non-apprentice journeyman. Section VI provides more detail on the equivalency process.

IV. SUMMARY OF APPRENTICESHIP PROGRAM REVIEW



Union apprenticeship programs are typically controlled by a National Joint Committee made up of union and employer representatives. Often, a separate organization known as a "Training Fund" or "National Training Committee" exists. Since the union apprenticeship programs are controlled from a central source, a detailed review of each union's standard program would be the most efficient approach to take. The apprenticeship program review process was flow charted and action plans for its implementation written. A subset of the Tripartite Committee, called the NMAP Study Group, was charged with completing the actions.

First, a review was conducted to determine if there were minimum entrance and graduation requirements for the apprenticeship programs. Then sections 9 through 12 of INPO 86-018 were used as the standard for program content review. INPO 86-018 forms a basis for utility training programs. Only Sections 9 through 12 of this document are the sections which correspond to the fundamental skill related subjects. The section titles are provided below:

- Section 9- Fundamentals Training (math, physics, electrical science, I&C, Chemistry, radiation detection, basic atomic & nuclear physics, etc.)
- Section 10- Tool and Equipment Skills Training (hand and power tools, M&TE)
- Section 11- Plant Systems and Components Knowledge Training (equipment: rotating, heat transfer, process conditioning, electrical, I&C, passive, etc.)
- Section 12- Plant Systems and Components Skills Training

A matrix of subjects and topics from INPO 86-018 was developed. The craft unions, in conjunction with members of the study group, reviewed the sections of their respective program documents which addressed each subject and topic on the matrix. The study's conclusion were that an individual completing the apprenticeship program acquires the knowledge and skills required per INPO 86-018. The NMAP Study Report and evaluation matrices which were developed are printed under separate cover.

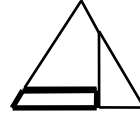
Issuance of ACAD 92-008

Subsequent to the program reviews, the Study Group discovered that ACAD 92-008 had been issued to replace INPO 86-018. A comparison of these two documents was performed to determine if the results of the apprenticeship program reviews would be affected by the issuance of ACAD 92-008. This comparison indicated that the review results remain valid under the use of ACAD 92-008. ACAD 92-008 provides a less detailed listing of the requisite knowledge and skills in sections 6 through 9 than INPO 86-018 does in sections 9 through 12. This comparison is documented in the NMAP Study Report.

Task Listings

Through the performance of the detailed reviews of the six union apprenticeship programs, the Study Group found that these programs provide qualification for an extensive number of tasks in several different industries. The tasks that the nuclear power industry normally assigns to craft labor union personnel are merely a subset of those tasks addressed in the apprenticeship

programs. Through discussions with utility, contractor, and union representatives a list of common tasks assigned to the building trades was developed. For each of these tasks the supporting skills and knowledge topics covered in the union apprenticeship program were identified and documented. The task listing for each union provides the trade specific tasks for which journeymen are capable of performing. The task lists are broken down into the categories of Generic, Fabrication/Installation, and Maintenance. This information concentrates on the tasks associated with the nuclear power industry and is not intended to be an all-inclusive list of task qualifications acquired through apprenticeship. The task listing and supporting skills and knowledge is documented in the NMAP Study Report. A summary list of the tasks without the supporting skills and knowledge listings is provided in Attachment H.



V. TRAINING PROGRAM SELF-ASSESSMENT

In addition to performing detailed reviews of the six unions, the Study Group also evaluated each union's ability to assure compliance with the program issued by the national organization. This is an important factor since the NMAP relies on proper implementation of the national training program at the local training center. The union training organizations have different methods in which they monitor compliance and adequate controls currently exist. To provide continuing feedback concerning how well the apprenticeship process is functioning, each union was asked to pursue an additional measure.

This additional measure is the development, distribution, and implementation of the training program "self assessment" process by each union. The Local Joint Training Committees will use a standard self assessment checklist that has been generated at the national level to evaluate the major program elements for compliance, and forward the results of these assessments to the national training organization. A copy of this self-assessment will be presented to the local union during the pre-implementation phase of the NMAP (Step 8). A generic example of this document is provided as Attachment B.

A key factor in the self assessment process is that the employers, who have a vested interest in the quality of union personnel, sit on the Local Joint Training Committee. It is the employer that provides additional accountability to the self assessment process.

Deficiencies or enhancements to the union apprenticeship program are identified during this self-assessment and corrective actions put into place to implement those elements needing correction. The utility and contractors have an opportunity to input areas of concern based on experience at the site level to the Local Joint Training Committee for correction to the programs. This method can also assist in the feedback of new technologies and changing methods of installation to the national and local unions.

Periodic and scheduled audits of the NMAP by the utility and contractor is an essential part in assuring the national and local training program are in compliance with the NMAP Study Report and matrices. A utility should include NMAP Subject Matter Experts and those involved with its implementation in the auditing process.

VI. EQUIVALENCY PROCESS



The Study Group also recognized that not all union journeyman from the six unions subject to detailed reviews have completed an apprenticeship program. The process for entry into the union varies from union to union and local to local. Therefore, a method was established to address such personnel referred to as "non-apprentices". The method took into consideration the existing program controls, and journeyman experience since many non-apprentices have been performing quality work in the nuclear plants since initial construction of the plants. The following two part approach was established to provide assurance that non-apprentices hold the fundamental skills required to work in a nuclear plant independently.

Each of the six unions have established a set number of working hours which, if possessed by a non-apprentice, provides assurance that the individual would have gained the same fundamental knowledge and skills as a graduate apprentice. This number of working hours is used as a cut off point to determine whether performance testing is required. If the non-apprentice exceeds the number of required hours as of January 1, 1996, then a one time "recognition of capability" will be granted and testing is not necessary. Table 1 provides the experience requirements for each union.

Union	Experience Required (hours)
Electricians	15,000
Pipefitters	12,000
Millwrights	10,000
Sheet Metal Workers	10,000
Boilermakers	7,500
Ironworkers	6,000

Table 1- *Equivalency Experience Requirements*

The Study Group pursued the use of equivalency examinations to formally demonstrate that construction trade union journeyman who did not complete the apprenticeship program and do not meet the criteria for the one time recognition of capability hold the fundamental skills equivalent to an apprentice graduate. If the non-apprentice does not meet the experience requirements, then equivalency testing will be administered. The equivalency tests have been developed by the union training organization and include written and manipulative testing. The union training organizations were provided with guidelines based on information extracted from EPRI's *Workbook for Maintenance Proficiency Test Development* (TR 101981 NP). Reference Attachment C for those guidelines. The equivalency examinations developed by each union training organization are available for review by the utility to assure that the testing is consistent with their expectations. Each union training organization has been instructed to validate their equivalency examinations as outlined in Attachment C.

VII. STEPS FOR ADOPTING THE NMAP

Since ANS 3.1 clearly indicates that each owner organization has the obligation to "...ensure that contractor personnel...are qualified to perform their tasks", each owner organization which is considering adopting the NMAP is expected to perform a review of the basis for the process. This entails a detailed review of the NMAP Study Report and those General and Detailed Reviews of the union apprenticeship programs contained in that report. It is recommended this review be documented on an individual union program basis and any exceptions to the study report noted in this review. Elements that are not included in the NMAP Study matrices, but are deemed necessary by the reviewing utility should be addressed in Site Specific Training.

Concerns and exceptions should be reviewed and resolved prior to implementation of the process.

Attachment D provides a set of important considerations when performing this review. Each utility must agree with the basis of the process for it to be implemented as designed. If a utility does not agree with specific portions of the basis, then the process must be adjusted to resolve all concerns with that portion of the process.

VIII. NMAP IMPLEMENTATION

Once a utility adopts the NMAP, then a specific set of actions must take be performed to prepare for and carry out implementation. Each of the process participants (union, contractor, utility) are responsible for completing their respective actions. The recommended approach is to implement first on a “pilot” basis (implementation by select trades or contractors versus all the first time). Attachment E provides a set of prerequisites for pilot implementation. After pilot implementation, the process is fine tuned and implemented full scale. Below are the specific steps necessary to properly pursue implementation.

Pre-Implementation

Step 1.

The utility performs a detailed review of the NMAP Study Report matrices and formally accepts and adopts the NMAP.

Step 2.

The utility formally notifies the contractor of the acceptance and adoption of the NMAP by notification letter. Attachment F is a sample letter. A pre-implementation meeting with the contractor is recommended to indoctrinate contractor management personnel on the NMAP and their role and responsibilities in the implementation process.

Step 3.

The contractor issues a formal notification letter to the local unions involved in the NMAP implementation. Attachment G is a sample letter. A pre-implementation meeting with the local union is recommended to indoctrinate local union personnel on the NMAP and their role and responsibilities in the implementation process.

Step 4A.

The utility performs a review of the impact of the NMAP on any training or inprocessing procedures. The utility revises procedures as necessary based on this impact review.

Step 4B.

The contractor performs a review of the impact of the NMAP on any training or inprocessing procedures. The contractor revises procedures as necessary based on this impact review.

Step 5A.

The utility evaluates and identifies those utility personnel necessary to be provided indoctrination on the NMAP. Indoctrination and training is performed on personnel identified as part of this evaluation.

Step 5B.

The contractor evaluates and identifies those contractor personnel necessary to be provided indoctrination on the NMAP. Indoctrination and training is performed on personnel identified as part of this evaluation.

Step 6.

The utility and contractor arrange a meeting with the Local and National union representatives involved to plan details for the implementation of the NMAP.

Step 7.

The National unions provide guidance and indoctrination on the NMAP implementation to the local union. This should include guidance and indoctrination to locals referring "travelers" to the home local.

Step 8.

The National union presents the documentation method to document qualification, equivalency test and self-assessment form to local union. Copies of documentation method is provided to the utility and contractor.

During Implementation

Step 9.

The Local union reviews the qualification status of its members. This method may follow one of three paths:

- Target those members who work at nuclear facilities
- Target the entire membership
- Target only those members referred to a nuclear facility as they are referred

This qualification review follows the NMAP Study Report methods for determining:

- An Apprentice Graduate Journeyman
- One Time Recognition of Capability Journeyman
- Equivalency Tested Journeyman

Note: The referral of all craftsman to one of these methods is not required. Craftsman referred as Welders, Specialized Skill (those craftsman who have previous training or will receive training in a specific area and who are not expected to perform any other work scope) and Apprentices. These individuals can be waived of the NMAP requirements. Those craftsman positions need to be identified and the details for inprocessing during the implementation phase of the NMAP. This should be completed as part of Step 6.

Step 10.

Complete the equivalency testing of those non-apprentice journeyman not meeting the one time recognition experience hours.

Step 11.

The union completes the qualification documentation upon referral of journeyman to job site. Journeyman brings the documentation form to the job site upon referral to the inprocessing center. Inprocessing personnel confirm qualification documentation and initiates inprocessing process for journeyman.

It is recommended that the initial implementation of the NMAP be conducted as a Pilot Program prior to complete implementation to verify that the necessary controls and implementing elements are present and functioning properly. All elements of the Pilot Program should be put into place for Pre-Implementation. The requirements for Implementation (Steps 9, 10 & 11) should be considered waived if the required documentation and/or equivalency testing is not completed. This consideration should be reviewed based on inprocessing time, manpower needs and outage start dates. A notice to the contractor and union locals of intent for full compliance to the NMAP should be given prior to complete implementation.

It is also recommended that information regarding number of craftsman referred by each local, number of craftsman referred with and without documentation and number of non-apprentice journeyman requiring equivalency testing be recorded to review with the contractor and local unions to resolve future implementation deficiencies at the end of a inprocessing phase.

Post Implementation

Step 12.

The local union performs an annual self-assessment of its apprenticeship training program and provides results to National level union representatives. Deficiencies or enhancements to the program based on this self-assessment are corrected or placed into action. Information regarding the self-assessment process is contained further in this handbook.

Step 13.

The utility in conjunction with contractor representation performs periodic audits of local and national union records and programs to assure compliance to the NMAP Study and Process. Information regarding the auditing process is contained further in this handbook.

Table 2 below is a summary of the steps with an indication of the amount of time they should be accomplished before implementation.

Steps to Implement	# Weeks prior to 1st hire date	
	Recommended	Minimum
1. utility accepts NMAP basis	20	8
2. utility issues notification letter to contractor	18	7
3. contractor issues notification letter to local unions	18	7
4A. utility revises any necessary training/inprocessing procedures	17	6
4B. contractor revises any necessary training/inprocessing procedures	17	6
5A. utility provides indoctrination on the NMAP to their responsible personnel	14	5
5B. contractor provides indoctrination on the NMAP to their responsible personnel	14	5
6. utility/contractor arrange a meeting with Local & National level union representatives to plan NMAP implementation	12	4
7. National union personnel provide guidance and indoctrination on the NMAP to local union personnel	12	4
8. National union training organization provides method to document qualification, equivalency test, and self assessment documents to the local union	10	3
During Implementation		
9. Local union reviews the qualification status of its members (can target only those members who work nuc's, or entire membership, or as referred to nuc's implementing the NMAP)	8	2
10. Test members as necessary	6	2
11. Complete qualification documentation; member brings to the site upon referral or document is faxed to site inprocessing personnel	1	1
Post Implementation		
12. Local Joint Committee performs annual self-assessment; provides results to national level	N/A	N/A
13. utility/contractor perform periodic audits of local/national union records to assure compliance with the NMAP	Periodically	Periodically

Table 2- NMAP Initial Implementation Steps

Application of NMAP to Work Assignments

This section provides the Fundamental Knowledge and Skills which an apprenticeship program addresses, and provides a Task Listing in order to help establish those fundamental knowledge and skills the individual union journeymen possess having completed the union apprenticeship program or equivalent process. A separate listing is provided for each union that was subject to detailed apprenticeship program reviews through the NMAP Study. These fundamental skills and knowledge are provided to assist in the development of levels of capability for each journeyman trade.

Fundamental Knowledge and Skills

- Basic Mathematics
- Classical Physics
- Basic Electric Science Principles
- Basic Instrument & Control Principles
- Properties of Reactor Plant Materials
- Basic Atomic & Nuclear Physics
- Heat Transfer & Fluid Flow
- Basic Reactor Plant Protection Concepts
- Chemistry Fundamentals
- Proper Use and Maintenance of Hand Tools
- Proper Use and Maintenance of Power Tools
- Proper Use and Maintenance of M&TE
- Purpose of/maintenance practices for plant systems and components

Through the performance of detailed reviews of the six union apprenticeship programs, the NMAP Study Group found that these programs provide qualification for an extensive number of tasks in several different industries. The tasks which the nuclear power industry assigns to craft labor union personnel is merely a subset of those tasks addressed in the apprenticeship programs. This section concentrates on the tasks associated with the nuclear power industry and is not intended to be an all inclusive list of tasks qualification acquired through apprenticeship.

The Task Listing (Attachment H) for each union provides the trade specific tasks which journeyman are capable of performing. The skills are broken down into the categories of Generic, Fabrication/Installation, and Maintenance. The listing of tasks and skills can be used by a utility/contractor to determine whether the planned work assignment for craft personnel is beyond the fundamental skill and/or task level which the union journeyman hold. If the work is beyond the fundamental skill or task level, then administrative controls or additional training may be necessary to assure proper task performance. Examples of administrative controls are detailed work instructions, technical direction during task performance, Quality Control Inspection, overview of task performance by utility personnel, and post maintenance testing. Additional training may either be accomplished through union skill enhancements training (journeyman upgrade training), contractor sponsored training, or utility sponsored training. See Attachment J for a recommended approach on using the Task Listing to determine need for additional controls.

The Task Listing (Attachment H) may not be all inclusive, but represents the greater percentage of tasks. If there are questions whether a particular task is addressed by the apprenticeship program, then discussion between the utility and local union training personnel is recommended to resolve the question.

Classification of Specialized Areas of Tasks

Not all craftsmen referred to the site will require NMAP qualification. This issue should be discussed and resolved during the pre-implementation meeting with the contractor and local unions.

Examples of exclusion to the NMAP are welders, painters, other specialized skills, and Apprentices.

Welders who are referred to the site only for the performance of welding activities need not meet the NMAP qualification requirements. Qualification is established using utility or contractor welding code and site specification requirements.

Specialized Skills may include those skills gained through a journeyman upgrade skills training program such as laser alignment, MOV, AOV or valve technician training. Journeyman referred to the site whose only work assignment will be the specialized area, may or may not need to meet NMAP qualification requirements. These qualification requirements need to be established prior to referral of journeyman to the site.

Apprentices referred to the site are craftsman performing on-the-job training as part of their work assignment and do not perform work on an independent basis. These referrals are excluded from the NMAP qualification process.

ACKNOWLEDGMENTS

Many organizations and individuals within those organizations contributed to the development of the NMAP. The NMAP Committee would like to identify those who diligently worked the hours necessary to assure the success of the study. This process was developed over a three year period. As a result, turnover of participants was experienced during this period. The following list attempts to capture all of those involved through the years.

NMAP Committee (Earlier called the Tripartite Committee):

Dan Shamblin	Commonwealth Edison Company
Len Petrie	Commonwealth Edison Company
Mike Dougherty	Commonwealth Edison Company
Stu Clark	Commonwealth Edison Company
Rich Swiderski	Duquesne Light Company
Kevin O'Connor	Southern California Edison Company
Frank Rothen	Northeast Utilities Company
Dave Ellenberger	Stone & Webster Construction Company
Jack Dakes	Fluor Constructors International, Inc.
Iz Cakrane	Raytheon Engineers & Constructors, Inc.
John Brock	Bechtel Construction Company
Tom Pagan	Associated Maintenance Contractors
Tom Owens	Building and Construction Trades Dept., AFL-CIO
Randall Gardner	United Association (Pipefitters)
Pat Reilly	International Brotherhood of Electrical Workers
Lew Pugh	United Brotherhood of Carpenters (Millwrights)
Henry Gertz	United Brotherhood of Boilermakers
Ed Pelger	Sheet Metal Workers International Association
Charles Hill	International Association of Bridge, Structural and Ornamental Iron Workers
Noel Borck	National Maintenance Agreements Policy Committee

NMAP Study Group:

Mike Dougherty	Commonwealth Edison Company
Stu Clark	Commonwealth Edison Company
Len Petrie	Commonwealth Edison Company

Primary Contacts for the International Union Apprenticeship Training Organizations:

Al Parmenter	United Association (Pipefitters)
Don Ball	United Association (Pipefitters)
A.J. Pearson	National Joint Apprenticeship and Training Committee (IBEW)
Dale Shoemaker	United Brotherhood of Carpenters (Millwrights)
Dan Everett	International Brotherhood of Boilermakers
Dave Herrington	National Training Fund (Sheet Metal Workers)
Ray Robertson	International Association of Bridge, Structural and Ornamental Iron Workers

ANS Contacts:

Jim Mallay	Standards Steering Committee
Marylin Weber	Administrative Secretary
Pete Walzer	ANS 3.1 Committee

INPO Contacts:

Jim Morris	Training Implementation Dept.
Don Sullivan	Training Implementation Dept.

EPRI Contacts:

Loran Maier	EPRI
Jamie Mangum	EPRI (contractor)

The NMAP Committee extends sincere appreciation to all of those involved in the development of the NMAP. This group followed a vision, and can be proud that their efforts have left a mark in the Nuclear training industry.

NMAP
Implementation
Handbook
Attachments

Listing of Attachments

Attachment	Description
A	ANS 3.1 Clarification Response
B	Apprenticeship Program Self Assessment
C	Performance Demonstration Development Guideline
D	Utility NMAP Review Considerations
E	Prerequisites for Pilot Implementation
F	Sample Notification Letter- Utility to Contractor
G	Sample Notification Letter- Contractor to Local Unions
H	Trade Specific Task Listing
J	Recommended Approach for Use of Task Lists



AMERICAN NUCLEAR SOCIETY
STANDARDS COMMITTEE

March 22, 1993

Headquarters:
55 North Kensington Avenue
Grange Park, Illinois 60525 USA
Telephone: 708/579-8266 or 8269
Fax: 708/358-6464 or 0499
Telex: 4972673

Stu Clark
Commonwealth Edison Company
1400 Opus Place, Suite 400
Downers Grove, IL 60515

Re: Request for clarification of ANSI/ANS-3.1-1993, American National Standard for Selection, Qualification, and Training of Personnel for Nuclear Power Plants.

Dear Mr. Clark:

You had requested clarification of **Section 3.2.2** of the above-referenced standard relative to the Nuclear Mechanic Accreditation Study (NMA) as defined in your letter of September 29, 1993. The ANS-3.1 working group has developed a response to your question: see below. This clarification has been approved by Subcommittee 3, Reactor Operations, and is in compliance with the procedures of the ANS Standards Committee.

The request for clarification is paraphrased as follows:

If a utility (e.g., owner organization) accepts the results of the NMA Study and the labor union responsible for the defined task provides documentation of an individual's successful apprenticeship program completion (or of equivalent experience), does this provide sufficient documentation to the contractor and the owner organization that this individual has the basic skills necessary to enter the contractor's and owner organization's task-specific training program?

Section 3.2.2, Contractor and Temporary Positions, of ANSI/ANS-3.1-1993 reads as follows:

The owner organization shall ensure that contractor and temporary personnel who perform activities on safety-related structures, systems, or components are qualified to perform their assigned tasks. Assurance shall be obtained that contractor personnel have the required qualifications prior to independent involvement in these activities. Proper documentation of at least one of the following is considered adequate assurance:

- (1) Documentation by the contractor that their

employee(s) is (are) qualified to perform their assigned tasks; or
(2) Previous verification by the owner organization of the ability of the contractor employees to perform their assigned tasks; or
(3) Successful completion by the contractor employees of those segments of the owner organization's training program that are considered pertinent to accomplishment of their assigned tasks.

Individuals who do not have the assurance (documentation) as described above shall be under the direction of an individual qualified to verify the adequacy of their work.

The following response is provided:

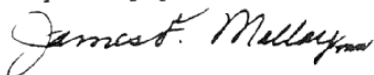
Section 3.2.2 of ANSI/ANS-3.1-1993 does not specify qualification requirements nor prerequisites for entering an owner organization's training program. Requirements are determined by the owner organization based on tasks assigned to contractor personnel.

The owner organization may accept the results of the NMA Study and documentation provided by the union in evaluating qualifications. Each owner organization has the obligation to "...ensure that contractor personnel...are qualified to perform their assigned tasks." The NMA Study provides useful information for performing this evaluation. However, the owner organization has the obligation to determine if the tasks identified in the study are sufficient to "...perform their assigned tasks" and may require additional documentation, training, or evaluation.

Documentation provided to the owner organization for evaluating contractor qualifications may include a description of the tasks they are qualified to perform, the basis for qualification recommendations, and supporting documentation (e.g., program description or test results).

We hope this clarification is helpful in applying the requirements of the standard.

Very truly yours,



James F. Mallay
Chair, Standards Steering Committee

cc: P. Walzer
L.E. Davis
W.H. D'Ardenne

Apprenticeship Program Self Assessment

This self assessment checklist is intended to be used by the Local Joint Training Committee. The main goal of this self assessment is to objectively evaluate whether the apprenticeship program is being properly implemented at the local level. The individuals involved in this assessment must take appropriate actions to assure resolution of any concerns identified.

Assessment by: _____

RATING SCALE:

Date: _____

- 0 Not Applicable. State reason for non-applicability
- 1 Unacceptable. Program requirements not met. Specifically state what is unacceptable.
- 2 Satisfactory. Program requirements met. Comment only when necessary.
- 3 Excellent. Program requirements exceeded. State how the program is exceeded.

Assessment Areas	Rating	Comments
------------------	--------	----------

1.0 Training Materials

- 1.1 Are the National Apprenticeship Program training materials used by the instructors for all subjects?
- 1.2 Are the National Apprenticeship Program training materials used by all apprentices?
- 1.3 Are errors or necessary enhancements in the training materials reported to the National training office?
- 1.4 Are updates to the training materials received and properly incorporated?

2.0 Instructors

- 2.1 Have the apprenticeship instructors successfully completed the training req'd by the national program for the subjects which they teach?
- 2.2 Are the instructors periodically evaluated for effectiveness?
- 2.3 Do the instructors attend required refresher or update training?

3.0 Examinations

- 3.1 Are examinations controlled such that they are not accessible to the apprentices prior to the exam period?
- 3.2 Are examination questions periodically changed?
- 3.3 Do the examinations being used correspond to the version of training materials being used?
- 3.4 Are errors or necessary enhancements to the examinations reported to the National Training office?

**Apprenticeship Program
Self Assessment**

Assessment Areas	Rating	Comments
------------------	--------	----------

3.0 Examinations (Cont.)

3.5 Are adequate controls in place to assure that the apprentices who are given credit for the exam are in fact the ones who completed the exam?

--	--

4.0 Training Records

4.1 Are records maintained which indicate that apprentices have successfully completed each required topic?

--	--

4.2 Does the file system allow easy retrieval of all records for a single apprentice?

--	--

4.3 Are the records controlled to prevent unauthorized access?

--	--

4.4 Are instructor records maintained which indicate the courses successfully completed by the instructor?

--	--

4.5 Does the file system allow easy retrieval of all records for a single instructor?

--	--

5.0 Apprenticeship Program Implementation

5.1 Does the Local Joint Apprenticeship Committee meet periodically per program requirements to address apprenticeship issues?

--	--

5.2 Are the employer and union groups adequately represented at all Local Joint Apprenticeship Committee meetings?

--	--

5.3 Have the apprenticeship standards developed by the Local Joint Apprenticeship Committee been approved per the National program?

--	--

5.4 Has the Local Joint Apprenticeship Committee submitted deviations from the National program for approval to the National office when required by the National program?

--	--

5.5 Does the Local Joint Apprenticeship Committee adequately interface with the National office to assure the program remains current with the changes in the technology and work assignment trends?

--	--

The following signatures indicate that this self assessment has been properly performed and all necessary corrective actions have been acceptably completed.

Local Joint Committee Union Representative _____
Local Joint Committee Employer Representative _____

Performance Demonstration Development Guideline

The use of an equivalency test is being pursued by the Nuclear Mechanic Apprenticeship (NMAP) Study Group to formally demonstrate that construction trade union journeyman who did not complete the apprenticeship program and do not meet the criteria for the one time recognition of capability, as a minimum, hold the fundamental knowledge and skills equivalent to an apprentice graduate. This document is meant to provide guidance on test development to the Pipe Fitter, Electrical Worker, Boilermaker, Millwright, Sheet Metal Worker, and Iron Worker unions.

The following guidance is based on information from a nuclear industry document which provides step by step direction for the development of proficiency tests. The document was published by the Electric Power Research Institute (EPRI) with the title of *Workbook for Maintenance Proficiency Test Development* (Publication No. TR 101981 NP). This Workbook was written to develop tests for task specific maintenance activities (such as repair of a specific component) which has a more narrow focus than the type of test to be developed for the NMAP (our test will address the range of tasks performed by journeyman), but the principles still suit our needs.

The NMAP Study Group realizes that the union training organizations have experience in performance demonstration development, but our hopes are that these guidelines will either confirm the quality of your process, or provide some new principles to enhance your process. These guidelines also provide specific direction for NMAP test development. The guidelines are broken down into four major areas: general, development of performance tests, development of written tests, and validation of tests.

General Guidance

1. Each union has a choice to make concerning the scope of the equivalency test. Since the skills required for the nuclear industry may only represent a portion of the skills obtained through apprenticeship, this non-apprentice equivalency test can verify that the full range of skills are held, or just those which the nuclear industry is interested in.
 - As a minimum, the skills necessary for the nuclear industry must be addressed by the performance demonstration.
2. To assure the skills necessary for the nuclear industry are addressed, the matrix which was developed as a results of the detailed review of your apprenticeship program should be used to identify the major subjects to be addressed. These are identified in the matrix with the word "Addressed" in the non shaded boxes. Attachments A and B are two sample outlines of the major subjects for the Pipe Fitter and Sheet Metal Worker trades. Each union would develop their own.
3. The equivalency test must be able to demonstrate an individual possesses both the knowledge and skills associated with their trade. This is best accomplished by having the individuals complete hands-on tasks under mock conditions to demonstrate that the knowledge/skills are present. A single mock activity can demonstrate numerous elements of knowledge and skill.

- For example, having an individual fabricate a simple piping/valve assembly per a drawing can demonstrate the following: Understanding of materials, components; joint preparation; fit-up/assembly methods; configuration; mathematical skills, blueprint reading; hand and power tools; and valve types. Such performance demonstration mockups could be standardized or made to suit the needs of each local union hall.
4. Oral or written questions will also be necessary to demonstrate an individual has the required knowledge. Such questions can be used to demonstrate the understanding of a task which takes too long to perform, involves thought processes not directly observable, or the task occurs under special conditions which are too difficult or expensive to duplicate.

Development of a Performance Test

1. **Identify the required skills to be verified-** This is performed by identifying the major activities/tasks which a graduate apprentice must be able to perform. This step is dependent on the decision discussed in the "*General Guidance*" section, Item 1.
2. **Determine what equipment and materials will be available-** The availability of real or simulated equipment and materials must be evaluated. Since this testing will be performed by the local training committees, the materials and equipment must be readily available to all locations, and as you are aware of, it must not be too expensive. The tools necessary for the performance test must also be considered.
3. **Determine the number and kind of test items-** The EPRI Workbook indicates that a goal of forty test items should be set (this is the ideal), with fifteen items being a minimum. The kind of items would be performance steps and discussion items (either verbal or written). Considering the fact that the Workbook was written for the testing of a single task, we must adjust this number to allow for the testing of more than one task. We recommend that each task have 10 to 20 items, and that the test address 2 to 5 major tasks. Since it is not practical to test for each task which an apprentice must learn, it is best to concentrate on those performed more frequently in the field or of greater importance.
4. **For each task, determine the performance steps to be addressed by the test-** It is important to establish the correct level of detail for each of the performance steps. Each step should contain a distinct action, with a clear beginning and ending; minor steps in service of a major step (such as removing a screw) should be encompassed in the major step (e.g., removal of the actuator casing).

Example 1- For the task of Overhauling a Centrifugal Pump

Too Narrow: Loosen bolts on upper casing

Too Broad: Remove rotating assembly

Correct: Remove upper casing

Example 2- For the task of Adjusting Limitorque Limit Switches

Too Narrow: Turn set rod clockwise until it stops

Too Broad: Adjust limit switch #1

Correct: Release limit switch rotor #1 for adjustment

5. **Determine which performance steps will be hands-on and which will be discussion-** The steps to be targeted for hands-on work should be those which are critical to the success of the task as a whole, and those which exhibit proficiency for the task. If the task involves repair of components, then consider concentrating on the disassembly steps since re-assembly involves performing similar actions in the reverse order. Once the hands-on steps are identified, evaluate each step not being performed and ask: "Do these steps have any characteristics that define proficiency?" If so, these should be considered for discussion questions. The re-assembly process will likely be a good candidate for discussion questions since the actions of disassembly are repeated in opposite order, and any special re-assembly concerns can be addressed.
6. **Construct the performance items-** At this point, you should have a rough draft of the performance test consisting of the steps of the task which are addressed through either performance items, or discussion questions. The performance items (normally designated by a "P" prefix) now need more detail added to assure the proficiency is properly evaluated. Each performance item has four possible parts; task step, performance standards, task caution, and scoring criteria.
- Task Step- is like the stem in a multiple choice question which describes the content of the activity and has a clear beginning and end point. The task step normally contains an action verb ("adjust") and an object on which the action is performed ("limit switch").
 - Performance Standard- is like the items under the stem of a multiple choice question which describes how the step should be performed.
 - Task Caution- provides warning that a step must be performed in a certain way to avoid personal injury or equipment damage. **These are normally listed in bold print.**
 - Scoring Criteria- is used to determine whether or not the examinee "passed" or "failed" the performance item. Often scoring criteria are contained in the performance standards.

Example:

- P1 .Remove the back pull-out assembly. (Task Step)
- a. matchmark casing adapter
 - b.(**Task Caution**) **ensure that the pressure is relieved before removing capscrews.** loosen capscrews in crisscross pattern;
 - c. jackscrews may be used, if available; capscrews may be used as jackscrews if necessary
 - d. remove capscrews and assembly
- Performance Standard: must perform items a through d

Scoring Criteria would be provided separately from the performance demonstration document and, for the above example, could be "correct performance of all four steps (common errors: forgetting to loosen in a crisscross pattern)"

7. **Construct the discussion items-** Discussion questions have three parts: question, response key, and scoring rule. These test items are normally designated with a "D" prefix.

- Discussion questions are meant to test specific task knowledge rather than general knowledge. For example, the question "What precautions should be taken when removing the limit switch compartment cover?" is appropriate whereas the question "What is the unit of measurement for resistance?" should be addressed through a written test rather than a discussion question.
 - Response Key- lists the acceptable answers to the question.
 - Scoring Rule- tells you which answers or how many answers must be given to receive full credit. Often, there are many acceptable answers, so you must decide how many a graduate apprentice should be able to name for full credit (e.g., 3 out of 7). You also have the option of giving partial credit when appropriate as long it is clearly defined.
8. **Package the items into a test-** Arrange the performance and discussion items in order. Consider creating some major sections such as Planning, Layout, Assembly/Fabrication, Inspection. You should also consider creating a space in the left margin of each item for the score, with the maximum possible score in parentheses. To complete the test package, you should add sections on Testing Conditions, Materials Required, and Instructions (for the examinee and test administrator).
9. **Establish scoring rules-** Now that you have a complete performance demonstration, you must assign each item a point value which is commensurate to its difficulty or importance. A simple method is to start with the easiest items first and assign a point value to it (say 2 points), then work your way through the items assigning higher point values to the more difficult or important items. Then add up the total points for the test and make minor adjustments in point values until you can make the total point value easily divisible into 100 (e.g., if total value is 50, then just double the value of each item to make 100).

Development of a Written Test

1. **Identify the required knowledge to be verified-** This is performed by identifying the major subjects which a graduate apprentice must have knowledge in. This step is also dependent on the decision discussed in the "*General Guidance*" section, Item 1.
2. **Determine the knowledge types to be covered by the test-** Most items cover one of four types of knowledge; Basic, Function, Component Identification, and Symptom Diagnosis.
 - Basic- general information which is not specific to a particular task
 - Function- information concerning how or why a component functions the way it does
 - Component Identification- through the use of a diagram or actual items, designated components are identified by the examinee
 - Symptom Diagnosis- information concerning why a component or assembly has particular functional or operating problems

The EPRI Workbook indicates that an equal number of questions should be developed for each type of knowledge. Considering the fact that the Workbook was written for the testing of a single maintenance task, we must adjust this number to allow for the testing of more than one assembly/fabrication task. Again, we recommend that each task have 10 to 20 total items, and that the test address 2 to 5 major tasks. Therefore, using 5 items for each knowledge type would

be a good guideline, however, if the task is purely initial construction (not maintenance related), then items for the Symptom Diagnosis type would not be applicable.

Multiple choice questions will have three components; stem, correct response, and distractors. Items 3 through 5 below will address these components.

3. **Construct the stem portion of each item-** The stem states the question to be answered, usually in the form of a question or incomplete sentence. Avoid the use of negative wording in the stem. If this cannot be avoided, then highlight the negative wording in bold text. The degree of difficulty of the question can be manipulated by varying the detail, specificity, and complexity of the question.
4. **Construct the correct response for each item-** The correct response should clearly be the best alternative, contain the essential information, and "leap out" at the test developer. The correct response should be the same length, and provide the same degree of specificity or complexity as the distractors.
5. **Construct the distractors for each item-** The distractors should be plausible but clearly incorrect. They should not be tricky. The responses of "All of the above" or "None of the above" should be avoided.
6. **Package the items into a test-** You should now have 40 to 60 questions to address the tasks which you have selected. The next step is to place the correct responses in a random order. No pattern of correct answers should be able to be identified.
7. **Write the test instructions-** The main instructions needed for the test are to; "Circle the correct answer. There is only one correct answer per item."; "Answer every item even if you must guess"; and "If you have a problem or find the question confusing, then write a note on the test by that item, describing the problem. These problems will be considered in determining your score."
8. **Establish the scoring rules-** Convert the number of questions into a 100 point grading system (percentage scale). For example, a 40 item test would convert to 2.5 points per question. Also prepare an answer key which allows the test to be quickly graded.

Test Validation

1. **Review the tests' content and format with Subject Matter Experts (SME)-** In this first step, you will have two to four individuals knowledgeable in the tasks (union training coordinators or instructors, college professors, or supplier specialists) review all test materials (both written and performance demonstration) and actually take the tests. These individuals should be someone other than those who developed the training allowing an independent evaluation to be performed. This acts as the first screening of the tests. Any test items, instruction, rating scales, or diagrams which are identified as problematic should be modified or eliminated.
2. **Conduct a pilot administration-** Now you are ready to put the tests through a second screening, the pilot test. This is accomplished by having 5 to 10 examinees take both the written and performance test. These individuals should represent the full range of skills and

knowledge relevant to the task being tested. This means, if possible, you should have a couple of novice journeyman (just beyond the cutoff for the one time recognition of capability), a couple of fairly good journeyman, and a couple of real experts. Make sure the examinees understand they are "testing the test", not themselves. Encourage them to make comments in the test materials whenever they see problems.

3. **Analyze pilot data and refine tests-** To improve test items, consider using a process called item analysis. In this analysis, you compare the number of items less proficient examinees answered incorrectly to the number of items the more proficient examinees answered correctly. To do this, divide the test group in half (say 10 total, so 5 for half), take the top five scores and place them in Pile A, then place the remaining in Pile B. Then use a table similar to the following table to record the number of test items answered incorrectly by each group:

Test Item #	Pile A (higher score)	Pile B (lower score)	Results
P1	III	I	Bad
P2	I	III	OK
D3	II	III	OK
to end of test	
P40	I	III	OK

A "bad" item is one that has more tallies in Pile A than in Pile B, since this indicates that the individuals who should be answering correctly did not do so. Often, slight rewording of a bad item will salvage it, otherwise, throw it out and replace with another items. Because of this process, it is helpful to have more questions available than actually needed for the pilot test. This process would be performed for both the written and performance tests. The Workbook does go on to describe some other analysis and validation methods, however, these do not seem appropriate for our situation.

Sample Proficiency Demonstration

Pipe Fitters

Elements for Knowledge and Skills Assessment:

Basics

- Mathematics
- Hand and Power tools
- Measuring & Test Equipment (Calibrated tools)
- Science/Physics

Piping

- Understanding of piping materials, fittings, and components
- Preparation of threaded and welded joints
- Fit-up/assembly
- Assembly of flanged joints
- Slope/Offsets/proper configuration (also demonstrates mathematical skills)

Valves

- Basic types
- Basic components
- Valve packing activity

Pipe Hangers

- Basic types
- Basic functions
- Installation considerations
- proper configuration

System Components (have knowledge of components Pipe Fitters interface with, and maintenance methods for any components which they work on)

- Rotating Equipment (pumps, compressors, fans, turbines)
- Heat Transfer Equipment (heat exchangers, heaters, condensers, reboilers, cooling towers, refrigeration units)
- Process Conditioning Equipment (demineralizers, purifiers, absorbers, recombiners, ion exchangers, ejectors, eductors)
- Instrument & Control Equipment (controllers, positioners, indicators, recorders, sensors, switches, transmitters, detectors)
- Passive Components (accumulators, pools, reservoirs, tanks, orifices, nuclear pressurizers and reactors)

Demonstration of knowledge on all of these is not required, but rather a sampling which demonstrates a solid knowledge base exists for these components.

Sample Proficiency Demonstration

Sheet Metal Workers

Elements for Knowledge and Skills Assessment:

Basics

- Mathematics
- Hand and Power tools
- Measuring & Test Equipment (Calibrated tools)
- Science/Physics

General Sheet Metal Work

- Layout (bench work)
- Fabrication & welding
- Drafting
- Insulating

HVAC

- HVAC component installation (duct, plenums, housings, grills, registers, diffusers, louvers, mixing boxes)
- Access doors
- Supports

Specialty Work

- Hoisting/rigging
- Balancing/controls

System Components (have knowledge of components Sheet Metal Workers interface with, and maintenance methods for any components which they work on)

- Rotating Equipment (compressors, fans)
- Heat Transfer Equipment (refrigeration units)
- Process Conditioning Equipment (filters, traps)
- Control Elements (actuators, dampers)
- Instrument & Control Equipment (controllers, positioners, indicators, recorders, sensors, switches, transmitters, detectors)

Demonstration of knowledge on all of these is not required, but rather a sampling which demonstrates a solid knowledge base exists for these components.

Utility NMAP Review Considerations

Since ANS 3.1 clearly indicates that each owner organization has the obligation to “...ensure that contractor personnel... are qualified to perform their assigned tasks”, each owner organization which is considering adopting the NMAP is expected to perform a review of the basis for the process (NMAP Study Report and associated documents). The following items should be considered during this review.

1. The NMAP Study addresses those contractor personnel who perform safety related maintenance activities at operating nuclear power facilities on a short term basis (6 months or less) as described in ANS 3.1-1993, Section 3.2.2. Per ANS 3.1 Section 3.2.1, contractor personnel who work on a long term or permanent basis must meet the requirements of ANS 3.1, Section 4 which includes the implementation of the Systematic Approach to Training (SAT) process.
2. Each union involved in the Detailed reviews performs a specific scope of work in the nuclear power plants across the country. This specific workscope was considered when determining whether the subjects/topics from INPO 86-018 not addressed by the apprenticeship program were significant. The following workscope were used when making these determinations:
 - **Pipe Fitters**- Piping/Tubing system fabrication, installation, pressure testing, repair; Piping support fabrication, installation, repair; Piping system component (e.g., valves, flow devices) installation, repair; Refrigeration system maintenance; Instrument installation, repair; Welding/Soldering; Bolting activities (flanged connections, bolted assemblies).
 - **Electricians**- Power and Control Cable installation, and termination; Cable raceway fabrication, installation, repair; Raceway support fabrication, installation, repair; Electrical equipment installation; Bolting activities (bolted assemblies); Temporary lighting system installation; Welding; Electrical connection soldering.
 - **Boilermakers**- Pressure vessel, heat exchanger, and tank fabrication, installation, repair; Pressure vessel, heat exchanger, and tank maintenance including bolted/welded manway removal and replacement; Welding; Bolting activities (flanged connections, bolted assemblies).
 - **Sheet Metal Workers**- HVAC system fabrication, installation, repair; HVAC system support fabrication, installation, repair; HVAC equipment installation, maintenance; Welding; Brazing; Bolting activities (flanged connections, bolted assemblies).
 - **Ironworkers**- Structural Steel installation, repair; Grating/Steel flooring installation, maintenance, repair; Welding; Bolting activities (bolted assemblies).
 - **Millwrights**- Rotating mechanical equipment installation, balancing, alignment; Motor Operated Valve (MOV) maintenance; Machining; Bolting activities (bolted assemblies), BWR Plant Control Rod Drive (CRD) maintenance.

3. Attachment A to the NMAP Study Report (Binder 2) provides the justification for not performing detailed reviews on other apprenticeship programs. This document contains specific positions taken by the NMAP Study Group concerning the scope of work assigned to the different unions, and the programmatic controls used by utilities which should be evaluated by each owner organization.
4. INPO 86-018 requires training in Basic Atomic and Nuclear Physics (section 9.7), Reactor Plant Protection (section 9.9), and Plant Systems (11.1). The position taken by the NMAP Study Group was that these courses are not necessary for the temporary contractor workforce. This position was taken based on the following reasons: (1) temporary contractor personnel receive the limited information necessary on these subjects through "GET" courses, and (2) sufficient administrative controls are normally placed on these personnel by the owners organization precluding the need for training in such areas as knowledge of system interaction and unreviewed safety conditions (50.59's) . The utility review should concur with this position.
5. INPO 86-018, Section 12 provides the requirements for "skills" training for plant components through the use of models and mock-ups. Such training aids will vary at each union local, however, the training given at the local union provides the fundamental skills required for further training. Owner organizations provide site specific training when necessary by using components identical to actual plant components such as Control Rod Drives (CRD's) and specific valve types. The utility review should concur with this position.
6. The NMAP allows for a one time "Recognition of Capability" for those journeyman who did not complete the union apprenticeship program. Each union established a set number of working hours that must be worked in the trade (e.g., 10,000 hours) by 1-1-96 to be eligible for the Recognition of Capability. This is considered equivalent to completion of the apprenticeship program since the established time period provides the individual with the same skill level as a graduate apprentice. Journeyman who do not meet this requirement must successfully complete the equivalency test developed by the National union training organization and administered by the local union training organization to be eligible for referral to a nuclear power facility. The utility review should concur with this position.

Prerequisites for Pilot Implementation

In order for the pilot process to function as designed, each process participant must complete the tasks as described below:

Unions

At the national level:

1. Provide the local training centers with the NMAP details, materials, and any necessary training. Facilitate initial implementation of the process at the local level.

At the local level:

1. Incorporate the evaluation for fundamental skills qualification into the referral process.
2. Perform the evaluation for fundamental skills on those members who are the most likely candidates for referral to nuclear stations.
3. Provide equivalency testing for those members who have not completed the apprenticeship program, or have worked the required number of hours.
4. Develop the ability to provide the fundamental skills qualification information to the contractor/utility.
5. Provide access for initial audits by the contractor/utility. Confirm that the National Training Department has been notified of the audit.

Contractor

1. Interface with the utility to determine the role which the contractor will play in the implementation process.
2. Develop any instructions or procedures necessary to support process implementation.
3. Provide any training necessary to support process implementation.
4. Continually interface with the local unions during the early phases to keep abreast of progress and issues which require resolution.

Utility

1. Evaluate the NMAP Study approach and considerations to assure that they support the methods and conditions for contracted work activities.
2. Develop any instructions or procedures necessary to support process implementation.
3. Provide any training necessary to support process implementation.
4. Coordinate the initial audit of the local unions.
5. Establish the conditions of the pilot program (determine whether the entire process or a portion thereof will be tested, determine the point at which normal operations is significantly affected and the pilot session should be discontinued).
6. Continually interface with the unions during the early phases to keep abreast of progress and issues which require resolution.

NMAP Committee

1. Facilitate planning meetings with the utilities, contractors and unions prior to the pilot session when requested by the implementing utility.

Sample Notification Letter: Utility to Contractor

<Date>

To: Contractor Project Manager
Address

Subject: Nuclear Mechanic Apprenticeship Process Implementation

<Utilities' name> <Station name> Station has adopted the Nuclear Mechanic Apprenticeship (NMA) process. To implement this process, <Contractor Name> must provide craft labor personnel who meet the requirements of the NMAP. The NMAP is a nuclear industry effort to provide more formal assurance that craft labor personnel working at commercial nuclear power facilities possess the fundamental skills required to perform the assigned work. This letter is intended to inform you of the requirements which are associated with the NMAP.

The second page of this attachment provides more detail on the basis for the NMAP and the steps involved in its implementation. The most important understanding you must have as the Contractor for the craft labor personnel, is that you must work closely with the local unions to assure that personnel referred to a nuclear site meet the NMAP requirements. To initiate this effort, you must notify the six local union organizations using the attached Sample letter (Attachment J).

The NMAP requires the union to provide written evidence for each person referred that indicates whether the individual either has:

1. Successfully completed the apprenticeship program for their trade, or
2. Met the criteria for the "One time recognition of capability" by working the required time in the trade prior to 1/1/96 (amount established by each union at the national level), or
3. Has successfully completed the apprenticeship equivalency test developed by the unions' national level training organization

The written evidence must be provided to your <Contractor name> representative on the first day of arrival at the site.

The existence of the above requirements does not prevent the union from referring apprentices as you normally have in the past. Since these apprentices will be working with a qualified journeyman at all times, the apprentices do not yet need to meet the NMAP requirements.

Should you have any questions concerning the NMAP, please contact the below signed individual.

<Utility representative name>
<Signature>

Background:

The Nuclear Mechanic Apprenticeship Process (NMAP) was developed through the efforts of Nuclear Utilities, AFL-CIO Building Trades Unions, and the Associated Maintenance Contractors. The process provides a formal method to document and verify fundamental skills qualification of contracted union workers. The process is based on a study which compared union apprenticeship training programs with the INPO standard for nuclear maintenance personnel training. Implementation of the process requires the involvement of the unions, contractors, and utility.

The term "fundamental skills" is defined as the skills acquired through the successful completion of the union apprenticeship program, or equivalent process, which provide an expectation for successful completion of further station specific or task specific training. A mechanic holding these skills can be expected to perform fundamental tasks which are normally assigned without detailed training. Training subjects which fall under this definition are mathematics, chemistry, hand tools, power tools, precision tools, basic physics, basic science, and plant systems/components.

Basic Process:

The basic NMAP is described below. This process only applies to the six unions typically involved in safety related work (Pipe Fitters, Electricians, Boilermakers, Sheet Metal Workers, Millwrights, Iron Workers)

1. The utility and contractor establish the type and quantity of contracted union personnel required for the project.
2. The contractor informs the different local union halls of the needs (positions to be filled).
3. The union hall determines which members are available for referral to this project and identifies the fundamental skills qualification status for each of these individuals. Those who have completed the apprenticeship program or meet the criteria for the "One time recognition of capability" (worked the required number of hours prior to 1/1/96) are eligible for referral. Those who have not must successfully complete an equivalency testing process to be eligible for referral.
4. The union hall provides the contractor with the fundamental skills qualification information. The basis for qualification must be either successful completion of the apprenticeship program, verification that the individual has met the criteria for the One time recognition of capability, or successful completion of the equivalency testing process. This may be presented in the form of a document, card, or other method authorized by the union.
5. The contractor verifies that each individual has provided evidence of fundamental skills qualification.
6. The union member then continues through the site specific training process.
7. Annually, the joint local training committee completes the self assessment form to evaluate whether the process is being properly implemented at the local level. A copy of the completed self assessment must be provided to the national office.

8. Periodically, the utility or contractor performs an audit of the union records to assure that qualification status is being properly evaluated at the local level. Such audits should be coordinated through the national training organization.

Sample Notification Letter: Contractor to Local Unions

Date

To: Local Union Business Agent/Manager
Address

Subject: Nuclear Mechanic Apprenticeship Process Implementation

<Utilities' name> <Station name> Station has directed <Contractor Name> to provide craft labor personnel who meet the requirements of the Nuclear Mechanic Apprenticeship Process(NMAP). The NMAP is a nuclear industry effort to provide more formal assurance that craft labor personnel working at commercial nuclear power facilities possess the fundamental skills required to perform the assigned work. This letter is intended to inform you of the requirements which are associated with the NMAP.

Attachment A provides more detail on the basis for the NMAP and the steps involved in its implementation. The most important understanding you must have as the provider of the craft labor personnel, is that the training and experience must be verified for personnel referred to a nuclear site which is implementing the NMAP. The process requires you to provide written evidence for each person referred that the individual either has:

1. Successfully completed the apprenticeship program for your trade, or
2. Met the criteria for the "One time recognition of capability" by working the required time in the trade prior to 1/1/96 (amount established by each union at the national level), or
3. Has successfully completed the apprenticeship equivalency test developed by the unions' national level training organization

The written evidence must be provided to the <Contractor name> representative on the first day of arrival at the site.

The existence of the above requirements does not prevent you from referring apprentices as you normally have in the past. Since these apprentices will be working with a qualified journeyman at all times, the apprentices do not yet need to meet the NMAP requirements.

Should you have any questions concerning the NMAP, please contact your national level business representative, national level training organization representative, or <utility representative name & phone number> who is a <Utility name> representative.

<Contractor representative name>
<Signature>

Background:

The Nuclear Mechanic Apprenticeship Process (NMAP) was developed through the efforts of Nuclear Utilities, AFL-CIO Building Trades Unions, and the Associated Maintenance Contractors. The process provides a formal method to document and verify fundamental skills qualification of contracted union workers. The process is based on a study which compared union apprenticeship training programs with the INPO standard for nuclear maintenance personnel training. Implementation of the process requires the involvement of the unions, contractors, and utility.

The term "fundamental skills" is defined as the skills acquired through the successful completion of the union apprenticeship program, or equivalent process, which provide an expectation for successful completion of further station specific or task specific training. A mechanic holding these skills can be expected to perform fundamental tasks which are normally assigned without detailed training. Training subjects which fall under this definition are mathematics, chemistry, hand tools, power tools, precision tools, basic physics, basic science, and plant systems/components.

Basic Process:

The basic NMAP is described below. This process only applies to the six unions typically involved in safety related work (Pipe Fitters, Electricians, Boilermakers, Sheet Metal Workers, Millwrights, Iron Workers)

1. The utility and contractor establish the type and quantity of contracted union personnel required for the project.
2. The contractor informs the different local union halls of the needs (positions to be filled).
3. The union hall determines which members are available for referral to this project and identifies the fundamental skills qualification status for each of these individuals. Those who have completed the apprenticeship program or meet the criteria for the "One time recognition of capability" (worked the required number of hours prior to 1/1/96) are eligible for referral. Those who have not must successfully complete an equivalency testing process to be eligible for referral.
4. The union hall provides the contractor with the fundamental skills qualification information. The basis for qualification must be either successful completion of the apprenticeship program, verification that the individual has met the criteria for the One time recognition of capability, or successful completion of the equivalency testing process. This may be presented in the form of a document, card, or other method authorized by the union.
5. The contractor verifies that each individual has provided evidence of fundamental skills qualification.
6. The union member then continues through the site specific training process.
7. Annually, the joint local training committee completes the self assessment form to evaluate whether the process is being properly implemented at the local level. A copy of the completed self assessment must be provided to the national office.
8. Periodically, the utility or contractor performs an audit of the union records to assure that qualification status is being properly evaluated at the local level. Such audits should be coordinated through the national training organization.

Trade Specific Task Listing

PIPEFITTERS

Generic:

- Bolting/Torquing
- Precision measuring
- Rigging of material/equipment (including use of hand signals or radio for direction, maintenance/inspection of rigging equipment)
- Fabrication of specialty tools, mock ups, and parts for support equipment
- Performance of welding activities- qualify for specific process
- Operation & Maintenance of welding/cutting equipment
- Reading/interpretation of mechanical prints, drawings, P&ID's
- Core drilling

Fabrication/Installation:

- Large and Small bore process piping (threaded, welded, bolted connections)
- Valves (gate, globe, ball, butterfly, check)
- Instrument tubing and supports
- Bending of small bore process piping and instrument tubing
- System components (such as valves, flowmeters, strainers, steam & air traps, pumps, cooling coils)
- Piping supports & auxiliary steel (such as clamps, U-bolts, sway struts, spring loaded, rod/trapeze hangers)
- Expansion joints
- Performance of hydrostatic/pneumatic testing
- Core drilling through floors/walls
- Concrete expansion anchors
- HVAC controls and supports
- Storage tanks
- Heat exchangers
- Boilers
- Condensers
- Air Compressors
- Pumps

Maintenance:

- Repair/replacement of damaged/degraded piping and tubing
- Repair/replacement of damaged/degraded system components
- Removal/repair/replacement of piping supports
- Valve repacking
- Installation of Hilti concrete expansion anchors
- Repair HVAC supports

Note: This task listing is intended to be used for determining the training requirements for contracted craft labor personnel, but is not intended to be used for determining jurisdictional work assignments. The contractor is responsible for making the appropriate work assignments based on labor agreements to which they have endorsed.

Trade Specific Task Listing

ELECTRICIANS

Generic:

- Bolting/Torquing
- Rigging of material/equipment (including use of hand signals or radio for direction, maintenance/inspection of rigging equipment)
- Fabrication of specialty tools, mock ups, and parts for support equipment
- Performance of welding activities- qualify for specific process
- Maintenance of welding/cutting equipment
- Reading/interpretation of electrical schematics, prints, drawings, control system & loop diagrams
- Reading/interpretation of *National Electric Code*
- Core drilling

Fabrication/Installation:

- Rigid steel conduit (bend, thread, and connect)
- Conduit supports & auxiliary steel
- Flexible conduit
- Junction boxes (including mounting or supports)
- Cable pan and covers (welded, bolted connections & grounding of)
- Cable pan supports & auxiliary steel
- Electrical duct & raceways
- Cable (placement or pulling; power and control cable)
- Cable termination
- Electrical equipment (such as cabinets, MCC's, power panels, distribution centers, motors,)
- Electrical instruments (such as recorders, meters, relays, limit switches, solenoid valves)

Maintenance:

- Repair/replacement of cable and conduit
- Repair/replacement of cable pan
- Repair/replacement of electrical supports and auxiliary steel
- Inspect and clean storage batteries
- Verify circuits are de-energized prior to work
- Check for equipment rotation
- Replace fuses and overloads
- Replace molded case circuit breakers
- Rack breakers in and out of switchgear
- Test and troubleshoot electrical circuits
- Repair/replace permanent lighting (bulbs, sockets, terminations)
- Perform continuity checks on cable
- Perform resistance checks on cable insulation
- Clean and inspect MCC's
- Control panel maintenance/modification (instrument installation, human factors upgrades)
- Installation of temporary lighting
- Installation of temporary power to trailers, or plant areas

Note: This task listing is intended to be used for determining the training requirements for contracted craft labor personnel, but is not intended to be used for determining jurisdictional work assignments. The contractor is responsible for making the appropriate work assignments based on labor agreements to which they have endorsed.

Trade Specific Task Listing

BOILERMAKER

Generic:

- Bolting/Torquing
- Rigging of material/equipment (including use of hand signals or radio for direction, maintenance/inspection of rigging equipment, use of block/tackles)
- Fabrication of specialty tools, mock ups, and parts for support equipment
- Performance of welding activities- qualify for specific process
- Maintenance of welding/cutting equipment
- Reading/interpretation of mechanical drawings

Fabrication/Installation (including internal components):

- Pressure vessels (tanks)
- Heat Exchangers
- Boilers/steam drums
- Condensers
- Galleries on Tanks and Vessels
- Tube rolling and installation
- Tank erection

Maintenance:

- Remove/install manway covers and gaskets
- Replace rupture discs
- Repair heat exchanger tubing (such as pulling & replacement, plugging, rolling tube ends, straightening, drilling)
- Tank repair
- Boiler repair
- Heat exchanger shell/structure repair
- Expansion joint replacement
- Condenser component repairs
- Grid layout for erosion/corrosion repairs
- Flange and closure connections
- Removal/Replacement of galleries on Tanks and Vessels

Note: This task listing is intended to be used for determining the training requirements for contracted craft labor personnel, but is not intended to be used for determining jurisdictional work assignments. The contractor is responsible for making the appropriate work assignments based on labor agreements to which they have endorsed.

Trade Specific Task Listing

MILLWRIGHT

Generic:

- Precision measuring
- Bolting/Torquing
- Setting sole plates
- Lubrication
- Rigging of material/equipment (including use of hand signals or radio for direction, maintenance/inspection of rigging equipment, use of block/tackles)
- Fabrication of specialty tools, mock ups, and parts for support equipment
- Performance of welding activities- qualify for specific process
- Maintenance of welding/cutting equipment
- Reading/interpretation of mechanical prints, drawings, P&ID's

Fabrication/Installation:

- Machinery (mainly rotating equipment; including setting base/foundation, bearings, gaskets & seals)
- Turbine-Generator-Exciter
- Air compressors
- Pumps
- Monorails
- Conveyor systems
- Belting
- Gear boxes
- Drive systems (such as belt, chain, direct, hydraulic, and pneumatic drive)
- Ventilation system fans & motors

Maintenance:

- Bearing installation/repair (such as roller, thrust, needle)
- Rim face coupling alignment
- Reverse double dial coupling alignment
- Vertical coupling alignment
- Gear alignment
- Turbine coupling installation/alignment
- Turning gear installation/alignment
- Crane inspection and repair

Note: This task listing is intended to be used for determining the training requirements for contracted craft labor personnel, but is not intended to be used for determining jurisdictional work assignments. The contractor is responsible for making the appropriate work assignments based on labor agreements to which they have endorsed.

Trade Specific Task Listing

IRON WORKER

Generic:

Bolting/Torquing

- Rigging of material/equipment (including use of hand signals or radio for direction, maintenance/inspection of rigging equipment, use of block/tackles)
- Heavy Rigging
- Skids, rollers and jacks
- Performance of welding activities- qualify for specific process
- Maintenance of welding/cutting equipment
- Reading/interpretation of structural prints, drawings, P&ID's

Fabrication/Installation:

- Structural steel
- Metal decking, grating/steel flooring
- Reinforcing material (Rebar)
- Rebar cadwelding
- Containment/Reactor building tendons (Post tensioning)
- Assemble cranes
- Crane reeving
- Special doors (steel; such as radiation, tornado, watertight)
- Fences, gates, barriers
- Galleries

Maintenance:

- Repair/replacement of structural steel
- Removal/replacement/repair of grating and steel flooring
- Labor support for Containment/Reactor building tendon surveillances (Post tensioning)
- Install/remove metal sheeting
- Crane inspection and surveillance support
- Removal/Replacement and Repair of galleries

Note: This task listing is intended to be used for determining the training requirements for contracted craft labor personnel, but is not intended to be used for determining jurisdictional work assignments. The contractor is responsible for making the appropriate work assignments based on labor agreements to which they have endorsed.

Trade Specific Task Listing

SHEET METAL WORKER

Generic:

- Bolting/Torquing
- Rigging of material/equipment (including use of hand signals or radio for direction, maintenance/inspection of rigging equipment, use of block/tackles)
- Fabrication of specialty tools, mock ups, and parts for support equipment
- Performance of welding activities- qualify for specific process
- Maintenance of welding/cutting equipment
- Reading/interpretation of HVAC prints, drawings, P&ID's

Fabrication/Installation:

- HVAC ductwork; round, rectangular and flexible
- HVAC supports and suspension systems
- HVAC units
- Cooling coils
- Dampers (such as control, fire, balancing, smoke, backdraft)
- Air filters
- Temporary ventilation units
- Accessories; flexible connections, factory insulated flexible duct, access doors, turning vanes, grilles, registers, diffusers, instrument test connections, duct silencers and screens
- Flanged connections

Maintenance:

- Repair/replacement of HVAC ductwork, accessories and repair
- Repair/replacement of HVAC supports
- Duct repair
- Lagging inspection and repair
- Filter inspection and change out
- Air balance testing
- Leak testing

Note: This task listing is intended to be used for determining the training requirements for contracted craft labor personnel, but is not intended to be used for determining jurisdictional work assignments. The contractor is responsible for making the appropriate work assignments based on labor agreements to which they have endorsed.

Recommended Approach for Use of Task Lists

To get the most benefit from the NMAP, a utility should incorporate the principles of the process into their maintenance/modification work activity preparation and assignment process. The work activity preparation process normally involves a review of the work activities and an assessment of whether a specific activity requires knowledge and skills beyond the entry level capability of the work group. If it does, then administering training for this activity or use administrative controls (such as detailed work instructions, and QC inspections) is necessary to provide assurance that the work will be properly completed.

To describe this concept in a way which is easier to understand, it is best to break contracted craft training down into five different categories as described below and illustrated in Exhibit K1:

- **Fundamental Skills Training:** The knowledge and skills gained through the union training program or trade experience
- **Type A: Nuclear power plant required training-** Includes courses such as Nuclear General Employee (NGET), Fitness for Duty, Station Administrative procedures, Self Checking
- **Type B: Contractor specific training-** Includes training on work rules, safety program, contractor administrative and quality procedures
- **Type C: Utility work procedure training-** Includes training on work package usage, standard work procedures, maintenance procedures
- **Type D: Special skills/qualification activities-** Includes training and/or qualification on activities beyond fundamental skills capability such as complex valve repair, seals/penetrations, painting/coating, welding qualification

Fundamental Skills training is verified upon arrival through the NMAP. Contracted personnel who work on Safety Related activities normally complete courses in all three types of Station Specific Training. Task Specific training is only administered when the work assignment requires knowledge/skills beyond the fundamental level.

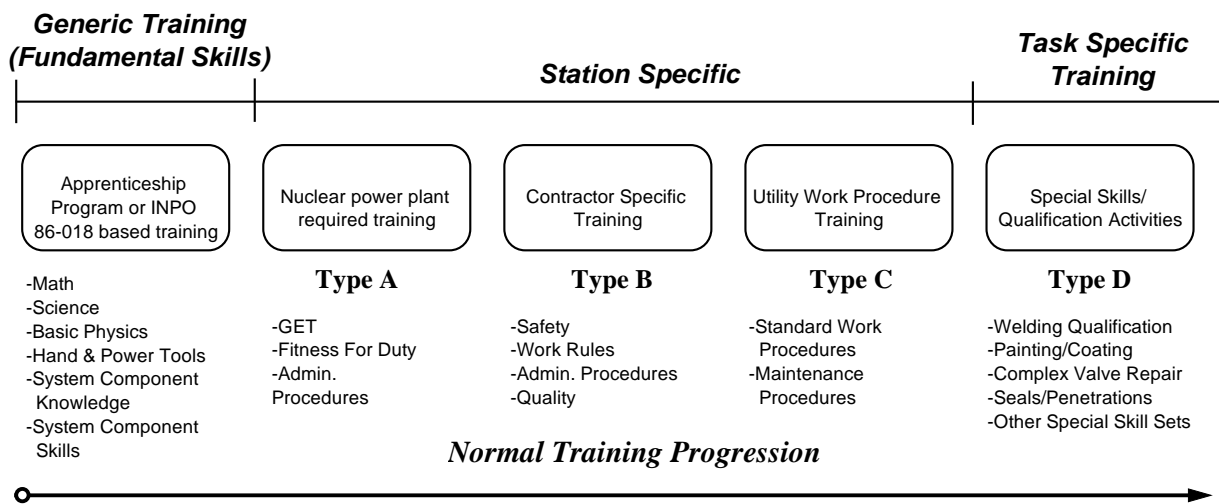


Exhibit K1- Nuclear Contractor Training Program Elements

Work Activity Preparation:

With this concept, a utility can use the Task Lists for each union (Attachment H) to determine whether the work activity only requires fundamental knowledge/skills. To describe this with a mental picture, a utility would place work packages for their maintenance/modification activities into two different stacks; one stack for those which do not require Type D training, and the second stack for those that do. The training organization can then work through the stack which requires Type D training and identify existing training courses which address the topic, or develop new courses. These courses would then be administered to those personnel who will be involved in the associated work activity. This process is normally performed in advance of an outage, or some other major work activity which does not involve an outage.

Work Activity Assignment:

When it is time to perform the maintenance/modification activity, a utility must assure that properly qualified personnel are assigned to work on the activity. To do this, a utility (or their contractor) would simply assure that personnel have completed the normal training program for those packages which do not exceed the fundamental knowledge/skill level. For those packages which require Type D training, additional controls are encouraged to assure that only personnel who have been appropriately trained are assigned to work on the activity. If training on these activities is not performed, then other administrative controls would be necessary. Examples of administrative controls are detailed work instructions, technical direction during task performance, Quality Control Inspection, overview of task performance by utility personnel, and post maintenance testing.