Occupational competency evaluation through written and performance tests assures that prospective vocational teachers possess the level of competence essential for effective teaching. The overall purpose of this project is to develop occupational competency examinations for nationwide use in evaluating trade and industrial education teachers. This second phase of a two-phase project involves: (1) directions for area test center coordination, (2) actual test development by procedures field tested in phase one, and (3) administration of written and performance tests. Each section includes the function of the individuals involved, sequence of the procedures, specific examples that show results of various steps, and sample worksheets. Several illustrations and worksheets are provided throughout the publication. Related documents are available as ED 051 378, and VT 014 260 in this issue. (GEB)
NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT

A Consortium for Occupational Competency Testing
of Trade and Industrial/Technical Teachers

PHASE II

DIRECTIONS FOR:  • AREA TEST CENTER COORDINATION
  • TEST DEVELOPMENT
  • TEST ADMINISTRATION

by Dr. Adolf Panitz and Dr. C. Thomas Olivo

Research Project Grant Number 8-0474 to
Department of Vocational-Technical Education
Graduate School of Education, Rutgers, The State University
New Brunswick, New Jersey

April 31, 1974
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by the U. S. Department of Health, Education and Welfare
Office of Education
National Center for Educational Research

April 1, 1971
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INTRODUCTION

Vocational education includes preparation for a wide range of occupations. The teachers for vocational programs must be recruited from industry and allied fields. Occupational competency evaluation through written and performance competency tests assures that prospective vocational teachers possess the level of competence essential for effective teaching in various vocational programs.

While there are many occupational areas with certain characteristics which require special considerations, the overall effort of the National Occupational Competency Testing Project requires a test development procedure consistent for all tests to be developed under its sponsorship.

During Phase I of the project such a procedure was developed and field tested. It has been refined by the project staff, reviewed by the Principal Investigators and Planning Committee, and adopted for the development of the tests scheduled for Phase II.

This material consists of three parts: Part One covers the directions for area test center coordination, Part Two relates to the actual test development, and Part Three the administration of written and performance tests. Each section includes the function of the individuals involved, sequence of the procedures, specific examples that show results of the various steps, and sample work sheets. These directions have been prepared with the intent to facilitate test construction effectively and efficiently according to the procedure.

Dr. Carl Schaefer

New Brunswick, New Jersey
April 1971
PLANNING COMMITTEE

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PART ONE

AREA OCCUPATIONAL COMPETENCY TEST CENTER COORDINATION

I. DIRECTIONS FOR THE AREA TESTING CENTER ADMINISTRATOR

A. The Area Test Center Concept

The area occupational competency test center serves as the regional representative for the National Occupational Competency Testing Program. At the present time each test center will develop one or more written and performance tests for a selected occupational area. Eventually, these centers might function as the regional agency through which all available tests are administered for a geographic area.

It must be emphasized that the centers currently identified are serving as pilots. The numbers, location and administration of Area Occupational Competency Testing Centers will be consistent with plans developed by the Consortium of States, with freedom of acceptance and participation determined by individual states.

B. Utilization of Test Results

The occupational competency test results will serve three major purposes of which the area test center coordinator must be aware. The results may be used as:

1. a prerequisite for admission to a preservice or in-service industrial teacher education program, and/or
2. a regular means for temporary and/or permanent certification, and/or
3. the basis for granting college credit for specialization content areas in degree programs.

The results of such tests are also used for prognostic and diagnostic purposes to determine weak or deficient content areas which the candidate needs to correct or improve.

C. The Role of the Area Test Center Coordinator

The overall responsibility for developing the written and performance test rests with the area test center coordinator. He must

1. organize the planning committee,
2. provide the direction for the work of the planning committee,
3. select the individuals competent to make the content analysis and write the test items,
4. arrange for the necessary clerical and other technical service,
5. arrange for the physical facilities to try out or pilot test the written and performance tests,

6. arrange for the revision and correction of the tests for final copy,

7. select the examiners and proctors for the pilot testing of the written and performance tests,

8. administer the test and be responsible for reporting results, and

9. act as coordinator between the individuals involved in test development and the National Project.

D. Materials to be Developed and Coordinated as Part of the Test Development Procedure

The final Written and Performance Tests must be supported by the following activities and materials:

1. A listing of job titles in clusters of the occupation according to major job level classifications and the levels of competency to be tested;

2. A determination of job cluster levels for which competency is to be determined;

3. An analysis of the job clusters showing the manipulative skills, methods, procedures and the necessary occupational and related technical information that constitute competence at the journeyman level or its equivalent;

4. The Scope of the examination for the written and performance test; (This is information for the candidate.)

5. The Written Examination, including an alternate form;

6. Test Rating Form for the Written Examination;

7. The Performance Examination, including an alternate form:
   a) Performance Evaluation Form
   b) Directions to the Candidate
   c) Directions to the Examiner, pertaining to setting up machinery, equipment, etc., and the materials required for the performance test

8. Completed Answer and Evaluation Form for all candidates for statistical evaluation.
E. Suggested Organization of the Planning Committee

1. Such a committee should consist of representatives from industry, teacher educator, qualified vocational teacher and a test specialist.

2. Such a committee should not exceed seven in number.

3. Various branches of the industry or occupational area should be represented.

4. Care should be exercised that the members of the committee are drawn from as wide a geographic area as is practical to represent sectional differences in the occupation, if they exist.

F. The Responsibility of the Planning Committee

The members of the Planning Committee must be provided with an outline of the work to be completed and the results expected. The outline should include specific tasks to be completed by the members of the committee:

1. Developing an overall statement of test purpose and objective of the examination,

2. Defining Job Clusters for the occupational areas to be tested,

3. Setting of proficiency levels within the Job Clusters area which are to be evaluated by the tests,

4. Establishing certain standards against which test results are to be evaluated,

5. Providing direction for the analysis of the occupational skills, knowledge and information from which the scope, test grid and examination items are to be developed.

G. Report and Work Forms for the Committee

Illustration 1 (following page) is a sample of the Planning Committee Work Schedule.

Work Sheet I has been effectively used to report the work of the Planning Committee.
Illustration 1
Planning Committee Work Schedule

Meeting Date __________ Place ______________________ Time ________

Participants ____________________________ __________________________

_________________________________________________________________

1. Development of Test Purpose and Objectives of the Written Examination
   for ______ (Occupational Area) ______.

2. Listing and Grouping of Job Clusters to be considered for the Examination:

   Resources: Dictionary of Occupational Titles -
   Listing of Occupational Programs of the U. S. Office of Education -
   Job Descriptions of Employer and Trade Associations.

   These complement the occupational analyses of the test developer.

3. Defining of Competency Levels of the Job Clusters:

   The job levels to be included for content analysis.

4. Defining the scope and directions for the skills, technical and related
   occupational information from which the examination items, performance
   test tasks, evaluation form and instructions to candidates and examiners
   must be developed.
Title of the Examination __________________________ Time Limit ________

The Written Examination in __________________________ includes
________________________ test items of the multiple-choice form.

The test items are prepared for the following occupational areas and competency levels.

<table>
<thead>
<tr>
<th>Major Area</th>
<th>Competency Level</th>
<th>Number of Test Items</th>
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A sufficient number of test items must be prepared to provide for alternate forms of the examinations.

The Performance Examination in __________________________ is of the
Finished Product or Troubleshooting ________ type.

Time Limit ________

Overall Objectives and Scope of the Examination: __________________________

________________________
________________________
________________________
II. OCCUPATIONAL JOB CLUSTER PROCEDURE

A. Determination of Job Titles in a Job Cluster

The occupational job clusters constitute the framework for any occupational competency examination. Care and effort must be devoted to the identification of jobs which form an occupational cluster. A thorough analysis of job titles, the skills and related technology represents the first step. This can be done from an assessment of Dictionary of Occupational Titles, job descriptions by employers, other U. S. Department of Labor sources, and trade groups.

These occupational job clusters must show the relationship of the jobs to each other and the varying degrees of competence in an occupational area. For example, in the Machine Industries Occupations there are specialist operators, all-around operators, setup men, skilled tradesmen (Machinist - Tool and Die Maker), and Technicians. Illustration 2A shows an example of Job Cluster Groupings according to estimated interrelationships for the Electronic Industries Occupations (Communications).

B. Determination of Proficiency Levels

The proficiency levels set the range for the test items to be developed. The occupational job clusters enable the committee to identify the proficiency levels which are to be evaluated. Illustration 2A shows the job clusters established by the committee for which test items for the Written Test and the Performance Test are to be prepared. Levels II, III and IV were identified as the range of competency to be evaluated. Work Sheet II is suggested for the listing of the major areas and their subdivisions for test item writing. This work sheet provides the common elements for all levels and the additional items that distinguish the levels of competency.
**Table: Job Cluster Levels for Which Test Items Must Be Developed**

<table>
<thead>
<tr>
<th>Level I</th>
<th>Level II</th>
<th>Level III</th>
<th>Level IV</th>
<th>Level V</th>
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<tbody>
<tr>
<td>Electronic Assembler 726.781</td>
<td>T.V. Installation 823.781</td>
<td>T.V. Service and Repair 720.281</td>
<td>Transmitter Maintenance</td>
<td>Radio Engineer 003.081</td>
</tr>
<tr>
<td>Electronic Assembler Development 726.781</td>
<td>T.V. Chassis Inspector 720.687</td>
<td>Component Inspector Technician 828.281</td>
<td>F.C.C. 1st Class License Mobile Communications Equipment F.C.C. 2nd Class License</td>
<td>T.V. Engineer 003.181</td>
</tr>
<tr>
<td>Radio Mechanic Helper 823.884</td>
<td>T.V. Repairman Apprentice 720.281</td>
<td>Public Address Serviceman 823.281</td>
<td>T.V. Transmitter Maintenance</td>
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<td>T.V. Repairman Apprentice 720.281</td>
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</tr>
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<td></td>
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<td>Electronic and Radio Work-Up Man 825.381</td>
<td>Customer Engineering Specialist 828.281</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radio Mechanic Troubleshooter 720.281</td>
<td>Radio Mechanic Troubleshooter 720.281</td>
<td>Sound Technician 024.288</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radio Mechanic 823.281</td>
<td>Radio Mechanic 823.281</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electronics Mechanic 828.281</td>
<td>Electronics Mechanic 828.281</td>
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## JOB CLUSTER LISTING IN RELATED GROUPS AND LEVELS OF COMPETENCE

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<th>Level IV</th>
<th>Level V</th>
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III. PREPARATION OF THE SCOPE OF THE EXAMINATION

A. Grid or Content Specification

The content analysis provides the total competence content of the Job Clusters. A test merely represents sampling through selected items of the overall competence.

A grid or specification provides the framework around which the test is built. It consists of a grouping of major areas of the content of the cluster of occupation. The planning and/or test item development committee will assign priorities to each grouping to show their importance. These priorities, expressed in percentages (Group A - 15%, Group B - 25%, Group C - 5%) of the total examination show the significance and relationships of the groupings to each other and their part in the total competence of the occupation.

This grid serves, also, as the scope of the examination which must be provided for the candidate who wishes to take the examination.

Illustrations 3 - 4 - 5 represent the scope of the written and performance examination which is provided to the candidate.

Work Sheet IV serves the planning committee to develop a complete scope for the written and performance examination.

B. Length of the Written Examination

While it is difficult to determine the exact length of an examination, experience has shown that a range of 135-165 test items produces satisfactory results in terms of sampling, reliability, and validity. For occupations involving great variety of skills and information, the upper range will provide better results; for those with fewer major areas, the lower limit is satisfactory. A somewhat arbitrary choice will have to be made for each occupation cluster. The number of test items for each major area are determined from the grid.

Example - Machine Occupations - Assumed number of test items: 164. For the Milling Processes and Machines area, the planning committee assigned 17% of the total test items. Therefore, no less than 28 test items will have to be developed for this area.

No. of test items for area = Total x percent
\[ N = 167 \times 0.17 = 28 \]
Illustration 3
NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT
OCCUPATIONAL PROFICIENCY EXAMINATION
MACHINE INDUSTRIES OCCUPATIONS (MACHINE TRADES)

DIRECTIONS TO THE CANDIDATE

Scope of the Written and Performance Examination

Occupational proficiency examinations are used, in conjunction with other criteria, for a single or for a combination of purposes:

1. Admission to trade and industrial/technical teacher education programs
2. To meet state requirements for certification
3. To establish evidence of occupational competence for advanced standing in undergraduate or graduate programs of study

They are designed to test the level of skill and knowledge of the candidate in his particular occupational field, as compared to other experienced people in the same occupation.

Two types of examinations are administered. The WRITTEN examination, consisting of multiple-choice questions, covers the information, knowledge and judgments a competent tradesman is expected to apply to his work.

The PERFORMANCE examination includes a variety of typical tasks a competent tradesman is expected to be able to perform.

The Scope of each examination lists the areas included in the examination and the proportion of test items from each area.

WRITTEN EXAMINATION

1. Candidates may take three hours to complete the written examination.
2. They will be notified as to the date, time and place of the examination.
3. A #2 lead pencil must be provided by each candidate.
Illustration 4

I. SCOPE OF THE WRITTEN EXAMINATION  (Sample section)

A. Trade information, theory, facts and basic principles the applicant should know

1. **Bench and Assembly Work, Layout and Inspection** (percent of the exam 12%)
   a) Principles and procedures of layout work
   b) Interpretation of blueprints, drawings-sketches
   c) Principles of inspection and precision measurement
   d) Utilization of precision tools and measuring instruments
   e) Determination of Tolerances, specifications from drawings for proper sequence of operations-treatment of materials
   f) Hand tool, assembly and bench operations and utilization of proper tools

2. **Machine Sawing, Filing and Multiple Parts Processing** (3%)
   a) Principles of operations
   b) Special functions - filing - internal and external
   c) Cutting tools, blades - friction cutting
   d) Selection of blades, file chains, etc.
   e) Determination of feeds and speeds

3. **Drilling, Tapping, Lapping - (Machines and Attachments)** (5%)
   a) Sizes and capacities of machines and attachments
   b) Single spindle and multiple spindle production operations
   c) Principles of precision finishing - reaming - lapping
   d) Determination of tolerances and internal finishes
   e) Principles and methods of clamping work
   f) Determination of speeds and feeds
   g) Determination of sizes and kinds of drilling and tapping tools

4. **Electrical Discharge Machining** (4%)
   a) Principles of operation of electronic machining
   b) Operation and adjustment of controls
   c) Determination of limits and tolerances from blueprints and specifications
   d) Accuracy, tooling, size
PERFORMANCE EXAMINATION

The performance part of the examination provides an opportunity for the candidate to demonstrate his level of proficiency in the manipulative skills and judgements essential to carry on the work of the occupation.

The scope of the performance part of the examination lists the skills, methods and procedures typical of the occupations from which the work sample jobs have been developed.

1. Candidates may take five hours to complete the work jobs.
2. Safety glasses are required and will be provided. Candidates may bring their own glasses.
3. Personal hand tools, such as micrometers and scales may be used.
4. Handbooks or reference materials may not be brought into the shop. They will be provided when necessary.
5. Appropriate work clothes should be worn.
6. Adherence to safety standards is mandatory.

II. SCOPE OF THE PERFORMANCE EXAMINATION (Sample section)

A. Trade skills, methods and procedures of operation the applicant should be able to perform:

1. **Bench and Assembly, Layout and Inspection** (15%)
   a) Layout of work, including center, reference, contour and dimension lines, surface preparation
   b) Using common hand and measuring tools, surface plate, vise and other holding or clamping devices, precision tools and gages.
   c) Filing, cutting, reaming, threading, fitting, polishing and lapping
   d) Testing and inspecting with precision inspection tools -- precision blocks, gages, indicators, hardness testers and comparator

2. **Machine Sawing, Filing and Multiple Parts Processing** (2%)
   a) Set up, weld saw blades
   b) Cut to a line
   c) Set up and file to a line
   d) Clamp regular and irregular shapes
   e) Sawing and filing angular surfaces
## WORK SHEET III FOR THE SCOPE OF THE WRITTEN EXAMINATION

FOR [EXAMINATION TITLE] ________

<table>
<thead>
<tr>
<th>Major Area</th>
<th>% of Total Test Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subdivision</td>
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<tr>
<th>Major Area</th>
<th>% of Total Test Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subdivision</td>
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<table>
<thead>
<tr>
<th>Major Area</th>
<th>% of Total Test Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subdivision</td>
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</tr>
</tbody>
</table>
IV. OCCUPATIONAL JOB CLUSTER ANALYSIS

A. Cluster Analysis for Skills and Information

This analysis should be made by one or more subject specialists assisted by a vocational teacher and a test technician. It should show the fundamental skills of the various occupations in the Job Cluster, indicate the frequency in which they are used and the difficulty or ease in which applied and what part they play in the overall competency of the occupation. It must, also, show the trade and technical information derived from the various sciences, mathematics, and communication practices of the occupation.

Work Sheet IV has been used effectively to carry on this part of the occupational content analysis.
<table>
<thead>
<tr>
<th>Occupation Major Occupational Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manipulative Skills and Methods</td>
</tr>
<tr>
<td>Frequency of Use</td>
</tr>
<tr>
<td>All the time</td>
</tr>
<tr>
<td>Frequently</td>
</tr>
<tr>
<td>Occasionally</td>
</tr>
<tr>
<td>Very Difficult</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>Easy</td>
</tr>
<tr>
<td>Difficulty</td>
</tr>
<tr>
<td>Occupational and Related</td>
</tr>
<tr>
<td>Technical Information</td>
</tr>
<tr>
<td>Frequency of Use</td>
</tr>
<tr>
<td>Very Often</td>
</tr>
<tr>
<td>Occasionally</td>
</tr>
<tr>
<td>Seldom</td>
</tr>
<tr>
<td>Comments</td>
</tr>
</tbody>
</table>
V. STEPS IN EVALUATING THE WRITTEN TEST

A. Preliminary Testing

Before pilot testing the examination with a group of candidates, it is strongly suggested that the test be administered to one or more individuals recognized and respected in the field for competence. This individual(s) should take the examination and later evaluate it for content, clarity, completeness and recency. This test might well lead to some revisions and modification. Such revisions, as may be necessary, must be made before the examination is administered to a pilot group.

B. Pilot Testing of the Written Examination

The completed examination should then be administered to a group of 10-15 tradesmen and/or trade teachers. The results must be tabulated for analysis and evaluation. Obvious test items can be corrected, others will reveal weaknesses through statistical analysis.

C. Evaluation of Pilot Test Results for Final Revision

Through item analysis, reliability and validity computation, a final appraisal must be made. Items too difficult, too easy or not clear must be eliminated, corrected or revised. A pool of additional test items reviewed for appropriateness, difficulty, completeness, etc. must be provided. If necessary, the revised form should be administered again. For helpful evaluative suggestions refer to Handbook page _________.

D. Final Form of the Written Examination

The occupational competency examination should be arranged to follow the prescribed form which is later included under the directions for the test developer.

VI. STEPS IN EVALUATING THE PERFORMANCE TEST

A. Preliminary Testing of the Performance Test

After the specification or drawing of one or more work job(s) is completed and before pilot testing the performance examination on a group of candidates, it is necessary to administer the performance test to an individual recognized and respected in the field for his competence. The evaluation should utilize the evaluation form and reveal whether the work assigned is appropriate in methods and representative of a certain competency level and whether the evaluation form is practical and can be used effectively and unobtrusively by an examiner. Revisions and modifications in the work sample should be made before pilot testing.
B. **Pilot Testing the Performance Test**

The performance test should be pilot tested by administering it to a group of candidates, the results evaluated, and all necessary revisions made before submitting the test in final form.

C. **The Completed Performance Test**

This part of the examination must include: (1) the specification and/or drawing of the work to be done by the candidate, (2) one alternate form, and (3) an evaluation or rating form which includes the evaluation of a finished product or a completed service, as well as the methodology employed.
PART TWO
TEST DEVELOPMENT

I. DIRECTIONS FOR THE TEST DEVELOPER

A. Information and Resources for Written Test Item Preparation

The cluster analysis for the skills and information provides the material from which the test items must be developed. The Scope of the written and performance examination, sometimes known as the examination specification, provides the percentage of the total test items which are to be formulated for each sub area. If the test item writer has participated in their preparation, he has them available. If others have carried on this work, the area test center coordinator will provide these items for him.

B. Test Item Form - Written Examination

The multiple-choice type of test item has been selected for the written part of the occupational competency test.

The test item writer should familiarize himself with the structure of the multiple-choice item and many different forms. The Handbook on Development and Administration of Occupational Competency Tests: Volume 3 provides examples for test item development writing. As many variations of this type of test item described in the Handbook should be employed in the test to be written.

C. Construction of the Performance Test

A quality performance test representative of certain competency levels is difficult to construct. Care must be exercised in the selection of those skills and methods that are truly indicative of the competency of the occupation. The test constructor should review the Handbook before proceeding with the construction of the performance test.

Performance tests involve (a) instructions for the candidate and (b) specific directions for the examiner who will administer the test in a local situation. These must be prepared by the test constructor. The evaluation of the performance test requires a special evaluation form. The procedure for preparing the performance test and the supplementary information is described in detail in the following pages.
D. **Constructing the Written Test**

1. **Test Item Preparation**

   The test items should be prepared by the subject specialists assisted by vocational teachers and test specialists. Some committees work together on each item. However, experience has shown that when each member assumes responsibility for a section of the occupational cluster and writes a specific number of test items which are then reviewed by the whole committee, the work proceeds more rapidly.

2. **Recording the Test Items**

   The test items should be recorded on 5 x 8 cards in the manner indicated on Work Sheet V. This method of recording expedites the item evaluation and the organization of the examination.

3. The review should focus on clarity of phrasing and completeness of sampling. A sufficient number of additional test items, beyond those indicated in the Scope, must be written to provide for, at least, one alternate form. In the example above, 28 test items are required; at least, 75% additional test items are required for alternate forms. This review permits revision, elimination or additions of test items.

II. **WRITTEN EXAMINATION FORMAT**

A. **Organizing the Examination**

1. A variety of ways have been developed for the grouping of test items. For occupational competency tests with different achievement levels, various areas should be grouped separately in sections. Within each section, the sequence of difficulty is to be arranged in random order.

2. Organizing the test items may well be done by the test technician. However, the committee, as a whole, should review the examination for content, ease of reading, and speed ease and accuracy of recording the answers.
Each test item should be written on a 5 x 8 card. The information must include the major and subdivision of the job cluster, the stem of the test item and the response answer choices. The response choices must be indicated by Capital Letters: A, B, C, etc.

<table>
<thead>
<tr>
<th>Date: ____________</th>
<th>Subdivision: _____</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code: ____________</td>
<td></td>
</tr>
</tbody>
</table>

**Stem of the Question:**

<table>
<thead>
<tr>
<th>Alternate Choices</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td></td>
</tr>
<tr>
<td>B.</td>
<td></td>
</tr>
<tr>
<td>C.</td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td></td>
</tr>
<tr>
<td>E.</td>
<td></td>
</tr>
</tbody>
</table>

The correct answer must be underlined in RED.

The Code should indicate the estimated difficulty level of the test item, and the frequency of application of the item. The following letters and numbers must be used:

<table>
<thead>
<tr>
<th>Level of Difficulty</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E - easy</td>
<td></td>
</tr>
<tr>
<td>A - average</td>
<td></td>
</tr>
<tr>
<td>D - difficult</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency of Use</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - all the time</td>
<td></td>
</tr>
<tr>
<td>2 - frequently</td>
<td></td>
</tr>
<tr>
<td>3 - occasionally</td>
<td></td>
</tr>
<tr>
<td>4 - seldom</td>
<td></td>
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</tbody>
</table>

28
Directions: 

NO MARKS ARE TO BE MADE IN THIS EXAMINATION BOOKLET.

Your name, identification number, and answers for all items are to be marked on the IBM answer sheet provided with this examination. Use a #2 lead pencil to make all marks on the answer sheet.

A. Print your name in the space on the top of the answer sheet.

B. Copy the Booklet Number from the upper right-hand corner of this page in the space provided for "Grade".

C. Enter today's date in the appropriate space.

D. Enter the name of the place, in which you are taking the examination, in the space after "city".

E. Copy the name of the test and the form letter in the space for "Name of Test".

F. Note the boxes below the red arrow on your answer sheet. Use these boxes to record your Social Security number. Then blacken the appropriate spaces to the right to correspond with the numbers in each box.

Directions for Recording Answers:

1. To mark each answer, make a heavy, black mark in the answer space next to the letter of the answer you think is correct. (NOTE: Items proceed in columns from left to right on the answer sheet.)

2. If you wish to change an answer, erase the old answer completely, then make a heavy black mark for the answer you think is correct.

3. Mark only one answer for each item. You should answer all items, since there is no penalty for guessing. Do not erase, fold, or make any stray marks on the answer sheet, since this may lower your score.

4. Time limit: 3 hours.
1. In the process of surface hardening by nitriding, the surface becomes hard by the absorption of nitrogen from each case. Induction hardening permits hardening of only one of several spots while leaving the remainder. Each of the test items or incomplete statements below is followed by four suggested answers or completions. Select the one which is best in each case.

Illustration 7
Multiple-Choice Form may Include a Four and/or Five Part Response
Sample Page for Written Examination
B. Preparation of an Answer Sheet

The answers must be so designed as to indicate random order. The examinee must not be able to recognize or identify a pattern to the correct answers. The answers are to be indicated by capital letters rather than numbers. The answer sheet must be scorable by electronic data processing equipment. Scoring must be done efficiently, accurately, and confidentially. Illustration 8 represents a typical answer sheet.

Illustration 8

NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT
OCCUPATIONAL PROFICIENCY EXAMINATION
ELECTRONIC COMMUNICATION

KEY TO ANSWERS FOR WRITTEN TEST - FORM A

<p>| | | | | | | | | | |</p>
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</thead>
<tbody>
<tr>
<td>2. B</td>
<td>27. D</td>
<td>52. D</td>
<td>77. A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. D</td>
<td>30. B</td>
<td>55. A</td>
<td>80. A</td>
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<td>25. B</td>
<td>50. B</td>
<td>75. B</td>
<td>100. A</td>
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III. CONSTRUCTING THE PERFORMANCE EXAMINATION

A. Selection of Skills for the Work Job

From the content analysis, the committee must select a series of skills that are representative of the typical work jobs of the occupation. These skills must be representative of certain levels of competency. Care must be taken to have a sufficient range of skills. Highly specialized or unusual skills or tricks not typical or representative of certain levels of competency must be avoided.

B. Selection of Work Jobs

The performance test should provide an opportunity for the examinee to demonstrate his skill and the methods employed by a competent individual. For some occupations the finished product reveals both the skills and the method; for others, the simulation work sample is more appropriate and for still others the troubleshooting approach is required. The committee must make a choice as to which is most appropriate for a particular occupation.

C. Description of Work Jobs

The performance tasks must be clearly described, the length of time for each work job estimated and sketches/drawings prepared.

Work Sheet VI has proven to be effective in the preliminary planning and revision of performance tests.

D. Directions to the Candidate for the Performance Test

Most performance tests require certain instructions to the candidate. He must know:

1. The reference material he may use,
2. Any special information, characteristic of his occupation that he needs to be told,
3. The number of work jobs he is expected to complete,
4. The minimum and maximum time limits established for the performance examination, and
5. Any special directions the candidate may need when a work sample is not required to be completed.

Illustration 9 shows an example of such directions and Illustration 10 a typical drawing of a work sample job.
NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT

WORK SHEET VI FOR PERFORMANCE TEST

Occupation ____________________________ Time __________________

Major Area ____________________________ Subdivisions __________________

1. Work Sample Test

   Sketches, Drawings, Wiring Diagrams, Circuits, specifications that show clearly what is to be done and completed.

2. Simulation Performance Test

   Must provide a clear description of the equipment, apparatus involved in the simulation. State specifically what method, procedure or technique is to be included in the simulation; also, the tools, materials and accessories required and the level of performance.

3. Troubleshooting

   Must provide a clear statement of the equipment to be used, the nature of the trouble to be introduced and the method by which it is to be accomplished. A statement must be included as to what particular competence is to be demonstrated in locating and correcting the induced trouble. Tools, accessories and supplies should also be listed.
WORK SHEET VII FOR THE SELECTION OF MANIPULATIVE SKILLS
FOR THE DESIGN OF PERFORMANCE TESTS

Major Occupational Area ________________ Subdivision ____________

Skills and/or Methods

A. 1. ________________________________________________
   2. ________________________________________________
   3. ________________________________________________
   4. ________________________________________________
   5. ________________________________________________

B. 1. ________________________________________________
   2. ________________________________________________
   3. ________________________________________________
   4. ________________________________________________
   5. ________________________________________________

C. 1. ________________________________________________
   2. ________________________________________________
   3. ________________________________________________
   4. ________________________________________________
   5. ________________________________________________

D. 1. ________________________________________________
   2. ________________________________________________
   3. ________________________________________________
   4. ________________________________________________
   5. ________________________________________________
Illustration 9

NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT
OCCUPATIONAL PROFICIENCY EXAMINATION
MACHINE INDUSTRIES OCCUPATIONS
(MACHINE TRADES)

DIRECTIONS TO THE CANDIDATE

PERFORMANCE TEST - FORM A

Name and Number ___________________________ Date ____________

Maximum time - 5 hours

Note:
1. The use of Handbook will be permitted.
2. The order in which the jobs are to be completed depend upon the shop facilities, and are determined by the examiner.
3. The candidate should follow his normal pattern of work to which he is accustomed in the trade. If any problems develop or questions arise, the examiner must be advised and consulted.
4. The candidates are expected to complete all jobs assigned to the performance test.
5. The candidate should ask the examiner for anything he needs, if it has not been provided.

Job I. Perform the necessary machining operations on the blank furnished by the examiner for the part shown on the attached drawing:

1. Square up part
2. Grind end and one narrow side square according to drawing
3. Mill slot - check with examiner before cutting
4. With precision tools, lay out location of holes and center mark
5. Drill and ream holes to size
6. Turn in paper used in computations with finished work piece

Job II. Machining part on lathe

1. Grind tool bit blanks, furnished by examiner, on a pedestal or bench grinder for use in machining Job II shown on the attached drawing.
2. Set up milling machine for cutting slots in edge of part, as shown on drawing.
   (a) Have examiner check the dividing head setup.
3. Lay out, set up and drill hole for tapping.
4. Turn in paper used in computation with finished work piece.
Job III. **Drill Grinding**

1. Obtain a drill 1/2" diameter or larger from examiner.
2. Grind drill by the off-hand method on a pedestal or bench grinder to obtain the standard cutting edge angle.
3. Return drill to examiner.

Job IV. Refer to print of Job III (part should be faced and center drilled).

1. Perform the necessary lathe operations on the material furnished by the examiner. The thread should fit the nut furnished.
2. Set up in shaper and cut a flat on the 1-1/2" diameter part 3/32" from circumference. This is optional - check with the examiner.

At the close of the examination, turn in:

1. All prints and instructions
2. Sheets with computations
3. Drawings I - II - III
4. Three tool bits
5. One drill
IV. EVALUATING THE RESULTS OF A PERFORMANCE TEST

A. Developing a Rating Form

The performance test should not only reveal that a candidate can complete an assigned test but, also, whether he has mastery of the most efficient and acceptable methods.

Some occupations permit more objective evaluations than others. Frequently, more than one examiner is required to test a group of candidates. To assure that all candidates are evaluated on the same items, it is necessary for the test development committee to develop an evaluation form with a rating scale. Such rating form includes an appraisal of the important steps in the methods employed and an evaluation of the finished product.

Work Sheet VIII has been used to list the factors essential to both method and finished product evaluation.

Work Sheet IX has been used for evaluating the methods and techniques employed in locating and correcting malfunctions in equipment or apparatus. Illustration 11 represents a sample rating sheet for a work sample test and Illustration 12 a sample rating for a group of troubleshooting tasks.
Illustration 10  Test Sample

DRILL & REAM FOR
(3/6)
DOWEL FIT (2 HOLES)

2.000 ±.001

15°

.375 ±.005

.625 ±.001

REMOVE ALL SHARP EDGES

NATIONAL OCCUPATIONAL
COMPETENCY TESTING

DRAWN BY
F.G.B.

SCALE
FULL

TOLERANCES UNLESS
OTHERWISE SPECIFIED

MATERIAL
C.R.S.

FRACTIONS
± 1/64

DECIMALS
±.005

ANGLES
± 5°

DWG. NO.
MS-1
**EVALUATION FORM FOR:**  
(Occupation)  

**Work Method and Finished Product Evaluation**

<table>
<thead>
<tr>
<th>Major Area</th>
<th>Point Value</th>
<th>Major Area</th>
<th>Point Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>( )</td>
<td>1.</td>
<td>( )</td>
</tr>
<tr>
<td>2.</td>
<td>( )</td>
<td>2.</td>
<td>( )</td>
</tr>
<tr>
<td>3.</td>
<td>( )</td>
<td>3.</td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
<td></td>
<td>( )</td>
</tr>
</tbody>
</table>

**Total Value**

**Total Value**

**Final computation of the score**

**Special conditions to be observed**
Illustration 11

NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT
OCCUPATIONAL COMPETENCY EXAMINATION
(MACHINE TRADES)

PERFORMANCE RATING SCALE

While the candidate is performing the assigned tasks, rate his performance according to the scale indicated for each subdivision. The top rating would be equivalent to an extremely able or competent worker. A good or above average worker would be rated 2 or 3 points below the top rating. The average worker rates at the midpoint. Workers with below average performance would rate 2 or 3 points below the midpoint, and the inept worker rates to zero. After he has completed the task, grade his finished product according to the dimension specified: deduct points for variations beyond normal tolerances. Check any weaknesses in box provided.

Candidate’s Name __________________________ Examinations Number __________
Location __________________________ Date ______

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Finished Product</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handling of layout tools</td>
<td>() Accuracy</td>
<td>0-10</td>
</tr>
<tr>
<td>Fixing layout procedure</td>
<td>() Dimension lines</td>
<td></td>
</tr>
<tr>
<td>Preparation of surfaces</td>
<td>() Centers of holes</td>
<td></td>
</tr>
<tr>
<td>Filing - center marking</td>
<td>() Sizing holes</td>
<td></td>
</tr>
<tr>
<td>Tapping</td>
<td>()</td>
<td></td>
</tr>
<tr>
<td>Other tools</td>
<td>()</td>
<td></td>
</tr>
</tbody>
</table>

Bench and Layout Inspection

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up of work</td>
<td>0-10</td>
</tr>
<tr>
<td>Set up of tools</td>
<td>() Finish</td>
</tr>
<tr>
<td>Set up of accessories</td>
<td>() Knurls</td>
</tr>
<tr>
<td>Operation of lathe</td>
<td>() Other</td>
</tr>
<tr>
<td>Feed - speed</td>
<td>() Tool bits</td>
</tr>
</tbody>
</table>

Turning Processes and Lathe Work

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up of work</td>
<td>0-15</td>
</tr>
<tr>
<td>Set up of tools</td>
<td>() Finish</td>
</tr>
<tr>
<td>Set up of accessories</td>
<td>() Squareness</td>
</tr>
<tr>
<td>Feed - speed</td>
<td>() Appearance</td>
</tr>
<tr>
<td>Safety procedures</td>
<td>() Burrs, marks, etc.</td>
</tr>
</tbody>
</table>

Milling Processes and Machines

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up of work</td>
<td>0-15</td>
</tr>
<tr>
<td>Set up of cutters</td>
<td>() Finish</td>
</tr>
<tr>
<td>Set up of accessories</td>
<td>() Squareness</td>
</tr>
<tr>
<td>Feed - speed</td>
<td>() Appearance</td>
</tr>
<tr>
<td>Safety procedures</td>
<td>() Burrs, marks, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper handling of part</td>
<td>0-5</td>
</tr>
<tr>
<td>Quenching procedure</td>
<td>() Proper tempering color</td>
</tr>
<tr>
<td>Tempering procedure</td>
<td>()</td>
</tr>
<tr>
<td>Safety</td>
<td>()</td>
</tr>
</tbody>
</table>

Heat Treatment

Drilling and Drill Press Work

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manner of clamping work</td>
<td>0-5</td>
</tr>
<tr>
<td>Use of vise-parallel</td>
<td>() Location of holes</td>
</tr>
<tr>
<td>Use of tapping attachment</td>
<td>() Removal of burrs</td>
</tr>
<tr>
<td>Tool bits</td>
<td>() Drills</td>
</tr>
</tbody>
</table>

Grinding Processes and Machines

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set up of work</td>
<td>0-15</td>
</tr>
<tr>
<td>Truing of wheel</td>
<td>() Finish</td>
</tr>
<tr>
<td>Dressing of wheels</td>
<td>() Squareness</td>
</tr>
<tr>
<td>Sequence of steps</td>
<td>() Formsand radii</td>
</tr>
<tr>
<td>Selection of wheels</td>
<td>()</td>
</tr>
<tr>
<td>Feeds and speeds</td>
<td>()</td>
</tr>
<tr>
<td>Safety practices</td>
<td>()</td>
</tr>
<tr>
<td>Coolants</td>
<td>()</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Observed Performance</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper hardness</td>
<td>0-5</td>
</tr>
<tr>
<td>Proper tempering color</td>
<td>()</td>
</tr>
</tbody>
</table>

Examiner's Signature __________________________

(Give your personal impression of the candidate on the back of the sheet)
<table>
<thead>
<tr>
<th>Points</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Worker inept or out of practice</td>
</tr>
<tr>
<td>8</td>
<td>Worker with below average or limited facility</td>
</tr>
<tr>
<td>10</td>
<td>Average worker in the field</td>
</tr>
<tr>
<td>16</td>
<td>Good, above average worker</td>
</tr>
<tr>
<td>20</td>
<td>Extremely able, competent worker</td>
</tr>
</tbody>
</table>

The same proportions apply whether the ratings are indicated as 0-5, 0-8, 0-10, 0-15.

Please state your overall impression of the candidate as a worker in the field in the addition to the above score.

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

(The above is printed on the back sheet of Illustration 11.)
NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT
PERFORMANCE EVALUATION
WORK SHEET IX FOR PERFORMANCE TEST - TROUBLESHOOTING

EVALUATION FORM FOR

Troubleshooting and Diagnostic Techniques

<table>
<thead>
<tr>
<th>Steps of troubleshooting to be evaluated</th>
<th>Score to be assigned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Area</td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
</tr>
<tr>
<td>Major Area</td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
</tr>
<tr>
<td></td>
<td>( )</td>
</tr>
</tbody>
</table>

Computation of Final Score.

Special Conditions to be observed.
EXAMINER'S PERFORMANCE EVALUATION SCALE

Candidate's Name and Number
Place
Date

While the candidate is performing the assigned tasks, rate his performance on each job on the scale shown below, indicate any weaknesses in the last column.

The candidate should be rated on two features of his performance: a) his work methods, and b) the finished job. The following seven aspects of his work methods are to be used:

1. Does he approach the identification and location of the trouble systematically in a step-by-step manner?
2. Does he use the accepted trade method in correcting the trouble?
3. Does he select test equipment properly?
4. Does he perform hand tool operations skillfully?
5. Does he work neatly, accurately and safely?
6. Does he work at an acceptable speed?
7. Does he avoid excessive and inappropriate use of reference material?

In assigning ratings to the job performance, remember that the scores indicated are maximum and should be given only to the extremely competent candidate. (For a breakdown see the following sheet.)

<table>
<thead>
<tr>
<th>Work Methods and Finished Job</th>
<th>Max. Score</th>
<th>Jobs</th>
<th>Comments: Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>a-1 Procedure in identifying and locating trouble</td>
<td>20</td>
<td>1 2 3 4 5 6 7 8</td>
<td></td>
</tr>
<tr>
<td>2 Method of correcting trouble</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Selection and use of test equipment</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Skill of hand tool operations</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Neatness, accuracy and safety of work</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Speed</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Use of reference materials</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b- SCORE FOR WORK METHODS</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCORE FOR FINISHED JOB</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Score</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Final Score = Add all columns
No. of Jobs

Final Score: 43
Examiner's Signature
RATING DISTRIBUTION

4 - Worker inept or out of practice
8 - Worker with below average and limited facility
10 - Average worker in the field
16 - Good or above average worker
20 - Extremely able, highly competent worker

The same relationship should prevail when the maximum scores are 15 or 10 or 5.

These are just estimated average values, a rater should go above or below these figures if his judgment so indicates.

Please state your overall impression of the candidate's competence as a worker in the field, in addition to the numerical score.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

(The above is printed on the back of Illustration 12.)
V. DIRECTIONS TO THE EXAMINER

A. The candidate is entitled to know what he is being tested on. This information is presented in the Scope of the Written and Performance Examination on each examination: The examiner who administers the performance examination must prepare the shop or laboratory for this test. He must know the materials and supplies needed, the tools, accessories required, and the machines, apparatus and instruments on which the candidates are to be tested.

B. Illustration 13 shows general directions to the examiner for a performance test followed by Illustration 14 which shows a listing of jobs, machines, accessories required for each job and Illustration 15 is an example of the listing of tools, accessories and materials required. Preparing such listings facilitates the preparatory work of the examiner.

Work Sheet X provides a convenient way for the test constructor to list all the items indicated in Illustrations 13 - 15.
NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT

Directions to the Examiner - Performance Test

WORK SHEET X - DIRECTIONS TO EXAMINER: __________ (occupation)

(To be used by Test Constructors to direct the examiner in the preparation of the shop or laboratory for the performance test.)

Job I. Provide the following:

A. Materials

B. Machine 1. (include all necessary tools and accessories)

C. Machine 2. (include all necessary tools and accessories)

D. Machine 3. (include all necessary tools and accessories)
Illustration 13

NATIONAL OCCUPATIONAL COMPETENCY PROJECT
OCCUPATIONAL PROFICIENCY EXAMINATION
MACHINE INDUSTRIES OCCUPATIONS
(MACHINE TRADES)

GENERAL DIRECTIONS TO THE EXAMINER

PERFORMANCE TEST - FORM A

Estimated maximum time - 5 hours.

1. Study the Scope and Directions to the candidate.


3. Use only the Performance Rating Sheets provided.

4. The purpose of this examination is to measure the candidate's occupational competency. No other judgment should be exercised. It is NOT the responsibility of the examiner to decide whether or not the candidate has teaching potential.

5. Do not allow candidates to discuss problems with each other.

6. Specific problems have been designated to test the candidate's ability to operate machines, use tools, etc. Do not alter the nature of the problem by substituting a different problem.

7. If facilities are available, permit the candidate to select the type of machine or tool he desires to use.

8. Provide such information, as drawings and handbook, that may be needed - also, the necessary tools, materials and accessories. Inform the candidate that they are available.

9. If it is quite apparent that the candidate is not skilled enough to perform the assignment, encourage him to move on to another assignment and then come back to the discontinued one if time permits.

10. Make sure that all machines, tools and equipment used for the test are in satisfactory working order, and are not specially set up.

11. Check the operation of each machine or equipment, after a candidate completes his work, to be sure it is in readiness for the next candidate.

12. Do not assist any candidate or make suggestions. If it is apparent that he is damaging any machines or equipment, you may interrupt the procedure to prevent this. Allow the candidate to complete the assignment, but record what has taken place on the rating sheet.
Illustration 14

NATIONAL OCCUPATIONAL COMPETENCY PROJECT
OCCUPATIONAL PROFICIENCY EXAMINATION
MACHINE INDUSTRIES OCCUPATIONS
(MACHINE TRADES)

DIRECTIONS TO THE EXAMINER

PERFORMANCE TEST - FORM A

Listing of Machines, Accessories and Materials Required for Each Job.

Time Limit - 5 hours.

This list has been prepared for your convenience, to be used in preparing the shop for the performance test. The candidate must be provided with the following items for each job. Determine the sequence in which the jobs are to be done, according to the machines and grinders available in the shop. Instruct the candidates as to the order of jobs in which to proceed.

Job I: Provide the following machines, accessories, tools and materials:

A. **Material** - For each candidate provide one piece of cold rolled steel, 1/2 x 2 x 5-1/8 plus extras.

B. **Surface Grinder** - with suitable wheel and guards.
   - Magnetic chuck
   - Wheel dresser
   - Clamps - parallel or "C"
   - Single cut or fine file or oil stone
   - Safety shield or goggles
   - Angle plate or precision vise
   - Solid steel square

C. **Milling Machine** - vertical or horizontal.
   - Vise
   - Parallels
   - Soft face hammer
   - Universal indicator
   - Milling cutters 3/8 - 5/16 - 1/4
   - Blocks and straps
   - Suitable tools to measure slot (vernier caliper, small hole gage, micrometer, adjustable parallels, inside calipers).
   - Assorted 3/8" reamers.
   - Vertical miller if used - drill chuck and adapters, center drill, set of letter drills
D. **Layout Table or Bench**

- Layout fluid
- Vernier height
- Bevel protractor
- Center or prick punch
- Angle plate
- Dividers
- Surface plate
- Combination square
- Sine bar (Jo-blocks or planer gage)
- Ball peen hammer
- 6" Ruler
- 0-1" Micrometer

E. **Drill Press**

- Drill vise
- Soft face hammer
- Letter drills
- Cutting fluid
- Fine file or oilstone
- Parallels
- Center drill
- Assorted reamers
- Brush

**Estimated time - 1 hour 10 minutes**

The completed work pieces, drills and tool bits must be submitted, placed in an envelope, checked and graded by the examiner at the conclusion of the performance test.

Each envelope must be properly identified with the candidate's name and number, and the examiner's signature.
Illustration 15

NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT
OCCUPATIONAL PROFICIENCY EXAMINATION
MACHINE INDUSTRIES OCCUPATIONS
(MACHINE TRADES)

DIRECTIONS TO THE EXAMINER
PERFORMANCE TEST - FORM A

Listing of Tools, Accessories and Materials Required for the Performance Test.

Time limit - 5 hours.

For your convenience in preparing the files for the performance examination, the following separate list of accessories, tools and materials has been prepared. When tools or accessories are used for an operation on several machines, the examiner must arrange for the number required and how to interchange them among the candidates when they are needed.

I. Materials - One for each candidate, plus several spares.
   - Job I: 1/2" x 2" x 5-1/8" cold rolled steel.
   - Job II: 1-3/4" diam. x 1-5/8" low carbon machine steel
   - Job III: 1-1/2" diam. x 5'1/2" long low carbon machine steel faced and center drilled at both ends
   - Job IV: One drill - 1/2" or larger - cutting edge dulled

II. Machines -
   A. Drill Press - Drill chuck of appropriate capacity, drill vise - V-blocks, parallels, coolant and brush
   B. Lathe - Chucks, drive plate, centers, tool holders (turning, parting, boring), micrometer stop (optional), tapered sleeves, taper attachment (if available, in sufficient numbers), #3 taper gage (optional), dogs, coolant and brush
   C. Milling Machine - Vertical or Horizontal
      - Vise
      - Index head (40 to 1 ratio)
      - Set of index plates
      - Wrenches
      - Screwdrivers
      - Blocks and straps
      - Coolant and brush
      - For vertical miller
      - Appropriate chucks and end mills
   D. Surface Grinder
      - Suitable wheel and guards
      - Precision hand vise
      - Magnetic chuck
      - Wheel dresser
III. **Tools & Accessories**

- 6" scale
- 0-1"") Micrometers
- Vernier calipers
- Vernier height gage
- Dial indicator
- Drill point gage or bevel protractor
- Inside calipers
- Telescoping gage
- Hermaphrodite calipers
- Dividers
- Combination square set
- Solid square-appropriate size
- Bevel protractor
- Sine bar & Jo-Blocks - if not available, provide Planer gage
- Surface plate
- Angle plate
- Assorted pair of parallels
- Parallel and C" clamps
- Bench drill vise
- V-block--suitable size
- Center drills--appropriate size
- Depth micrometer or vernier caliper
- Thread micrometer
- Thread gage
- Pitch gage
- Small hole gage or 3/8" dowel pin
- Set of fraction drills
- Surface gage and scriber
- Center prick or marking punch
- Small ball peen hammer
- Layout fluid
- 5/8" drill
- Drills 1/2" or larger
- One set 1/4"-20 taps
- Tap wrench
- Countersink
- Scraper
- Assorted wrenches--screwdrivers
- Soft-faced hammer or mallet
- Fine cut tiles or oilstone
- Chip brush & coolant
- 3 tool bit blanks (pre-identified)
- Set of letter drills
- Set of number drills
- Set of 3/8" assorted reamers--(oversize, undersize, correct size)

### A. Milling Machine - Vertical or Horizontal

- Vise
- Index head (40 to 1 ratio)
- Set of index plates
- Wrenches
- Screwdrivers
- Blocks and straps
- Coolant and brush
- For vertical miller appropriate chucks and end mills

### E. Surface Grinder

- Suitable wheel and guards
- Precision hand vise
- Magnetic chuck
- Wheel dresse.

Provide safety guards and/or goggles.

Let the candidate make his choice of methods, tools or accessories whenever practical.

Advise the candidate to ask for tools and accessories which he desires, but are not included in the list. The examiner should record such a request and report in his evaluation on the appropriateness of the request.
PART THREE

ADMINISTERING OCCUPATIONAL COMPETENCY EXAMINATIONS

Information necessary for preliminary preparation, administration and scoring of written and performance occupational competency examinations.

I. GENERAL INFORMATION FOR THE EXAMINERS

The proficiency examinations are divided into two separately administered tests: (a) the written test, and (b) the performance test.

The written test is usually administered to a large group of applicants. The performance examination is given to small groups with greater supervision and observation.

The scoring of test items on the written examination will be done by machine.

For the performance examinations, the scoring is more subjective and judgments must be made by the examiner as he observes the candidate's performance and records the observations and performance on a special scoring form with each examination.

A. Testing Procedures

Testing procedures must be uniform in all locations and by all examiners, to insure comparability of test results. The procedures should be followed, even though they may seem cumbersome to the examiners. If, for any reason, an irregularity occurs, a description of the nature of the irregularity should be noted in the appropriate section on the Examination Report.

B. Identification of Candidates

Examiners will be furnished with a list of names and Social Security Numbers and the specified test for persons who are to be tested.

Candidates are provided with admission notices; showing name, address, Social Security Number, and the name of the occupation. Candidates appearing without admission notices, may take the examination, if their names are on the list of candidates or its supplement.

Candidates who are more than 45 minutes late should not be admitted. An extension of time may be granted to individuals, if the lateness is due to difficulties encountered in traveling long distances or when time and place of examination are changed without adequate notice.
II. DIRECTIONS FOR ADMINISTERING THE WRITTEN EXAMINATION

A. Things for the Proctor to Do Prior to the Examination

1. Obtain specific directions relative to proctoring the written examination.

2. Obtain list of candidates expected for the examination.

3. Obtain examination papers, answer papers and other materials needed for the test.

B. Before the Examination Begins

1. Check condition of the examination room for proper heat, light, ventilation and adequate seating facilities and enter irregularities on the Examination Report.

2. Require candidates to identify themselves as they arrive.

3. Two candidates, taking the same examination, must be seated away from each other.

4. Supplies not specifically required for the examination are not permitted.

5. Check to be sure each candidate has a pencil or is given one by the examiner.

6. If other supplies, such as handbooks or slide rules, are suggested, the proctor should have a supply available for those candidates who did not bring them.

C. Distribution of Examinations

1. Make any special announcements that may be required.

2. Be sure all candidates are seated and ready to begin work.

3. Hand to each candidate the appropriate examination envelope. Do not allow the envelopes to be opened or any work to begin until you have given the "start" signal.

4. Say to the candidates, "Take the examination out of the envelope. (Pause) Put your Social Security Number on the line for the Name or Number and today's date, which is ________. Your name should not be penciled on the booklet, unless you do not know your Social Security Number. (Pause) Make sure your Social Security Number is entered on all work you hand in to the examiner. After you read the directions, you may begin work. Before leaving, place all your work and papers into the exam-
DIRECTIONS FOR ADMINISTRATION OF PERFORMANCE EXAMINATIONS

NOTE: THE EXAMINER IS RESPONSIBLE FOR ALL PREPARATION NECESSARY FOR THE EXAMINATION.

It is absolutely essential that the following steps be carefully followed. Deviations from these procedures will result in difficulties in administering and scoring the examination. As you complete each of the following steps, check the item off on the Examination Report form and, also, record any problems or irregularities. In this way, you will be adequately prepared for the examination, and will avoid needless hardships and time-consuming delays.
If you encounter any difficulties which you cannot handle in preparing for the examination, contact the appropriate person immediately, so that the problem can be solved prior to the date of the testing. Someone will check, prior to the date of the examination, to be sure that everything is ready, and will, also, check with you during the actual administration of the performance examination, since unexpected problems may arise.

A. Facilities for Examinations

Performance tests should be conducted in shops, or laboratories, equipped with appropriate and sufficient machine, equipment, hand tools and materials. Shops may be located in vocational schools or selected industrial establishments.

Specific directions, for conducting examinations for each occupation, will be placed in the hands of the examiner well in advance of the date of the examination.

In any case, he should analyze the test problem to determine amount and type of tools, equipment and other items needed for the number of persons scheduled to take the test. When the best available facilities are inadequate, arrangements should be made to supplement those at hand and bring additional equipment in order to conduct the test under the best possible conditions.

B. Supplies for Testing

Prior to the examination, the examiner should determine the materials and supplies needed to conduct the tests. In cases where supplies are not readily available and must be purchased, the examiner should consult the appropriate person.

C. What to Do Before the Day of the Examination

1. Read the "Directions to the Examiner" and "Performance Examination" for the examination being given.
2. Check to verify arrangements for time and place of the examination.
3. Visit the testing center to be sure that all equipment and tools necessary for the test are available.
4. Check all equipment to make sure that it is in good working condition.
5. Set up all tools, machines, equipment and working conditions, as nearly identical as possible, at each work station.
6. Prepare all partially completed test pieces and/or install defects or malfunctions into equipment for troubleshooting for the examination.
7. Check to make sure that all tools, materials and supplies are in a convenient location for each examinee.
8. Place all test materials in a large envelope for each candidate and mark it with candidate's name and Social Security Number.

9. Familiarize yourself with the scoring procedures.

THE ABOVE STEPS ARE TO BE COMPLETED AND RECORDED ON THE "EXAMINATION REPORT: PRELIMINARY CHECK-LIST FOR PERFORMANCE EXAMINATIONS" BEFORE THE DAY OF THE EXAMINATION.

D. What to Do During the Examination

1. Before actual work begins, permit the examinee to acquaint himself with his surroundings since the shop may be strange to him. Point out the location of such facilities, as electrical outlets, service facilities and other physical details.

2. Note the time each job is started and finished by each candidate.

3. Observe the candidate at his work. Check his work methods quietly and inconspicuously. Keep a record for your own purposes as the examination progresses.

4. Spend approximately the same amount of time with each candidate.

5. Check and rate each step of the job as it is completed by each candidate.

6. Tag or stamp each completed job with the candidate's number.

7. Maintain an impartial attitude at all times. It eliminates criticism and aids in reducing tension which, quite naturally, develops during the examination.

8. Provide handbooks, reference tables, etc., required in the examination.

9. Carefully record all ratings required on the "Performance Rating and Summary" form for the specific field.

E. What to Avoid During the Examination

1. Allow no more than one examinee to leave the room at any time.

2. Permit no work to be taken from the shop during the examination.

3. If any questions are raised concerning the meaning or intent of a job assignment, suggest that the candidate proceed according to his understanding.

4. Mark rating sheets away from the candidate.
5. Refrain from giving any information to a candidate concerning his progress or the probable result of the examination.

6. Refrain from discussing such matters as a candidate's occupational experience, his education, or personal problems.

F. At the Close of the Examination

1. Stop the work at the expiration of the maximum allotted time.
2. Collect all examination forms and directions.
3. Identify all test pieces with candidate's number.
4. Retain all finished work.

G. Completing the Scoring of the Examination

1. Most of the performance ratings can be made during the examination.
2. Inspect and rate all other completed work immediately after candidates have departed from the shop.
3. Use only the performance rating sheets provided.
4. Enter comments which have a bearing on the competency of the candidate on the back of the sheet. This is particularly important in cases where the performance is below average.
5. Sign the rating sheet in place provided for "Examiner".
6. Return all scoring sheets, question papers, prints and other materials which will be provided for each examination.
7. All totals will be computed at the National Occupational Competency Testing Project.
EXAMINATION REPORT: PRELIMINARY CHECK-LIST FOR PERFORMANCE EXAMINATION

Complete each step as listed below, filling in the date when completed.

1. Have read "Directions to the Examiner" which are specific to the examination being given.

2. Have read over the "Performance Examination", which is the actual examination the candidates take.

3. Arrangements for the time and place of the examination have been verified with the Regional Coordinator.

4. Visited testing center to be sure that all equipment, materials and tools necessary for the test are available. (See: "Directions to the Examiner" and the "Performance Examination" for the specific items that will be needed.)

5. All equipment has been checked and is in good working condition.

6. Tools, machines, equipment and working conditions have been set up, as nearly identical as possible, at each work station.

7. All partially completed test pieces and/or defective equipment for troubleshooting are prepared and ready for the examination.

8. Tools, materials, handbooks and supplies are in a convenient location for each examinee. (This should be similar to the typical work situation where he would select equipment from a choice of tools and supplies normally available. However, the examinee should not be required to spend time in securing stock and performing other preliminary work.)

9. Job assignments, necessary drawings and other written directions, relating to the test, have been placed in a large envelope and marked with the candidate's name and Social Security Number. Partially completed items are available for the candidate.

I have completed the above steps, completely familiarized myself with all procedures I am to follow during the examination and have verified this with the Regional Director.

Signature __________________________ Date __________________________

(If there are any problems related to the above steps, or if you see any problems in administering the examination, contact the coordinator of the testing program.)
Illustration 17

NATIONAL OCCUPATIONAL COMPETENCY TESTING PROJECT
OCCUPATIONAL PROFICIENCY EXAMINATION

SAMPLE REPORT FORM OF IRREGULARITIES

OCCUPATIONAL PROFICIENCY EXAMINATION

Center ___________________________________________________________________________ Date _____________________________

<table>
<thead>
<tr>
<th>Name</th>
<th>Social Security Number</th>
<th>Exam Title</th>
<th>Attendance</th>
<th>Individual Irregularities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Present</td>
<td>Absent</td>
</tr>
</tbody>
</table>

(Defective test, illness, cheating, lacks notification, etc.)

Time examination began: ___________________________ Time examination completed: ___________________________

Possible Item Error: (Remember: The candidates are not to be told to change the item!)

Examination ____________________________________________________________________________

Item Number __________________________ Description of Possible Error ___________________________

Irregularities affecting all candidates: (e.g. overcrowding, power failure, distracting noises, emergencies over which you have no control, etc.)

Examiner's Signature ___________________________________________________________________