

**Report on the Development
of the
Overhead Crane Operator
Certification Program**

Prepared for the
National Commission for the Certification of Crane Operators
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Introduction

This report outlines the process followed in the development of the certification program for overhead crane operators. It includes documentation of the various steps required in the certification examination development process. It has been updated to include the item analysis and related 2005 statistics for the written examination as well as recent changes to the Overhead Crane Practical Examination.

The Need

Since 1995, the National Commission for the Certification of Crane Operators (NCCCO) has offered a nationwide certification program for mobile crane operators. This program has received wide spread adoption, endorsements and recognition. The success of NCCCO's certification program for mobile crane operators has lead to sustained industry requests for a similar program geared to overhead crane operators. In January 2003, the Board of Directors of NCCCO agreed to undertake the development of the overhead crane operator certification program.

NCCCO identified the need for resources in three major areas; financial support, subject matter expertise and psychometric guidance.

- § The direct financial support for the program development was obtained through donations from industry related organizations.
- § Subject matter expertise was offered by a broad cross section of overhead crane specialists including some who had already created training and testing programs related to the overhead crane industry. A few of the SME's had previously participated in the mobile crane operator certification program.
- § For psychometric assistance, NCCCO called upon its existing test developer and test administrator, International Assessment Institute (IAI).

Subject Matter Experts

One of the initial activities was the selection of subject matter experts (SME's) to serve on the Overhead Crane Program Development Task Force. Essential considerations in determining the Subject Matter Expert panel were that they be recognized for their expertise in Overhead crane operations, be knowledgeable regarding the various conditions under which Overhead crane operators work and be representative both geographically and in terms of specialties, of operators within the Overhead crane industry.

All of the Task Force members are active overhead crane operators, supervisors, trainers or safety specialists. Approximately half of the SME's are CCO Certified Crane Operators and serve as Accredited Practical Examiners for the CCO practical exams. Named as Co-Chairpersons were John Alexander of Cranetex Services and Peter Kerrick of Morris Material Handling, who was later replaced by Fred Simmons of Foley Material Handling Company. All of the co-chairpersons have extensive experience in the overhead crane industry and currently work in a training and safety related capacity.

The following individuals have participated on the Overhead Crane Task Force.

- John Alexander Cranetex Services - Co-Chair
- Fred Simmons Foley Material Handling - Co-Chair
- Ted Blanton, Jr. NACB Group
- Stephen Branstrom IUOE Local 324
- Walter Brumly Shell Oil
- Bo Collier Crane Tech
- John Hellums Max Bar
- Tom Hornberger Safety Resources
- Leonard Hull IUOE Local 825
- Leon Johnson AMECO
- Don Jordan Lyondell/Equistar
- Reijo Kamula KCI Konecranes
- Peter Kerrick Morris Material Handling
- Jim Knisley Crane Pro Service
- William LaFlamme IUOE Local 4
- Jim Lang Morris Material Handling
- Tom Luhrman Overhead Crane
- Rolf Lovgren Crane Partner International
- Judy Mellott ACTI
- William Nathan IUOE Local 54
- James Pritchett Crane Inspection Service
- Robert Reisinger ACCO Chain & Lifting

Program Development Schedule

The development plan anticipated that where appropriate, the Overhead Crane Certification Program would be modeled after the existing Mobile Crane Certification Program. Certification requirements to be considered included a written examination, a practical examination, physical (medical) requirements, an experience requirement and a recertification requirement.

The program development schedule was developed by segmenting the work into four (4) major sub-categories.

- Job Analysis and Test Specification;
- § Written Examination Development;
- § Practical Examination Development;
- § Design of the Certification Program Administration.

The schedule identified major tasks to be undertaken, the sequence in which the tasks needed to be addressed and what tasks would be addressed during each of the initial scheduled meetings. The program development schedule, which is attached as Appendix #1, was viewed as being flexible and allowing for appropriate adjustments, based upon the progress made at each of the scheduled meetings.

The Task Force agreed to meet for three day sessions approximately every two to three months. The following meetings were scheduled and conducted.

- § Birmingham, Alabama - April 21 - 23, 2003
- § Dayton, New Jersey - June 17 - 19, 2003
- § Portland, Oregon - August 25 - 27, 2003
- § Richfield, Ohio - October 27 - 29, 2003
- § Wilmington, North Carolina - February 17 - 19, 2004
- § Concord, California - April 26 - 28, 2004
- § Howell, Michigan - September 15-17, 2004

Minutes of each meeting were kept and are provided in the Appendices.

Program Development Staff

For purposes of supervision and project management, NCCCO assigned its Director of Technical Services, Philip Kinser, to be responsible for the overall program development. Mr. Kinser has worked for NCCCO for the past three years and previously served for a number of years as a test developer for a national testing company. The other facilitator was Anthony W. Mitchell, Ph.D, President of International Assessment Institute. Both Mr. Kinser and Dr. Mitchell attended all but one Task Force meetings. Dr. Paul Naylor, Ph.D., a psychometric consultant to IAI, conducted the cut-score setting workshops and provided input into the process.

Assisting at each workshop were Nancy Perry, Senior Associate at IAI, and Erin Jones of NCCCO. Their role included document production and modification. A computerized data file of the working version of any item or document was projected on a large screen for committee work. As decisions were made by the SME's, the statements, documents or items in question were added to, modified or deleted.

The typical approach used throughout the development process was to assign the SME's to work in small groups of four to five participants. A recorder was selected in each group. Task Force staff would then explain the specific assignment or issue that the groups needed to address. A set time period was given for small group discussions after which each group would report back to the full Task Force. The full Task Force would then attempt to reach consensus on the specific assignment or issue.

Training the Subject Matter Experts

One of the primary activities at each Task Force meeting was training the SME's in the various aspects of test development. At the first meeting, the initial activity, after welcome and introductions, was a presentation by Graham Brent, Executive Director of NCCCO. Mr. Brent described the Mobile Crane Operator Certification Program, how it was developed and how it operates today. Dr. Mitchell of International Assessment Institute then presented an introduction to certification and to the testing process in which he defined and differentiated between accreditation, certification and licensing. He discussed the public purpose of certification and how the public interprets certification. The presentation included an overview of the certification program development process including eligibility pre-requisites, written examinations, practical examinations and recertification.

Scope of the Certification Program

Task Force members were instructed to carefully examine the Mobile Crane Operator Certification Program to see which elements could be used as a model for the Overhead Crane Operator Certification Program. After both presentations, Task Force members broke into small groups to discuss the following questions:

- § Who will attempt to become certified as an overhead crane operator?
- § For what purpose?
- § How should the public(s) interpret the certification?
- § How difficult should it be to become certified?
- § What should eligibility requirements be?
- § What knowledge and skill areas should be tested?
- § How can candidates best demonstrate their competence?
- § What kind of examination format would be most appropriate?
- § Should there be a process for recertification?

Task Force members were told that these initial discussions were designed to give them a sense of the scope of the entire project and that they would revisit these questions a number of times during the development process. When each group had completed its initial deliberations, it reported back to the full Task Force. Further discussions ensued to attempt to arrive at consensus on each of these questions. A summary of the results of these initial discussions is found in Appendix #2.

Overhead Crane Operator

Job Analysis Report

This Job Analysis was conducted in accordance with the 1999 revision of the *Standards for Educational and Psychological Testing* (American Educational Research Association, the National Council on Measurement in Education and the American Psychological Association). The *Standards* emphasize the concept of content validity and state that the evidence should include a description of the major job characteristics that the test is meant to sample, including the relative frequency, importance and criticality of the elements. The job analysis is used to ensure that the knowledge assessed in credentialing initiatives is in fact limited to those required for competent performance and serve a public protection function. Job analysis becomes the primary basis by which a credentialing agency establishes and defends the content validity of its credentialing requirements.

SME Training

The first meeting of the Job Analysis Task Force was held on February 21 - 23, 2003, in Birmingham, Alabama. The initial activity was a presentation by Anthony W. Mitchell, Ph.D of International Assessment Institute. The presentation covered the important role job analysis plays in the examination development process, the concept of content validity and the methodology which would be followed in conducting the job analysis. The SME's discussed the scope of the job analysis that would be conducted and undertook training in the job analysis process.

Content Domains and Knowledge, Skill and Ability Statements

One of the initial challenges the Task Force had to deal with was the extent to which different skills are required of an overhead crane operator depending on the specific types of overhead cranes being operated. In other words, would the certification program need to include any specialty examinations for specific types of overhead cranes. The group identified major types of overhead cranes and their various configurations such as:

Cab Operated Specialty

- § Monorails
- § All Jibs
- § Bridge
- § Single Girder w/Under Hung Trolley
- § Double Girder w/Top Running
- § Double Girder w/Under Hung Trolley
- § Under Running
- § Top Running
- § Gantry

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- § Semi Gantry
- § Cantilever Gantry
- Floor Operated Specialty (Pendant/Remote Control)
- § Monorails
- § All Jib
- § Bridge
- § Single Girder
- § Double Girder
- § Under Running
- § Top Running
- § Gantry

This question was discussed at great length at a number of Task Force workshops. It was one of the most difficult issues on which to achieve consensus. The Task Force determined that while there are considerable differences in size, complexity, purpose and operating controls among various overhead crane categories that they could be dealt with as a single category.

Task Force members were asked to identify the major content domains within which the various tasks and the requisite knowledge, skills and abilities (KSA's) could be grouped. Task Force members were asked to consider typical jobs and the sequence in which tasks were performed when conducting these jobs. The following content domains were established:

- § Pre-Operational Activities
- § Work Requirements
- § Load Handling
- § Shutdown and Secure
- § Technical Knowledge

SME's were divided into small groups and asked to identify and list the knowledge, skills and abilities (KSA's) required of an overhead crane operator. Each group compiled a list of KSA's and then reported back to the full Task Force. The full Task Force discussed, debated and deliberated on each KSA statement in an attempt to reach a consensus.

The Task Force used the same process to determine the demographic information that would be gathered and to prepare the instructions to survey recipients.

Survey Instrument

The survey instrument was prepared by IAI based on the decisions made by the Task Force. It was reviewed at the second meeting in June 17th -19th, 2003 in Dayton, New Jersey by the SME's to ensure that all of the recommended changes and modifications had been included. The approved survey forms were then printed and prepared for distribution. A copy of the survey form is attached as Appendix #3.

A job analysis survey instrument is typically pilot tested to make sure that the instructions and the task, knowledge, skill or ability statements are clearly stated, and easily understood. However,

given the similarity of the overhead crane job analysis survey instrument to the original mobile crane survey instrument and given the extensive input from the SME's, it was determined that it was unnecessary to pilot the survey beyond that of the Task Force members.

Survey Distribution

Task Force members discussed the size of the survey sample and how best to obtain a satisfactory response level. It was suggested that the most effective approach would be to mail surveys to committee members who would then distribute the survey to overhead crane operators. It was decided that at least 300 survey responses should be sent out in the expectation of receiving 100 responses.

In addition, more than 200 surveys were mailed to CCO test sites. The test site coordinators were instructed to invite mobile crane operators who also work on overhead cranes to complete the survey. The survey was also placed on the NCCCO website.

Prior to each Task Force meeting, IAI tabulated the surveys that had been returned to date and prepared the statistical analysis. Tabulation of the importance, frequency and criticality scores on each of the KSA statements was undertaken. The demographic information provided by the respondents was also tabulated and analyzed. This report is based upon 100+ surveys received by September 30, 2004.

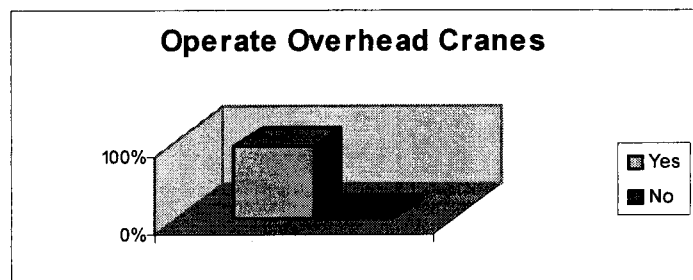
Survey Respondents - Demographic Information

A review of the demographic information derived from survey respondents demonstrates that a cross section of the Overhead crane industry is represented in the survey results.

Do you operate overhead cranes?

Among the survey respondents ninety-three percent (93%) identified themselves as overhead crane operators.

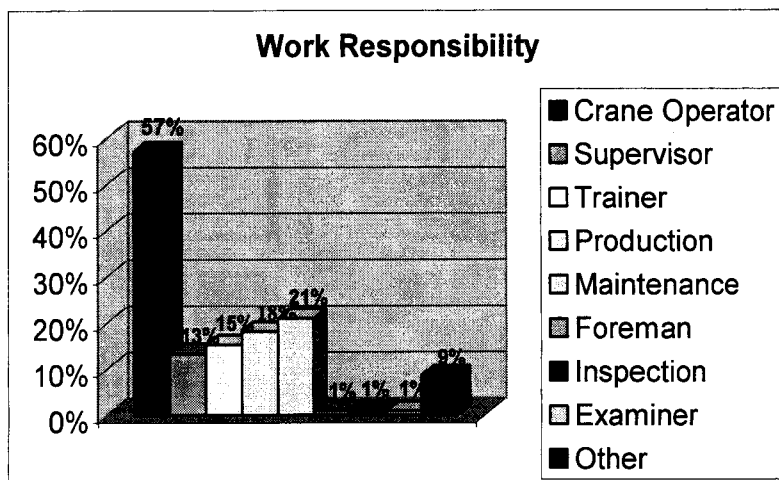
Operate Overhead	
Yes	93%
No	7%



What best describes your work responsibility? Crane Operator G Supervisor G Trainer G

In response to the question of “what best describes your work responsibility”, fifty-seven percent (57%) indicated crane operation. Maintenance, training and inspection each having a significant response.

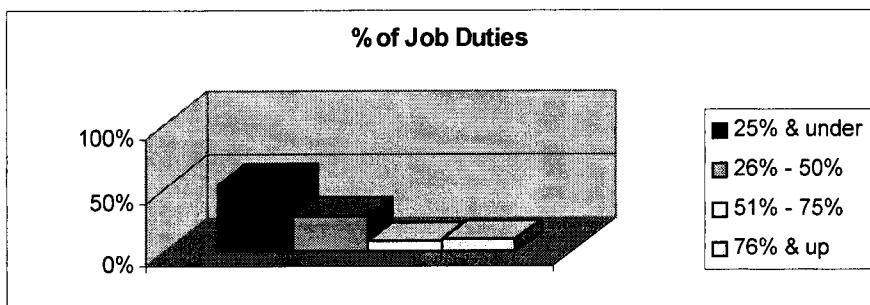
Work Responsibility	
Crane Operator	57%
Supervisor	13%
Trainer	15%
Production	18%
Maintenance	21%
Foreman	1%
Inspection	1%
Examiner	1%
Other	9%



What percent of your job duties require you to operate an overhead crane?

Survey respondents were asked to estimate what portion of their job duties requires them to operate an overhead crane. The results show that less than twenty percent (20%) of the survey respondents considered overhead crane operation as more than fifty percent (50%) of their job duties.

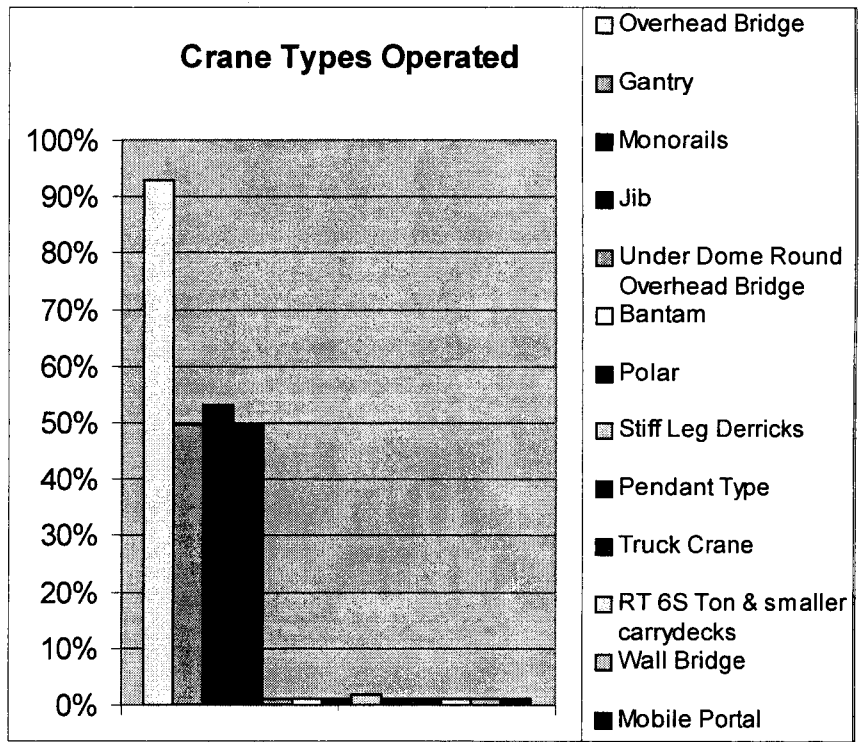
% Job Duties	
25% & under	53%
26% - 50%	28%
51% - 75%	9%
76% & up	10%



Indicate the type(s) of overhead cranes you have operated and currently operate.

The survey results show that operators operate multiple types of cranes.

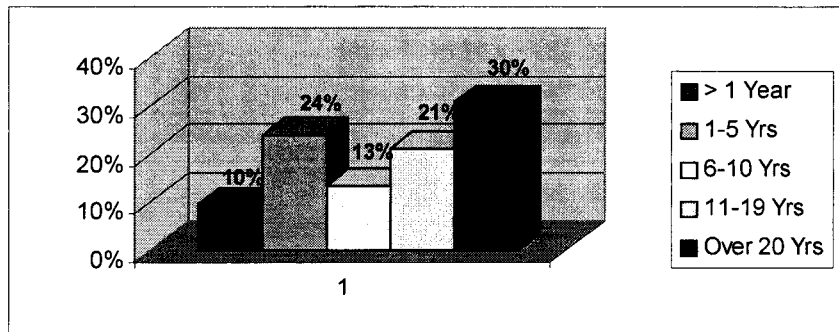
Type of Cranes	
Overhead Bridge	93%
Gantry	50%
Monorails	53%
Jib	50%
Under Dome Round Overhead Bridge	1%
Bantam	1%
Polar	1%
Stiff Leg Derricks	2%
Pendant Type	1%
Truck Crane	1%
RT 6S Ton & smaller carrydecks	1%
Wall Bridge	1%
Mobile Portal	1%
Radio Control	
Pedestal	14%
Refuel Platform	14%



How much experience do you have working with overhead cranes?

Survey respondents represented a wide range of experience as overhead crane operators with ten percent (10%) having less than one year experience and thirty percent (30%) having more than 20 years experience.

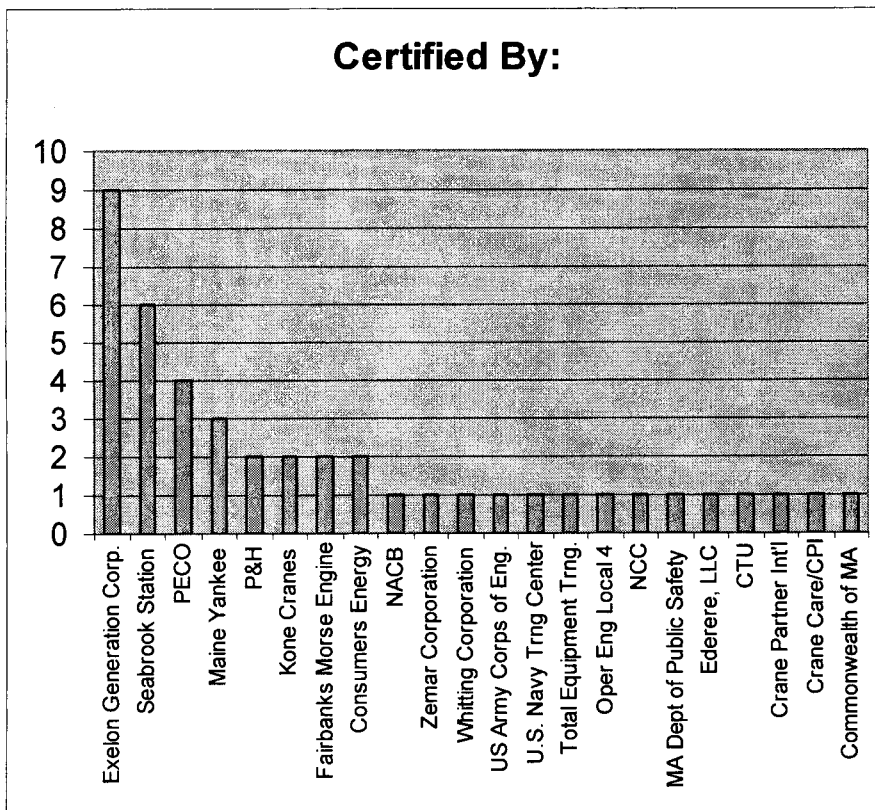
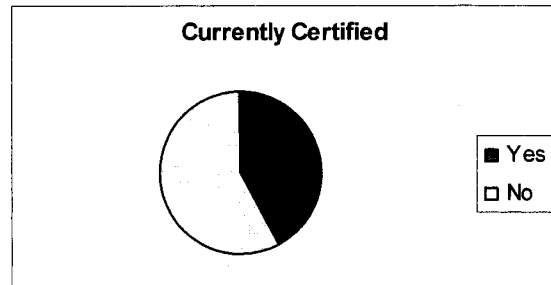
Experience	
> 1 Year	10%
1-5 Yrs	24%
6-10 Yrs	13%
11-19 Yrs	21%
Over 20 Yrs	30%



Are you current certified in overhead crane operations?

Forty-two percent (42%) of the survey respondents identified themselves as being currently certified. The “certifiers” included their current employer, training companies, unions, apprenticeship programs and overhead crane manufacturing companies.

Currently Certified	
Yes	42%
No	58%

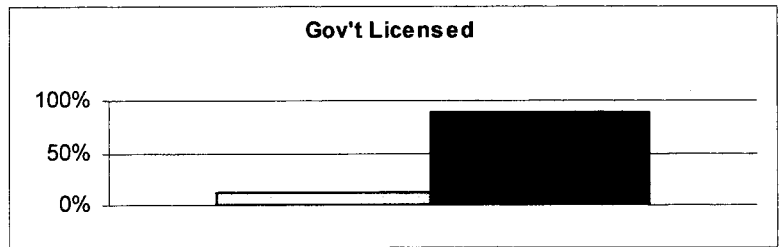


By Whom	
Exelon Generation Corp.	9
Seabrook Station	6
PECO	4
Maine Yankee	3
P&H	2
Kone Cranes	2
Fairbanks Morse Engine	2
Consumers Energy	2
NACB	1
Zemar Corporation	1
Whitting Corporation	1
US Army Corps of Eng.	1
U.S. Navy Trng Center	1
Total Equipment Trng.	1
Oper Eng Local 4	1
NCC	1
MA Dept of Public Safety	1
Ederere, LLC	1
CTU	1
Crane Partner Int'l	1
Crane Care/CPI	1
Commonwealth of MA	1

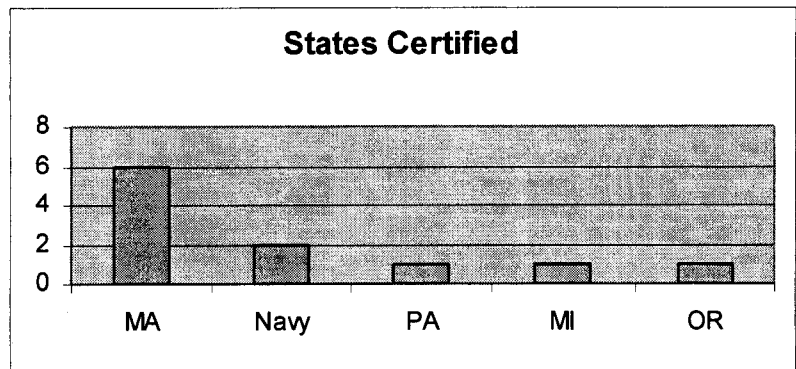
Are you licensed by a government agency as an overhead crane operator?

Few respondents indicated that they were licensed by a government agency.

Government Licensed	
Yes	11%
No	89%



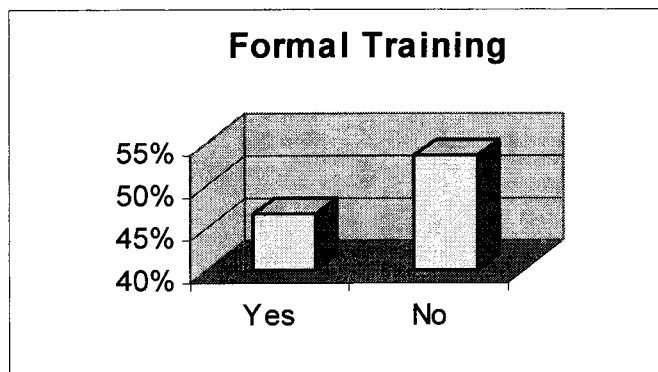
States	
MA	6
Navy	2
PA	1
MI	1
OR	1



Have you participated in formal training program(s) for overhead crane operators?

Nearly one-half of the respondents have participated in a formal training program.

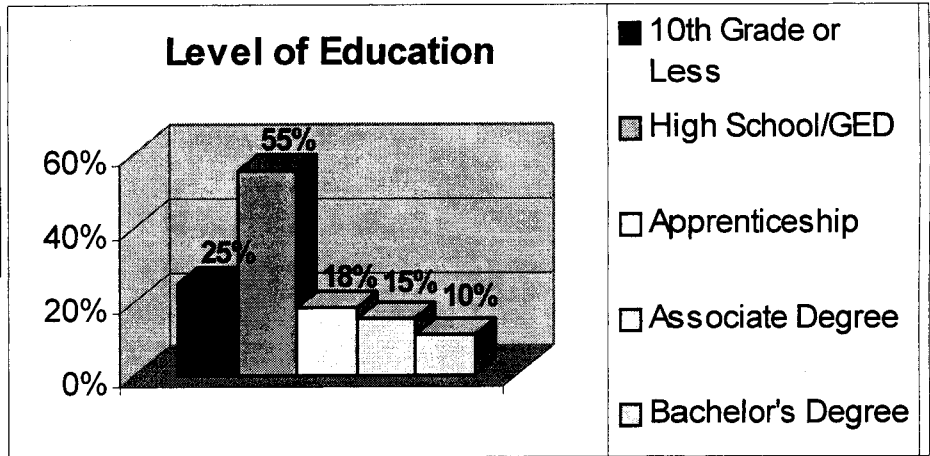
Formal Training	
Yes	47%
No	53%



What level of education you have completed?

The educational level of the survey respondents was predominately High School/GED completion fifty-five percent (55%). Twenty-five percent (25%) had completed an Associate or Bachelors degree.

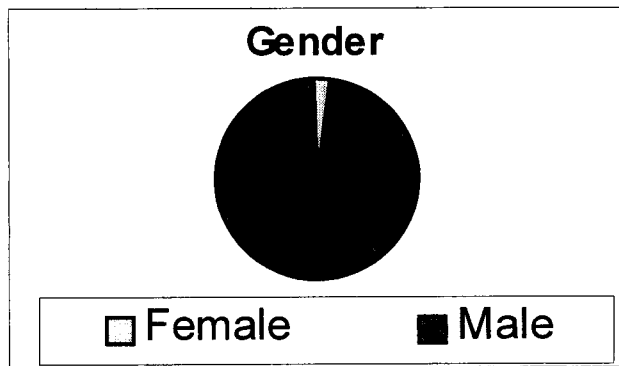
Level of Education	
10th Grade or Less	25%
High School/GED	55%
Apprenticeship	18%
Associate Degree	15%
Bachelor's Degree	10%



What is your gender?

Gender representation was in line with expectations in the overhead crane industry with ninety-seven percent (97%) of respondents, males and three percent (1%) females.

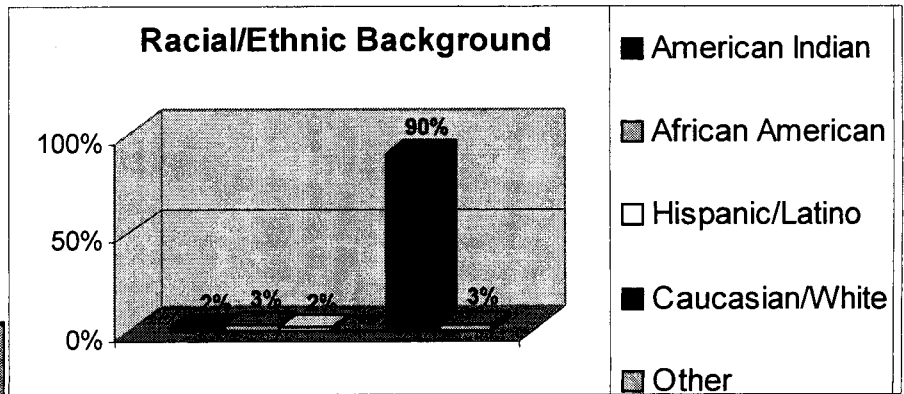
Gender	
Female	3%
Male	97%



Which of the following describes your racial/ethnic background?

In terms of racial or ethnic background, ninety percent (90%) of the respondents identified themselves as Caucasian/White. All minority groups were represented.

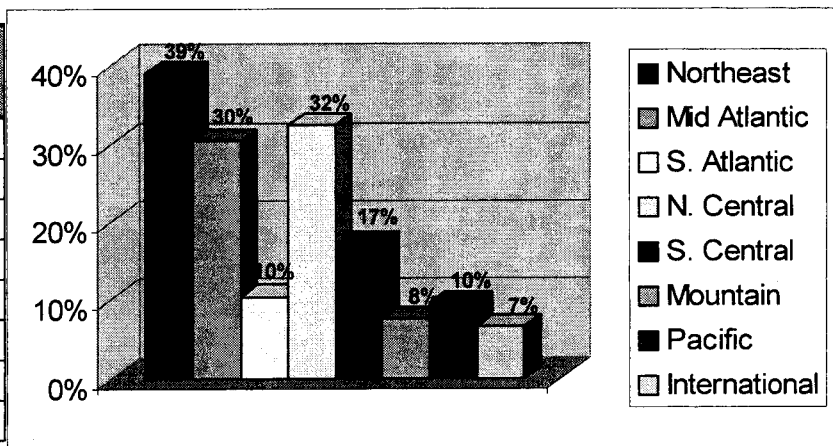
Racial/Ethnic Background	
American Indian	2%
African American	3%
Hispanic/Latino	2%
Asian/Pacific Islander	0%
Caucasian/White	90%
Other	3%



Indicate the geographic area(s) in which you work.

Survey respondents were asked to identify the geographical regions in which they operate cranes. All geographical regions were represented.

Geographic Working Area	
Northeast	39%
Mid Atlantic	30%
S. Atlantic	10%
N. Central	32%
S. Central	17%
Mountain	8%
Pacific	10%
International	7%



Job Analysis Survey Results

The knowledge, skill and ability (KSA) statements were presented in the survey in five (5) content domains:

- § (1) Pre-Operational Activities,
- § (2) Work Requirements
- § (3) Load Handling
- § (4) Shutdown and Secure
- § (5) Technical Knowledge

Respondents were asked to identify the importance of each of the knowledge, skill or ability statements. In the survey instrument, Importance was described at four (4) levels:

1. Not Important - a lack of knowledge is unlikely to lead to accident or work disruption or a delaying of leaving work.
2. Somewhat Important - a lack of knowledge could lead to minor accident resulting in a work disruption or delay in completing the work.
3. Quite Important - a lack of knowledge could lead to a serious accident resulting in personal injuries or property damage.
4. Very Important - a lack of knowledge could lead to a serious accident resulting in a fatality or major property damage.

Respondents' were asked to circle 1, 2, 3 or 4 based upon on their expert judgment regarding the importance of each of the knowledge, skill or ability task statements.

In the survey instrument, Frequency was also described at four (4) levels:

1. Almost Never - maybe once a year.
2. Sometimes - at least monthly.
3. Quite Frequently - at least weekly.
4. Very Frequently - just about every day.

Respondents' were asked to circle 1,2,3, or 4 based upon their expert judgment regarding the

frequency with which each of the knowledge, skill or ability task statements is utilized in the job setting.

The following graphic shows the Overhead crane survey results in terms of each of the knowledge or skill statements and the number of respondents who selected 1,2,3,4. For calculation purposes, the 1,2,3,4 was subsequently changed to 0,1,2,3 so that tasks or KSA's that were judged to be "not important" or had a frequency of "almost never" had no value assigned to them.

	Importance					Frequency				Criticality
	Total Number for each level of Importance					Total Number for each level of Importance				
	0	1	2	3		0	1	2	3	

1. Site

K1.1	0	8	23	80		16	44	28	24	
	0	8	46	240		0	44	56	72	
				294					172	
		Mean	2.65			Mean	1.54			6.83

K1.2	0	10	24	77		11	26	32	43	
	0	10	48	231		0	26	64	129	
				289					219	
		Mean	2.60			Mean	1.96			7.16

The number of respondents selecting a given number was multiplied by that numeric value, i.e., 0, 1, 2, or 3 to derive a total number for importance. This number was then divided by the total number of respondents who completed that statement to derive the mean score for each knowledge, skill or ability statement. The same process took place in terms of the frequency statements. A criticality rating was then derived by taking two times the importance plus the frequency to arrive at a criticality rating. For Example:

$$\text{Importance} \times 2 + \text{Frequency} = \text{Criticality}$$

$$2.65 \times 2 + 1.54 = 6.83$$

Appendix #4 contains the raw statistics for each KSA statement. Appendix #5 shows the same importance, frequency and criticality scores along with the task or KSA statements used on the survey.

Examination Specifications

The SME's discussed the length of the examination. That is, how many questions needed to be asked of each candidate to reasonably arrive at the judgment that the candidate has a sufficient grasp of the knowledge required to be a competent Overhead crane operator. The parallel question examined by the SME's was how many questions need to be asked to adequately sample the various knowledge areas covered in the five content domains. The SME's decided that a sixty (60) item examination would meet these needs. Using the information derived from the survey, the SME's then determined the number of questions that should be written for each content area and for each KSA statement.

The following chart shows this information.

Domain 1:	Pre-Operational Activities	27%	of the exam =16	Questions
Domain 2:	Work Requirements	27%	of the exam =16	Questions
Domain 3:	Load Handling	27%	of the exam =16	Questions
Domain 4:	Shutdown and Secure	4%	of the exam = 3	Questions
Domain 5:	Technical Knowledge	15%	of the exam = 9	Questions

The SME's discussed the issue of time allowed to take the test and made a preliminary determination that one hour would be sufficient to allow test takers to complete the test without any undue time pressures.

Overhead Cranes Content Outline

The Overhead Crane Written Examination tests the following knowledge areas relating to the operation of overhead cranes.

Domain 1: Pre-Operational Activities

27% = 16 Questions

Domain 2: Work Requirements

27% = 16 Questions

Domain 3: Load Handling

27% = 16 Questions

Domain 4: Shutdown and Secure

4% = 3 Questions

Domain 5: Technical Knowledge

15% = 9 Questions

1. PRE-OPERATION ACTIVITIES

27% = 16 Questions

1. Knowledge of emergency shutdown procedures.
2. Know where to locate and verify access to main runway disconnect.
3. Knowledge of lockout/tag-out condition resolutions.
4. Knowledge of initial inspection of both visual and audible hazards.
5. Knowledge of proper control labeling and conditioning.
6. Knowledge of pendant control strain relief requirements.
7. Knowledge of warning and capacity labeling requirements.
8. Know where to check for oil leaks.

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9. Knowledge of wire rope or chain condition and proper spooling.
10. Knowledge of applicable requirements for guards.
11. Knowledge of applicable fire extinguisher requirements.
12. Knowledge of emergency stop function.
13. Knowledge of applicable bumper/stop requirements.
14. Knowledge of ASME B30.2 control layout.
15. Knowledge of all limit devices and control functions.
16. Knowledge of brake test procedure.
17. Knowledge of all warning devices.
18. Knowledge of load block, hook and latch requirements.

2. WORK REQUIREMENTS

27% = 16 Questions

1. Determine how much load weighs.
2. Know the proper use of (below the hook lifting devices).
3. Know proper rigging selection and applications.
4. Know how to move crane into correct lifting position to assure true vertical lift of load.
5. Know how to avoid side pulling or swinging of load during start, stop and travel.
6. Identify signal person.
7. Know ASME B30.2 hand signals.
8. Communicate lift activity to other workers.

3. LOAD HANDLING

27% = 16 Questions

1. Verify communication devices (i.e. radios) are functioning correctly.
2. Perform hoist brake check with load.
3. Verify crane and load path is clear of personnel and obstructions.
4. Know when to activate warning alarm system.
5. Know how to operate hoist, bridge and trolley safely.
6. Know how to avoid shock loading.
7. Know how to minimize load swing.
8. Verify floor capacity, know how to safely set load down and remove rigging.

4. SHUTDOWN AND SECURE

4% = 3 Questions

1. Know where to park the crane.
2. Know shutdown procedures.

3. Report deficiencies or problems to supervision.

5. TECHNICAL KNOWLEDGE

15% = 9 Questions

1. Knowledge of ASME B30.2 -Overhead and Gantry Cranes- {Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist}.
2. Knowledge of ASME B30.20 - Below-the-Hook Lifting Devices.
3. Knowledge of OSHA 1910.179 - Overhead and Gantry Cranes.
4. Knowledge of OSHA 1910.184 - Slings.
5. Knowledge of other applicable rules, standards, and regulations.
6. Knowledge of crane manufacturer's operating instructions.
7. Knowledge of functions and limitations of crane components and attachments.

Written Examination Development

The development of the written examination followed standard item writing, item review and item bank development procedures. The subject matter experts (SME's) received training in item writing and subsequently had an opportunity to practice writing and critiquing items in a group setting. Task Force members received an "Item Writing Guide" as part of their study material.

At each meeting, Task Force members would write items and review items written either at that meeting or at previous meetings. Items were either approved, revised or deleted by the subject matter experts throughout the course of the item writing, item review process. Approved items were placed into the overhead crane item bank. Efforts were made to pilot test the items, however, only a relatively small number of overhead crane operators actually participated.

Task Force members spent considerable time discussing the need for authoritative reference sources. They reviewed a number of nationally recognized crane related standards as well as other appropriate publications that could be used to reference each item to an authoritative source.

Cut Score Workshop

At the February 2004 meeting in Wilmington, North Carolina, Dr. Paul Naylor conducted a standard setting workshop. A full report of the workshop follows.

OVERHEAD CRANE OPERATOR STANDARD SETTING WORKSHOP REPORT

On February 17, 2004, nine members of the Overhead Crane Task Force or the National Commission for the Certification of Crane Operators met in Wilmington, North Carolina to develop a recommended criterion-referenced passing standard for the Overhead Crane Operator's Examination. The panel of Subject Matter Experts (SME) represented a wide range of overhead crane operation and supervisory experience. A list of the participants is at attachment 1. International Assessment Institute's psychometric consultant, Paul Naylor, Ph.D, facilitated the workshop.

The workshop began with a general discussion of normative, mandated, and criterion-referenced methods used in setting performance standards. Time was spent discussing the rationale behind the various methods of standard setting as well as the pitfalls in setting standards too high or too low. The concept of minimum competency and its seminal role in criterion-referenced standard setting was discussed at some length.

The next step was to develop and agree upon a definition of the level of performance that constitutes minimum competency for the safe and effective operation of overhead cranes. This definition would be the reference point for all judgments regarding the 91 examination items to be reviewed.

Following the achievement of a consensus on the definition of minimal competence for overhead crane operators the panelists were instructed in the detail of the Angoff method of criterion-referenced standard setting. Once comfortable with the procedure the panelists were asked to review the first 5 items in the item bank and determine, individually, the probability of a minimally qualified candidate correctly answering each question. Each panelist's responses were posted on an electronic spreadsheet. As the ratings were reviewed the facilitator asked the highest and lowest raters to explain the rationale for their responses. A discussion ensued during which the panelists re-reviewed their understanding of the concept of minimal competency and reinforced the consensus. The panelists were informed that they were free to modify their ratings if they felt they had been influenced by the discussion.

The panelists were next instructed to review the remaining items in the item bank and record their probability ratings on the sheets provided. These data were entered into a spreadsheet where an

average rating for each items was computed as well as the standard deviation for the panelists ratings on each item.

Upon completion of the data entry task the panelists were asked to revisit their rating for those items where a significant difference between the raters was evident. Following discussion some ratings were changed to reduce the magnitude of the differences.

The panelists were also asked to determine if any items in the bank had issues of clarity or accuracy to be discussed. When such items were found modifications, if warranted, were made and the panelists were asked to make any necessary changes in their item ratings.

As a result of the panel's efforts, each item in the bank now has an Angoff value that may be used in setting the passing standard for each form of the examination.

Practical Examination Development

At each of the meetings, Task Force members worked on the development of the practical examination. They began by addressing such issues as the important skills to be tested and the logistics of how best to test those skills. For each skill the Task Force determined needed to be tested it identified:

- § the performance standards that would be required for an operator to demonstrate their competency,
- § deficiencies in performance that would be observable,
- § time that would be needed for a competent operator to perform the task,
- § how the examiner would evaluate the performance,
- § how the performance would be observed, recorded and scored,
- § how the test site needed to be configured for that task.

Throughout the process the Task Force members were able to work with overhead cranes with both cab and pendant control systems and with appropriate equipment to pilot test each task identified as appropriate for the practical examination. Results of the pilot practical tests, both in terms of individual operator performance and time taken to perform the tasks was recorded and analyzed. Performance standards were established for each of the tasks.

Attached as Appendix #6 on the following pages are the respective documents that describe the practical exam including:

- § a description of the tasks to be performed,
- § site set-up,
- § candidate score sheet
- § verbatim instructions to be read to the candidates.

Administration

At each meeting, time was spent discussing issues related to program structure and administration. This included discussion on candidate pre-requisite eligibility standards such as age, experience and medical requirements. It included discussion of the information that would need to be available in the candidate handbook such as written examination content outline and practical examination requirements.

A major topic was the extent to which the overhead crane program would be integrated into the mobile crane program and tower crane program. It was predicted that most candidates would

seek to become certified only as overhead crane operators and that relatively few operators would also seek certification as mobile crane operators or tower crane operators.

Administrative issues regarding the processing of candidates, test administration functions and certification cards issued to certified candidates were discussed by Task Force members in an attempt to reach consensus.

Task Force members recognized that final approval for many of these administrative issues would pass from the Overhead Crane Task Force to the NCCCO Commissioners. Attached is the most recent document regarding administration of the Overhead crane certification program.

List of Appendices

Appendix #1 - Program Development Schedule

Appendix #2 - Summary of results of initial discussions

Appendix #3 – Copy of the Job Analysis Survey Form

Appendix #4 – Raw Statistics for each KSA statement

Appendix #5 – Importance, Frequency and Criticality scores and KSA statements

Appendix #6 – Practical Examiner Verbatim Instructions, Sample Candidate Score Sheet, Test Site Set-Up, Practical Exam Outline