NASCLA ACCREDITED ELECTRICAL EXAMINATION PROGRAM

TEST DEVELOPMENT REPORT

August 2018

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Section 1: Background

This report documents the methodology and procedures used to conduct the job analysis and test development of the NASCLA Accredited Electrical Examination Program for examinations for Electrical Contractor/Master Electrician, Journeyman Electrician, and Residential Electrician/Residential Electrical Contractor classifications. The purpose of this Background Section is to outline the historical context and events that preceded the development of the NASCLA Accredited Electrical Examination Program.

Overview of NASCLA

The National Association of State Contractors Licensing Agencies (NASCLA) was formed in 1962, "dedicated to the mutual assistance of the member states in striving for better regulation of the construction industry to protect the health, safety, and welfare of the general public." It has now grown to include a membership of 41 contractor licensing agencies in 27 states, as well as in Washington, D.C., in the territories of the U.S. Virgin Islands and Guam, and in the nation of Kenya. The NASCLA constitution lists nine objectives that form the primary purposes for which NASCLA was created. One of these objectives is "To provide mutual assistance in the standardization of licensing examinations."

Overview of the NASCLA Accredited Examination Program

NASCLA members began internal discussions in 1998 on the possibility of creating an accredited examination program with the goal of reducing redundant requirements facing contractors who seek to be licensed in multiple states. The idea was that examinations could be created that participating states would be able to either administer or accept as meeting their own examination requirements, benefitting both the agencies and the contractors seeking licensure.

The agencies would benefit in that:

- pooled resources between agencies would reduce the cost to each agency for exam development.
- using a common standardized examination would allow agencies to have a common basis for assessing the competency of license applicants.
- agencies could streamline the licensing application process for out-of-state contractors and attract these contractors more easily when more contractors are needed due to:
    - the aftermath of natural disasters.
    - economic booms.
    - a shrinking workforce.

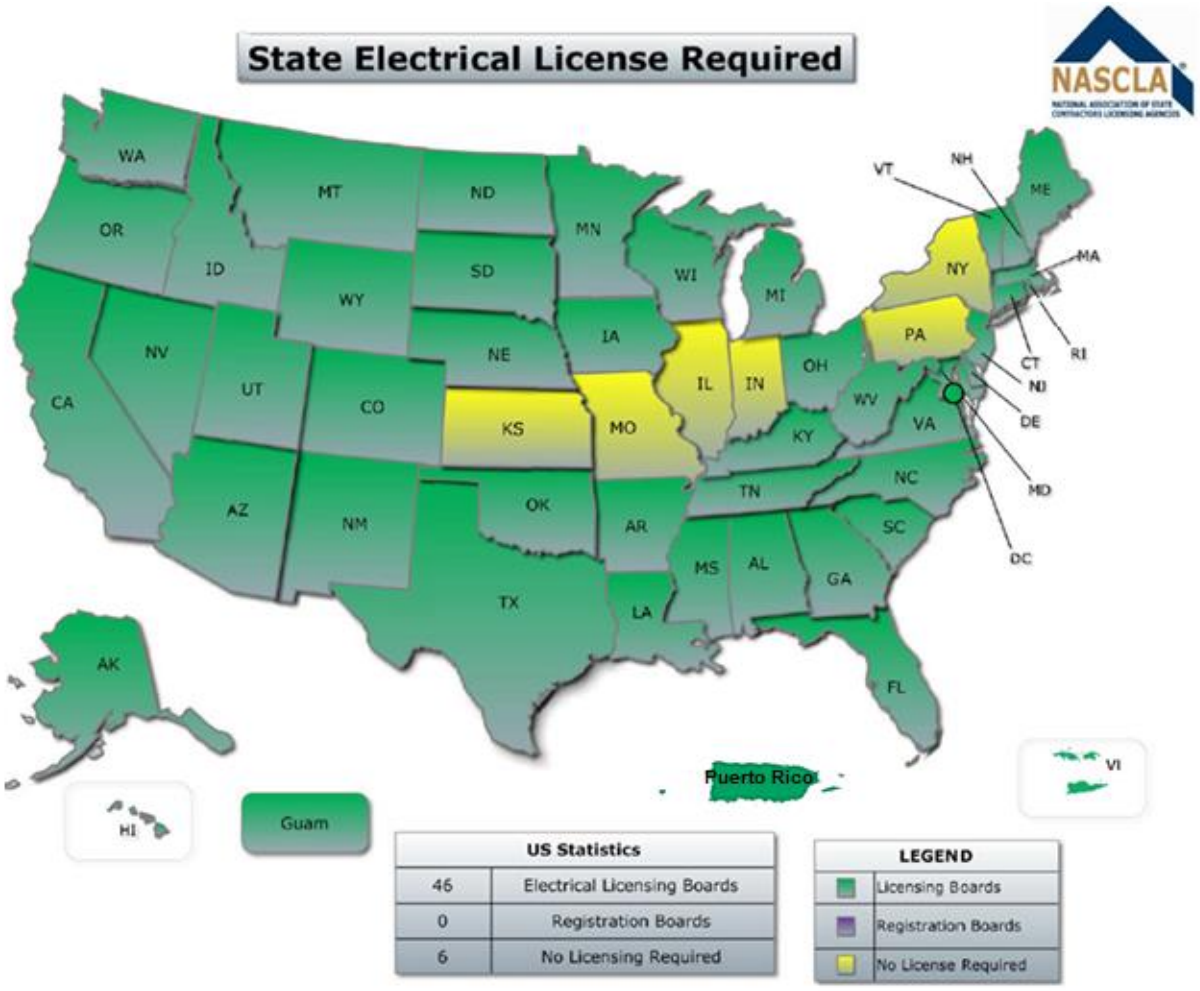
The contractors would benefit because they would be able to take one examination for multiple states. This would:

- allow the contractor to avoid the costs of travel
    - transportation.
    - meals.
    - hotels.
    - lost work time.
- eliminate the waiting time for exams to be given, thus expediting the license application process.
- eliminate the necessity for similar tests to be taken repeatedly.

The NASCLA Accredited Examination Program Committee analyzed major contractor classifications from states across the country for compatibilities and created common scopes of work as a basis for determining whether common examinations might be feasible. As a result, the committee decided to develop a national job analysis for general building construction contractors. The committee determined that rather than NASCLA developing and administering any examination, it would accredit companies who would develop and/or administer their own proprietary examination forms based on the NASCLA General Building Construction Contractor job analysis. As a first measure in that process, they completed a set of examination standards in 2001 from which to guide all consequent work. NASCLA then contracted with Professional Examination Service (PES) of New York City in 2004 to conduct the job analysis for the General Building Construction Contractor occupation. Since then, two companies have been approved both as an examination development provider and as an examination administration provider. These two companies were PSI, Inc., and PES. However, PES has chosen not to follow through as either an examination development provider or as an examination administration provider. In 2009, PSI, Inc. began administering a NASCLA Accredited Examination for Commercial General Building Contractors which they had developed based upon the job analysis. Then, as a result of NASCLA's policy of re-validating the job analysis every 5 to 7 years, the NASCLA Accredited Examination Program Committee revalidated the job analysis for the General Building Construction Contractors exam in 2012. In 2016, PROV, Inc. was also approved as an examination administration provider. PROV has not requested to become an examination development provider.

NASCLA Accredited Electrical Examination Program

In 2013, the NASCLA Accredited Examination Program Committee began to explore whether there might be other contractor trades that could benefit from a NASCLA examination. Following research conducted by NASCLA staff to determine which states have licensing Boards and related examinations for the various trades of plumbing, electrical work, mechanical work (HVACR, boilers, etc.), and home building, a survey was sent to the executive officers of the various Boards regulating each trade to determine their interest in a national or multi-state examination in each trade. The survey was sent both to members of NASCLA and to nonmembers.



Research prior to the survey revealed that there are 44 states that have statewide electrical licensing for electrical contractors/master electricians/unlimited electricians/electrical administrators, as well as Washington, DC, Guam, the Virgin Islands, and Puerto Rico.

After reviewing the results of the survey, the committee decided that the trade that would benefit most from a NASCLA examination would be that of electrical contractors. The United States Department of Labor, Bureau of Labor Statistics for May 2016 indicated that there were 1,487,890 individuals working in electrical professions in the U.S. (see Appendix A). This was the trade for which the survey indicated the most interest in an exam, and electricians are more commonly known for moving between states than the other trades that were being considered. After determining that there was currently no national electrical examination being administered or being actively pursued for the future by any testing company or electrical association, the committee resolved to pursue the development of a nationally recognized trade examination for electrical contractors. Furthermore, the committee decided that it should seek the cooperation of the electrical industry in general before moving forward. As a result, a meeting was set up in Washington, D.C. between members of the NASCLA Accredited Examination Program Committee and the National Electrical Contractors Association (NECA) in March 2014. Attending the meeting for NECA were Daniel G. Walter, Vice President and Chief Operating Officer, Michael J. Johnston, Executive Director, Standards and Safety, and Marco A. Giamberardino, MPA, Executive Director, Government Affairs. Attending the meeting for NASCLA were George Whalen, Executive Director, Rhode Island Contractors' Registration and Licensing Board and the President of NASCLA at the time, Victor Weston, President, Tri-State Road Boring and Board Member of the Louisiana State Licensing Board for Contractors, and Doug Traylor, NASCLA Accredited Examination Program Committee Chair and Director of Examinations and Assessment for the Louisiana State Licensing Board for Contractors. During the meeting, it was decided that the best course of action would be to create three separate, but related, examinations for electrical work: Electrical Contractor, Journeyman Electrician, and Residential Electrical Contractor. Thereafter, the NECA Executive Committee directed that the two organizations work together toward this end; the NASCLA Executive Committee made a similar resolve.

It was also determined that the cooperation of the major electrical industry organizations should be sought as additional partners, so that this would be a united effort. A number of electrical industry organizations were contacted regarding this effort. NASCLA invited these organizations to send representatives to their annual conference on August 25, 2014, in Newport, Rhode Island, for the NASCLA Accredited Examination Program Committee meeting to gather feedback from them regarding their potential concerns about the test development process. As a result, the following representatives attended and took part in this discussion at that meeting: Michael Johnston, Executive Director Standards & Safety, National Electrical Contractors Association (NECA); John Masarick, Vice President of Codes & Standards, Independent Electrical Contractors (IEC); Mark W. Earley, P.E., Chief Electrical Engineer, National Fire Protection Association (NFPA); John Cannon, Project Manager, Certifications, National Fire Protection Association; Jack Lyons, Northeast Field Representative, National Electrical Manufacturers Association (NEMA), and Bruce Hollands, Executive Director of the Uni-Bell

PVC Pipe Association, and by teleconference, Tracy Dalrymple, Training & Certification Operations Manager, Electronic Security Association; and Marianna Kramarikova, Manager of Technology and Standards, Telecommunications Industry Association (TIA). There were other organizations that were also interested in attending but were unable to do so due to scheduling conflicts. Also attending that meeting were a number of NASCLA state members and contractor member attendees, and a few additional interested parties. During the meeting, the NASCLA Accredited Examination Program Committee asked these various associations if they would nominate electrical practitioners over the next few weeks who might be able to serve as SMEs for this project. Also discussed were procedures to create a unified approach to possible electrical examinations.

Two of the most important conclusions that resulted from the discussion were:

- The various names for a master electrician, such as Unlimited Electrician, Master Electrician, Electrical Contractor, etc. should be given a single name under which all of these names can be identified. Such a name might be "Master Electrical Contractor."
- The examinations for Master Electrical Contractor, Journeyman Electrician, and Residential Electrical Contractor should be developed without creating a standardized requirement for experience. The various individual states and boards should be able to determine their own requirements as to experience, independent of the examinations.

In October 2014, the National Electrical Manufacturers Association (NEMA) Code and Standards Committee voted to provide assistance to NASCLA through the advisory capacity of one of its field representatives, Jack Lyons.

Following the August NASCLA meeting in 2014, preparations began for conducting the first panel meeting of Subject Matter Experts (SMEs) for the Electrical Contractor examination. At the NASCLA 2015 Mid Year Meeting on March 11th in Huntsville, Alabama, the NASCLA Accredited Examination Program Committee met again, and decided to change the model used for the electrical examinations from that of the Commercial General Building Construction Contractor examination. Under the General Building exam, there exists the potential to have multiple tests developed by multiple test providers and multiple test administration providers (i.e., test proctoring providers). Under the new model for the NASCLA electrical examinations, there would be one test provider, and one or multiple administration providers. This new model would allow for there to be a single unified exam item bank, while allowing each state to use its own pre-existing proctoring setup, assuming that the administrating entity for each proctoring setup is confirmed as an approved NASCLA administration provider.

In August of 2015, representatives of NASCLA attended the annual meeting for the National Electrical Reciprocal Alliance (NERA) in Santa Fe, New Mexico and spoke to the group regarding the NASCLA electrical examination efforts at their invitation. NERA is a coalition of

electrical Boards from a number of different states whose goal is to form and streamline reciprocal agreements between states for Master Electrician and Journeyman Electrician licenses. NASCLA members were able to gain additional insights as to the concerns and views of the NERA members regarding the licensing environment in general, and the NASCLA Accredited Electrical Examination Program development effort in particular.

Section 2: Overview of the Job Analysis Project

NASCLA conducted a national job analysis for electrical occupations from October 2014 through February 2016 for the following electrician classifications: Electrical Contractor/Master Electricians, Journeyman Electricians, and Residential Electrician/Residential Electrical Contractor. The purpose of this job analysis study was to define the work conducted by electrician classifications through identifying the tasks required to perform the job safely and competently, along with the knowledges and skills needed to perform those tasks. The job analysis defined the examination content and the level of competency that examination candidates must exhibit in order to receive a license. This effort was conducted under the oversight of the NASCLA Accredited Examination Program Committee and with the assistance of NASCLA's Psychometrician, Kara Schmitt, Ph.D.

Validation Strategy

NASCLA used a content validation strategy to identify: (1) the variety of tasks performed by electrical contractors at the level of competency needed at the time of licensure, and (2) the knowledges and skills needed to accomplish those tasks. In order for an examination to be considered content valid, the test developer must demonstrate a clear relationship between the content of the job and the content of the examination. This relationship is typically established through a series of linkages. The first linkage involves establishing the relationship between the important job tasks performed on the job and the knowledges and skills needed to successfully perform those tasks. The second linkage involves establishing the relationship between the important knowledge and skills and the items on the examination. The content validation strategy utilizes the expertise of practitioners in the field to:

- develop statements that reflect the
    - tasks performed.
    - knowledges and skills needed to perform each task safely and competently.
- link the tasks with the knowledges and skills.
- form a basis upon which each examination item may be written and linked to those
    - task statements.
    - knowledge and skill statements.

Preliminary Research

NASCLA reviewed the various content outlines of licensure electrician examinations from various states. This process allowed NASCLA to establish all of the various content areas that

are being assessed for state licensure. Any available job analysis reports for these license types were also reviewed.

Legal Standards and Guidelines

The Electrical Contractor job analysis was developed in accordance with accepted professional psychometric standards and legal decisions regarding conducting job analyses and developing licensure examinations. Sources of guidance for developing evidence needed to demonstrate reliability and validity in the interpretations of test scores include the:

- ***Standards for Educational and Psychological Testing***, 2014, by the American Educational Research Association, the American Psychological Association, and the National Council on Measurement in Education.
- ***Principles for the Validation and Use of Personnel Selection Procedures***, 2003, by the Society for Industrial and Organizational Psychology, Inc.
- ***Uniform Guidelines on Employee Selection Procedures***, 1978, by the Equal Employment Opportunity Commission.
- ***Americans with Disabilities Act of 1991.***
- ***Titles VI and VII of the Civil Rights Act of 1964.***
- ***Griggs v. Duke Power Co.***, 401 U.S. 424, 432, 91 S. Ct. 849, 28 L.Ed.2d 158 (1971).
- ***Albemarle Paper Co. v. Moody***, 422 U.S. 405 (1975**).**
- ***Kirkland v. New York State Department of Correctional Services***, 520 F.2d 420.
- ***Guardian's Assn. v. Civil Service Commission of New York***, 630 F.2d 72, 79 (1980).
- ***Texas Department of Community Affairs v. Burdine***, 450 U.S. 248, 253-54, 101 S.Ct. 1089, 1093, 67 L.Ed.2d 207 (1981).
- ***Allen v. Alabama State Board of Education***, 816 F.2d 575 (11th Cir.1987).
- ***Tyler v. Vickery***, 517 F.2d 1089 (1975).
- ***Wards Cove Packing Co. V. Atonio***, 490 U.S. 642 (1989).
- ***Lanning v. Southeast Pennsylvania Transportation Authority (SEPTA)***, 181 F.3d 478 (3rd Cir. 1999), cert. denied, 120 S. Ct. 970 (2000).
- ***Lanning v. SEPTA***, 308 F.3d 286 (3rd. Cir. 2002).
- ***Gulino v. New York State Education Department***, 460 F.3d 361 (2nd Cir. 2006).
- ***Ricci v. DeStefano***, 557 U.S. 557 (2009).
- ***M.O.C.H.A. v. City of Buffalo***, 689 F.3d 263 (2nd Cir. 2012).

Section 3: Electrical Contractor/Master Electrician Job Analysis

The procedures and methodology used to conduct the Electrical Contractor/Master Electrician job analysis are described in this section.

Participation of Subject Matter Experts

A representative sample of electrical contractors served as Subject Matter Experts (SMEs) throughout the development of the job analysis. NASCLA sought SME nominations from the executive directors and staffs of the various member and nonmember licensing agencies throughout the country, from the various electrical associations, from NASCLA Contractor Members, from individuals who had volunteered when surveyed, and from NASCLA Accredited Examination Program Committee members. NASCLA staff sent information about NASCLA, the accredited examination program, and the workshops being planned to those electrical contractors who had shown interest in participating, along with an experience and training questionnaire. The electrical contractors selected to participate were chosen that best represented the most comprehensive and diverse backgrounds possible and the widest reach geographically to ensure that the results would be representative of current practice in electrical construction throughout the United States.

There were 19 different Subject Matter Experts (SMEs) who participated in the 2 panels specifically for the Electrical Contractor job analysis: 7 SMEs participated in the first panel only, 5 SMEs participated in the second panel only, and 7 SMEs participated in both panels. The 19 SMEs who participated in the Electrical Contractor job analysis workshops lived in 11 different states (California, Florida, Maryland, Massachusetts, Minnesota, Mississippi, New Hampshire, Oregon, Texas, Utah, and Wisconsin) and had worked in a total of 30 states, the District of Columbia, Iraq, and Kuwait. Most of the SMEs identified themselves as being white or Caucasian or American, with one identifying himself as being Hispanic, one as being Pacific Islander, and one as being German. Two SMEs identified themselves as being between the ages of 36-45 years old, 6 identified themselves as being between the ages of 46-55 years old, and 18 identified themselves as being 56 years old or above. All SMEs stated that they have been licensed as a master electrician or electrical contractor. The length of time of their licensure ranged from 1 year to 40 years, and the length of time they have been working full time in the electrical field, including their apprenticeship years, ranged from 13 years to 47 years. Demographic information for the SMEs that participated in both Electrical Contractor job analysis meetings is included in Appendix B. The lists of SMEs that participated in the two job analysis meetings and those SMEs that served as independent reviewers are included in Appendix C.

Initial SME Job Analysis Panel Meeting

The first panel meeting of Subject Matter Experts (SMEs) for the Electrical Contractor/Master Electrician job analysis was conducted at the offices of the Independent Electrical Contractors of Utah, Inc., in Midvale, Utah, a suburb of Salt Lake City, on March 25-26, 2015, led by the NASCLA Accredited Examination Program Committee Chair and by the NASCLA Psychometrician. The group consisted of 14 individuals from 7 states (Texas, Maryland, California, Mississippi, Oregon, Florida, and Massachusetts).

During this meeting, a discussion was held to determine the meaning of "minimally acceptable level of competence" for an "entry level" electrical contractor in reference to the level that would be needed at the time of licensure. Some confusion arose among the SMEs regarding the difference between an "Electrical Contractor" license in some states, and a "Master Electrician" in others, until it was explained that in most states, in order to acquire an "Electrical Contractor" license, the applicant would generally have to pass both the equivalent of a "Master Electrician" license exam, i.e., the trade exam, and a "Business and Law" exam for the state. It was further explained that the intention of this project was to determine the content that could be used as the trade portion of an examination for Electrical Contractor licenses or as the examination for Master Electrician licenses. Other states use the terms "Electrical Administrator," or "Unlimited Electrician" to refer to a similar job scope. The panel decided that it would be best to label this exam as an "Electrical Contractor" examination, and let each Board continue to determine the name for their license that would best suit their needs. The purpose of the job analysis was to create a standard that would help to define the meaning of "Electrical Contractor," and that would satisfy the majority of states that license electricians. A definition of Electrical Contractor was developed through this discussion, as follows:

One who conducts business in the installation, maintenance and repair of electrical work conforming to applicable standards and codes.

All decisions made by the SME panel were determined by consensus; as the discussion on each point ensued, if anyone disagreed with any decision being reached, they were allowed to state their disagreement and the reason for their dissent, and further discussion was allowed until all parties reached a mutual understanding or a modification which addressed all concerns to the satisfaction of all parties.

In a series of group discussions facilitated by the NASCLA Psychometrician and the NASCLA Accredited Examination Program Committee Chairperson, the SMEs developed a comprehensive outline of the major content domains, the important tasks conducted by job incumbents in those domains, and the related knowledges and skills for each task. Once the SMEs were able to identify the domains, they came to a consensus as to the percentage of questions to be preliminarily assigned to each domain. The SMEs then compared the newly developed domains to some representative content domain outlines obtained from the states of California, Florida, Georgia, North Carolina, and Texas to determine if there were any adjustments that the felt should be made to make the content domains better reflective of the content domains being used by the majority of states; only minor adjustments were made by the SMEs at this time. The SMEs also identified the tasks most important to the work of an electrical contractor and to the safety of the general public; each task was then linked to the domain to which it most closely fit. For each task, the knowledge and skills needed to perform the task were identified and linked to the task. An outline of the Content Domains, Tasks, and Knowledges and Skills was compiled.

Once the SME panel concluded its work and the initial job analysis outline of tasks, knowledge, and skills was completed, the outline was sent to the SME panel members for their individual input and review. The outline was also sent to another independent group of ten reviewers who also had at least 5 years of experience in the electrical field. The comments received were incorporated into the initial job analysis outline and the revised version was sent to the SME panel members for their review via e-mail. After all comments were received on the revisions, the resulting job analysis outline was used as the basis for the surveys that were conducted.

Initial Job Analysis Survey of SMEs

In July of 2015, the initial Electrical Contractor Job Analysis Survey was sent out to electrical contractors throughout the United States, requesting that they rate each task stated in the job analysis according to a Likert scale for frequency and importance, and to rate each related knowledge or skill for importance. The task frequency was rated as: 0 = not performed, 1 = rarely performed, 2 = sometimes performed, or 3 = frequently performed. The importance for each task, knowledge, and skill statement was also rated from 0 to 3; 0 = not important, 1 = minor importance, 2 = moderately important, or 3 = very important. This first survey was sent by NASCLA to 4,793 licensees of some of the NASCLA member states. Additionally, the survey was sent by Boards of some of the other NASCLA member states to their licensees, by the International Association of Electrical Inspectors to their members nationwide, by the National Electrical Contractors Association to their members nationwide, and by the Independent Electrical Contractors to their members nationwide. The total number of surveys sent out by the

various boards is unknown. A copy of the NASCLA Electrical Contractor Job Analysis Survey is included in Appendix D.

A total of 367 recipients responded to the survey. The respondents included contractors holding licenses in all 50 states and in Washington, D.C. The respondents also represented a wide range of experience; the amount of time the respondents had held a license ranged from 3 months to 51 years. The vast majority (98.7%) of the respondents currently or have at one time been licensed as an Electrical Contractor (Master Electrician/Unlimited Electrician). It should be noted that there are jurisdictions in the United States in which no licensure is required to perform as an electrical contractor or master electrician. The complete breakdown of the Electrical Contractor Job Analysis Survey respondent demographics is included in Appendix E.

Second SME Workshop

The second SME panel for the Electrical Contractor/Master Electrician job analysis was convened in San Diego, California, on September 2, 2015, led by the NASCLA Accredited Examination Program Committee Chair and by the NASCLA Psychometrician. There were 12 subject matter experts from 9 different states, including Florida, Minnesota, Massachusetts, California, Texas, Wisconsin, New Hampshire, Mississippi, and Maryland. Seven of the 12 SMEs had participated in the initial SME panel meeting; 5 of the SMEs were participating in their first SME meeting.

The SMEs were shown the survey results for each task and its associated knowledges and skills, and asked to discuss the results for each and determine whether any changes needed to be made to any task statement or knowledge/skill statement as a result of this information. The SMEs eliminated several tasks or knowledges/skills based on a low importance and/or frequency rating shown in the survey. They also modified several tasks or knowledges/skills statements to eliminate what they perceived as alternative interpretations to the statement based on a low rating that they believed should have been higher. Afterwards, the SMEs allocated the number of questions that should be assigned to each task or set of tasks and developed the examination plan. All decisions made by the SMEs during the meeting were made through the consensus process.

Second Job Analysis Survey of SMEs

The first survey received responses from throughout the United States, however, the states of Ohio and Louisiana had many more responses than the other states and may have possibly skewed the results. The sample size was also deemed to be somewhat small, given the number of surveys that were sent out. Based on these facts, it was decided that a second survey should be conducted to either corroborate the first results, or to identify discrepancies. The second survey was sent by NASCLA to 56,589 electrical contractors in October/November 2015,

compiled from licensee lists for nearly all of the states with statewide electrical licensure programs and some municipalities in states without statewide licensure programs, along with other targeted mailing lists of electrical contractors, assisted by LTAS Technologies. Additional surveys were sent out directly by a few individual states. Some electrical associations also sent out the surveys to their membership, including the Western Electrical Contractors Association, the International Association of Electrical Inspectors, the National Electrical Contractors Association, the Independent Electrical Contractors, and the National Electrical Training Alliance. The second survey was almost exactly like the first survey, except that the survey was split into one survey for the tasks, and a second survey for the knowledges and skills. The purpose of splitting up the survey was an attempt to increase the response rate by not overburdening the recipients by occupying too much of their time. The ethnicity question was also refined further in the second survey.

Many of the surveys were only partially completed by the respondents. A total of 327 respondents began the second survey for tasks, and 168 finished. A total of 216 respondents began the second knowledges and skills survey, and 68 finished. The resulting means of the second survey were remarkably close to the results of the first survey, often exactly the same. Out of all tasks and all KSAs (knowledges, skills and abilities), the greatest variance from the mean was 8 hundredths of a point (e.g., 2.82 vs. 2.90). Therefore, given how closely the results from both the first and second surveys were, it was concluded that the results from the first survey could be used for the final analysis. The results of the job analysis survey is included in Appendix F. The linkages between the tasks and knowledge/skills are also documented in Appendix D.

During the Residential Electrical Contractor/Residential Electrician SME panel meeting convened in Mesa, Arizona on February 17 – 18, 2016, a discussion was held to review the results of the second survey and their comparison to the first. There was a total of 13 Electrical Contractor SMEs present, representing 10 states, including Arizona, Louisiana, Florida, Wisconsin, Washington, Colorado, Hawaii, Massachusetts, Iowa, and New Hampshire. All SMEs but one had one or more years of experience as a licensed Journeyman Electrician and were experienced in various tasks associated with electrical contractor work. The one SME whose experience was limited to residential electrical work did not offer input into this discussion. At that meeting the SMEs reviewed the results of the second survey and their comparison to the first. The SMEs made a few modifications to the version of the job analysis completed by the SMEs at the second meeting in San Diego. These new modifications were mostly slight changes in wording to reduce possible alternative interpretations of statements as reflected by lower ratings than would have been expected by the SMEs. During this meeting, the SMEs completed the final version of the job analysis and test specifications for the Electrical Contractor examination. A copy of the final examination plan for the Electrical Contractor examination is included in Appendix G.

Section 4: Journeyman Electrician Job Analysis

The procedures and methodology used to conduct the Journeyman Electrician job analysis are described in this section.

Participation of Subject Matter Experts

A representative sample of electrical contractors served as Subject Matter Experts (SMEs) throughout the development of the job analysis. All SMEs had at least 5 years of full time hands-on experience in the electrical field. In a series of group discussions facilitated by the NASCLA Psychometrician and the Accredited Examination Committee Chairperson, the SMEs developed a comprehensive outline of the major content domains, the important tasks conducted by job incumbents in those domains, and the related knowledges and skills for each task.

NASCLA sought SME nominations from the executive directors and staffs of the various member and nonmember licensing agencies throughout the country, from the various electrical associations, from NASCLA Contractor Members, from individuals who had volunteered when surveyed, and from NASCLA Accredited Examination Program Committee members. NASCLA staff sent information about NASCLA, the accredited examination program, and the workshops being planned to those electrical contractors who had shown interest in participating, along with an experience and training questionnaire. The electrician SMEs selected to participate were chosen that best represented the most comprehensive and diverse backgrounds possible and the widest reach geographically to ensure that the results would be representative of current practice in electrical construction throughout the United States. All decisions made by this panel were determined by consensus; as the discussion on each point ensued, if anyone disagreed with any decision being reached, they were allowed to state their disagreement and the reason for their dissent, and further discussion was allowed until all parties reached a mutual understanding or a modification which addressed all concerns to the satisfaction of all parties.

There were 20 different Subject Matter Experts (SMEs) who participated in the 2 panels specifically for the Journeyman Electrician job analysis: 7 SMEs participated in the first panel only, 7 SMEs participated in the second panel only, and 6 SMEs participated in both panels. The 20 SMEs who participated in the Journeyman Electrician job analysis workshops lived in 15 different states (Alaska, Arizona, Arkansas, California, Colorado, Florida, Idaho, Louisiana, Maryland, Nevada, New Hampshire, Oregon, Texas, Utah, and Washington). Most of the SMEs identified themselves as being white or Caucasian or American, with one identifying himself as being African American. All of the SMEs were male. Three SMEs identified themselves as being between the ages of 20-35, one SME identified themselves as being between the ages of 36-45, seven SMEs identified themselves as being between the ages of 46-55 years old, and nine

SMEs identified themselves as being 56 years old or above. All but one of the SMEs stated that they have been licensed as a journeyman electrician; the exception practiced in a state that did not require licensure. The length of time of their licensure ranged from 5 year to 42 years, and the length of time they have been working full time in the electrical field, including their apprenticeship years, ranged from 10 years to 45 years. Additional demographic information for the SMEs that participated in both Journeyman Electrician job analysis meetings is included in Appendix H. The lists of SMEs that participated in the two job analysis meetings and those SMEs that served as independent reviewers are included in Appendix I.

Initial SME Job Analysis Panel Meeting

The first panel meeting of Subject Matter Experts (SMEs) for the Journeyman Electrician job analysis was conducted in Dallas, Texas on June 9 - 12, 2015, led by the NASCLA Accredited Examination Program Committee Chair and by the NASCLA Psychometrician. The group consisted of 13 individuals from 10 states (California, Florida, Idaho, Louisiana, Maryland, Nevada, Oregon, Texas, Utah, and Washington). During this meeting, a discussion was held to determine the meaning of "minimally acceptable level of competence" for an "entry level" journeyman electrician in reference to the level that would be needed at the time of licensure. One of the goals of this meeting was to create a standard that would help to define the meaning of "Journeyman Electrician" and that would satisfy the majority of states that license journeyman electricians. The following definition of Journeyman Electrician was developed through this discussion:

An individual who has demonstrated competency in knowledge and skills needed to properly perform the installation, maintenance and repair of electrical work conforming to applicable standards and codes.

The SME panel was asked to identify job content domains in which the work of journeyman electricians could be categorized. Once the SMEs were able to identify the domains, they came to a consensus as to the percentage of questions to be preliminarily assigned to each domain. The SMEs then compared the newly developed domains to some representative content domain outlines obtained from the states of California, Colorado, and Texas to determine if there were any adjustments that the felt should be made to make the content domains better reflective of the

content domains being used by the majority of states, and to the content domain outline previously established in the first NASCLA Electrical Contractor SME panel for Electrical Contractors/Master Electricians; only minor adjustments were made by the SMEs at this time. The SMEs also identified the tasks most important to the work of a journeyman electrician and to the safety of the general public; each task was then linked to the domain to which it most closely fit. For each task, those knowledges and skills needed to perform the task were identified and linked to the task. An outline of the Domains, Tasks, and Knowledges and Skills was compiled.

Once the SME panel concluded its work and the initial job analysis outline of tasks, knowledge, and skills was completed, the outline was sent to the SME panel members for their individual input and review. The comments received were incorporated into the initial job analysis outline and the revised version was used as the basis for the surveys that were conducted.

Initial Job Analysis Survey of SMEs

In July of 2015, the initial Journeyman Electrician Job Analysis Survey was sent out to electrical contractors throughout the United States, requesting that they rate each task stated in the job analysis according to a Likert scale for frequency and importance, and to rate each related knowledge or skill for importance. The task frequency was rated as: 0 = not performed, 1 = rarely performed, 2 = sometimes performed, or 3 = frequently performed. The importance for each task, knowledge, and skill statement was also rated from 0 to 3; 0 = not important, 1 = minor importance, 2 = moderately important, or 3 = very important. The surveys were sent to the Directors of all of the Electrical Boards to distribute to their licensees. NASCLA is aware of at least four states that distributed the surveys to their licensees (California, Louisiana, Ohio, and Colorado), although there could have been more. At least 2,000 surveys were sent out by the various states. Additionally, the survey was sent out by the following electrical organizations to their memberships: NECA, the Independent Electrical Contractors, the International Association of Electrical Inspectors, and the Electrical Training Alliance. NASCLA estimates that the total number of recipients who were sent the initial Journeyman Job Analysis survey was more than 40,000, however the exact number is not known. A copy of the NASCLA Journeyman Electrician Job Analysis Survey is included in Appendix I.

A total of 69 recipients responded to the initial survey. The respondents included contractors holding licenses in 36 states. The respondents also represented a wide range of experience; the amount of time the respondents had held a license ranged from 1 year to 43 years, with the average respondent having over 18 years of being licensed. The vast majority (96.8%) of the respondents currently or have at one time been licensed as a Journeyman Electrician. It should be noted that there are jurisdictions in the United States in which no licensure is required to

perform as a Journeyman Electrician. The complete breakdown of the Journeyman Electrician Job Analysis Survey respondent demographics is included in Appendix K.

Second SME Workshop

The second panel of subject matter experts (SMEs) was convened in San Diego, California, on September 1, 2015, led by the NASCLA Accredited Examination Program Committee Chair and by the NASCLA Psychometrician. There were 13 SMEs from 11 different states, including Alaska, Arizona, California, Colorado, Florida, Idaho, Maryland, Nevada, New Hampshire, Texas, and Washington. The SMEs were shown the survey results for each task and its associated knowledges and skills, and asked to discuss the results for each and determine whether any changes needed to be made to any task statement or knowledge/skill statement as a result of this information. The SMEs eliminated several tasks or knowledges/skills based on a low importance and/or frequency rating shown in the survey. They also modified several tasks or knowledges/ skills statements to eliminate what they perceived as alternative interpretations to the statement based on a low rating that they believed should have been higher. Afterwards, the SMEs allocated the number of questions that should be assigned to each task or set of tasks and developed the examination plan.

Second Job Analysis Survey of SMEs

The first survey received responses from throughout the United States, however, 44% of the responses were from the State of California and may have possibly skewed the results. The sample size was also deemed to be somewhat small, given the number of surveys that were sent out. Based on these facts, it was decided that a second survey should be conducted to either corroborate the first results, or to identify discrepancies. The survey was then split into two separate surveys, one with the tasks only and one with the knowledges/skills only and re-sent out in January/February 2016. The reasoning behind splitting up the survey was that NASCLA thought that a shorter survey might increase participation. The second task survey was sent out by the same states and electrical organizations as were the first survey, with additional surveys sent out by the Western Electrical Contractors Association. NASCLA estimates that the second survey may have been sent out to as many as 100,000 recipients.

A total of 135 respondents began the second survey for tasks, and 80 finished. A total of 100 respondents began the second knowledges and skills survey, and 48 finished. The survey results for the Journeyman Electrician tasks, knowledge statements, and skill statements are included in Appendix L.

During the Residential Electrical Contractor/Residential Electrician SME panel meeting convened in Mesa, Arizona on February 17 – 18, 2016, a discussion was held to review the results of the second survey and their comparison to the first. All SMEs but one had one or more

years of experience as a licensed Journeyman Electrician and were experienced in various tasks associated with electrical contractor work. The one SME whose experience was limited to residential electrical work did not offer input into this discussion. There was a total of 14 SMEs present, representing ten states, including Arizona, Louisiana, Florida, Wisconsin, Washington, Colorado, Hawaii, Massachusetts, Iowa, and New Hampshire. The SMEs made a few modifications to the version of the job analysis completed by the SMEs at the second meeting in San Diego. These new modifications were mostly slight changes in wording to reduce possible alternative interpretations of statements as reflected by lower ratings than would have been expected by the SMEs. During this meeting, the SMEs completed the final version of the job analysis and blueprint specifications for the Journeyman Electrician examination. A copy of the final examination plan for the Journeyman Electrician examination plan is included in Appendix M.

Section 6: Residential Electrician/Residential Electrical Contractor Job Analysis

The procedures and methodology used to conduct the Residential Electrician/Residential Electrical Contractor job analysis are described in this section.

Participation of Subject Matter Experts

A representative sample of residential electrical contractors served as Subject Matter Experts (SMEs) throughout the development of the job analysis. NASCLA sought SME nominations from the executive directors and staffs of the various member and nonmember licensing agencies throughout the country, from the various electrical associations, from NASCLA Contractor Members, from individuals who had volunteered when surveyed, and from NASCLA Accredited Examination Program Committee members. NASCLA staff sent information about NASCLA, the accredited examination program, and the workshops being planned to those electrical contractors who had shown interest in participating, along with an experience and training questionnaire. The residential electrical contractors selected to participate were chosen that best represented the most comprehensive and diverse backgrounds possible and the widest reach geographically to ensure that the results would be representative of current practice in electrical construction throughout the United States.

In a series of group discussions facilitated by the NASCLA Psychometrician and the NASCLA Accredited Examination Committee Chairperson, the SMEs developed a comprehensive outline of the major content domains, the important tasks conducted by job incumbents in those domains, and the related knowledges and skills for each task. All decisions made by this panel were determined by consensus; as the discussion on each point ensued, if anyone disagreed with any decision being reached, they were allowed to state their disagreement and the reason for their dissent, and further discussion was allowed until all parties reached a mutual understanding or a modification which addressed all concerns to the satisfaction of all parties.

There were 22 different Subject Matter Experts (SMEs) who participated in the 2 panels specifically for the Residential Electrical Contractor job analysis: 8 SMEs participated in the first panel only, 7 SMEs participated in the second panel only, and 7 SMEs participated in both panels. The 22 SMEs who participated in the Residential Electrician/Residential Electrical Contractor job analysis workshops lived in 15 different states (Arizona, California, Colorado, Florida, Hawaii, Iowa, Louisiana, Maryland, Massachusetts, New Hampshire, New York, South Carolina, Texas, Washington, and Wisconsin). The lists of SMEs that participated in the two Residential Electrician/Residential Electrical Contractor job analysis meetings and those SMEs that served as independent reviewers are included in Appendix O.

All SMEs had at least 5 years of full time hands-on experience in the electrical field. Most of the SMEs identified themselves as being white or Caucasian or American, with one identifying himself as being a Pacific Islander. One of the SMEs was female, while the others were all male. Two SMEs identified themselves as being between the ages of 20 - 35 years old, 3 SMEs identified themselves as being between the ages of 36-45 years old, 3 SMEs identified themselves as being between the ages of 46-55 years old, and 11 SMEs identified themselves as being 56 years old or above. All SMEs stated that they have been licensed as either a master electrician or residential electrical contractor. The length of time of their licensure ranged from 2 years to 40 years, and the length of time they have been working full time in the electrical field, including their apprenticeship years, ranged from 5 years to 42 years. Additional demographic information for the SMEs that participated in both of the Residential Electrician/Residential Electrical Contractor job analysis meetings is included in Appendix N.

Initial SME Job Analysis Panel Meeting

The first panel meeting of Subject Matter Experts (SMEs) for the Residential Electrician/Residential Electrical Contractor job analysis was conducted in Phoenix, Arizona on October 28 - 29, 2015, led by the NASCLA Accredited Examination Program Committee Chair and by the NASCLA Psychometrician. The group consisted of 15 individuals from 11 states (Arizona, California, Colorado, Florida, Hawaii, Louisiana, Maryland, New Hampshire, New York, South Carolina, and Texas).

During this meeting, a discussion was held to determine the meaning of "minimally acceptable level of competence" for an "entry level" residential electrical contractor in reference to the level that would be needed at the time of licensure. The SMEs were instructed that in most states, in order to acquire a Residential Electrical Contractor license, the applicant would generally have to pass both the equivalent of a Residential Electrician license examination, i.e., the trade exam, and a Business and Law examination for the state. It was further explained that the intention of this job analysis was to determine the content that could be used as the trade portion of an examination for Residential Electrical Contractor licenses. The panel decided that it would be best to label this exam as a "Residential Electrician/Residential Electrical Contractor" examination, and let each Board continue to determine the name for their license that would best suit their needs. The purpose of the job analysis was to create a standard that would help to define the meaning of "Residential Electrical Contractor," and that would satisfy the majority of states that license electricians. The definition of a Residential Electrician/Residential Electrical Contractor was developed through this discussion, as follows:

One who demonstrates competency in performing electrical installations, service, repair and maintenance typically encountered in a permanent dwelling unit.

The SME panel was asked to identify job content domains in which the work of residential electrical contractors could be categorized. Once the SMEs were able to identify the domains, they came to a consensus as to the percentage of questions to be preliminarily assigned to each domain. The SMEs then compared the newly developed domains to some representative content domain outlines obtained from the states of Alaska, Colorado, Iowa, and Texas to determine if there were any adjustments that the felt should be made to make the content domains better reflective of the content domains being used by the majority of states; only minor adjustments were made by the SMEs at this time. The SMEs also identified the tasks most important to the work of a residential electrical contractor and to the safety of the general public; each task was then linked to the domain to which it most closely fit. For each task, those knowledges and skills needed to perform the task were identified and linked to the task. An outline of the Content Domains, Tasks, and Knowledges and Skills was compiled.

Once the SME panel concluded its work and the initial job analysis outline of tasks, knowledge, and skills was completed, the outline was sent to the SME panel members for their individual input and review. The comments received were incorporated into the initial job analysis outline and the revised version was used as the basis for the surveys that were conducted.

Initial Job Analysis Survey of SMEs

In December of 2015, the Residential Electrician/Residential Electrical Contractor Job Analysis Survey was sent out to electrical contractors throughout the United States, requesting that they rate each task stated in the job analysis according to a Likert scale for frequency and importance, and to rate each related knowledge or skill for importance. The task frequency was rated as: 0 = not performed, 1 = rarely performed, 2 = sometimes performed, or 3 = frequently performed. The importance for each task, knowledge, and skill statement was also rated from 0 to 3; 0 = not important, 1 = minor importance, 2 = moderately important, or 3 = very important. The surveys were sent to the Directors of all of the Electrical Boards to distribute to their licensees. NASCLA is aware of at least four states that distributed the surveys to their licensees (California,

Louisiana, Ohio, and Colorado), although there could have been more. At least 2,000 surveys were sent out by the various states. Additionally, the survey was sent out by the following electrical organizations to their memberships: NECA, the Independent Electrical Contractors, the International Association of Electrical Inspectors, and the Electrical Training Alliance. NASCLA estimates that the total number of recipients who were sent the initial Residential Electrician/Residential Electrical Contractor Job Analysis survey was more than 40,000, however the exact number is not known. A copy of the NASCLA Residential Electrician/Residential Electrical Contractor Job Analysis Survey is included in Appendix P.

Second Job Analysis Survey of SMEs

A second Residential Electrician/Residential Electrical Contractor Job Analysis Survey was sent out in January/February 2016 in an attempt to get more respondents. The second survey was identical to the first survey. The second task survey was sent out by the same states and electrical organizations as were the first survey, with additional surveys sent out by the Western Electrical Contractors Association. NASCLA estimates that the second survey may have been sent out to as many as 100,000 recipients.

The results of both the initial and second surveys were combined. A total of 93 respondents began the survey for tasks, with 56 answering all of the survey questions. A total of 70 respondents began the second knowledges and skills survey, with 30 answering all of the survey questions. The respondents included contractors holding licenses in 20 states. The respondents also represented a wide range of experience; the amount of time the respondents had held a license ranged from 1 year to 50 years, with the average respondent having over 21 years of being licensed. The vast majority (85.7%) of the respondents currently or have at one time been licensed as a Residential Electrical Contractor. It should be noted that there are jurisdictions in the United States in which no licensure is required to perform as a Residential Electrician. The complete breakdown of the Residential Electrician/Residential Electrical Contractor Job Analysis Survey respondent demographics is included in Appendix Q. The survey results for the Residential Electrician/Residential Electrical Contractor tasks, knowledge statements, and skill statements are included in Appendix R.

Second SME Workshop

The second panel of subject matter experts (SMEs) was convened in Mesa, Arizona on February 17 - 18, 2016, and led by the NASCLA Accredited Examination Program Committee Chair and by the NASCLA Psychometrician. There were 14 subject matter experts from 11 different states, including Arizona, California, Colorado, Florida, Hawaii, Iowa, Louisiana, Massachusetts, New Hampshire, Washington, and Wisconsin. The SMEs were shown the survey results for each task and its associated knowledges and skills, and asked to discuss the results for each and determine whether any changes needed to be made to any task statement or knowledge/skill

statement as a result of this information. The SMEs eliminated several tasks or knowledges/skills based on a low importance and/or frequency rating shown in the survey. They also modified several tasks or knowledges skills statements to eliminate what they perceived as alternative interpretations to the statement based on a low rating that they believed should have been higher. Afterwards, the SMEs allocated the number of questions that should be assigned to each task or set of tasks and developed the examination plan.

During the second SME panel meeting, a discussion was held to review the results of the Residential Electrician/Residential Electrical Contractor survey. The SMEs made a few modifications to the version of the job analysis; the new modifications were mostly slight changes in wording to reduce possible alternative interpretations of statements as reflected by lower ratings than would have been expected by the SMEs. During this meeting, the SMEs completed the final version of the job analysis and blueprint specifications for the Residential Electrical Contractor examination. A copy of the final examination plan for the Residential Electrical Contractor examination plan is included in Appendix S.

Section 6: Test Development and Standard Setting

This section describes the procedures and methodology used to develop the test items/examination forms and to determine the legally defensible cutscores used for the 3 examinations within the NASCLA Accredited Electrical Examination Program.

Psychometric Guidelines for the NASCLA Accredited Electrical Examination Program

Prior to developing items for the examination, the NASCLA Psychometrician developed the following psychometric guidelines for the NASCLA Accredited Electrical Examination Program through discussion with the SME job analysis development panels for each of the examinations. These guidelines were ratified afterwards by the NASCLA Accredited Electrical Examination Program Committee:

- Open book examination
- Items referenced to the last two revisions of the National Electric Code
- 4-choice Multiple Choice (items can also be in the format of 4- choice "hot spot")
- No more than 5% negatively worded items
- Cut score based on standard setting workshop
- Number of scored items on exam: 100
- Number of pre-test items: 10
- The % of non-code items must be at least equal to 100% minus the % cutscore plus 1%.
- Number of items relating to visual aids: 15%
- No “none of the above” or “all of the above” items
- Items must be referenced
- All items based on skill statements from the KSAs should be written at the application and analysis level
- No true/false or essay items
- Generally, avoid absolute items with words such as “always,” “all,” or “never” - may use “shall” or “shall not”
- No weighted items
- Clones should be created when feasible although they must be designated as such so that clones do not appear on the same version of an examination.
- Other "Enemies" should be marked and set so that they do not appear on the same version of an examination.

Test Development

The items for the 3 examinations within the NASCLA Accredited Electrical Examination Program were developed by Subject Matter Experts (SMEs). In January of 2017, NASCLA assembled a panel of 17 SMEs at their office in Phoenix, Arizona, for the purposes of writing the test items. A list of the SMEs that attended the meeting and their qualifications are included in Appendix T. Prior to attending the meeting, the SMEs were provided with the Examination Plans for the 3 electrical exams. The Examination Plans consisted of the examination content areas, the number of items in each content area, and the KSAs that have been linked to each examination content area. The SMEs were given a half-day of item writing training by the NASCLA Psychometrician, Brian Moritsch, and the Chairperson for the NASCLA Accredited Examination Program Committee, Doug Traylor. The training consisted of an overview of the NASCLA Accredited Electrical Examination Program job analysis process and results, multiple choice test item components and formats, item writing techniques, identifying common item writing clues and errors, and item editing procedures. Each SME was required to sign a confidentiality agreement prior to participating in the items writing session.

The SMEs spent the remainder of the workweek writing test items in the NASCLA offices. Reference materials were provided to the SMEs from which to base the test items on. All of the test items were linked to one or more of the KSAs on the Examination Plans. Test items could be linked to each of the 3 electrical examinations, provided the SME who wrote the test item provided an appropriate KSA linkage for each exam. Hence, many of the test items were linked to more than one of the electrical examinations. During that week, the SMEs developed a total of 950 test items: 723 of the test items were linked to the Electrical Contractor/Master Electrician examination; 651 test items were linked to the Journeyman Electrician examination; and 509 test items were linked to the Residential Electrician/Residential Electrical Contractor examination. All of the test items were reviewed by the NASCLA Psychometrician for clarity, format, and completeness. All of the items were then assembled into a spreadsheet and sorted by KSA to identify potentially duplicate items.

In July 2017, some of the SMEs that were involved in the January item writing session were asked to write some additional test items to ensure that NASCLA had a sufficient number of items in each of the examination content areas. The SMEs were allowed to develop the test items from their resident states and securely transferred the items electronically to NASCLA; per their confidentiality agreements, the SMEs were not allowed to retain copies of the newly developed test items. A total of 47 new items were developed.

Standard Setting

In February 2017, NASCLA assembled a panel of 14 SMEs to review the newly developed electrical examination test items. The 5-day panel meeting was held at the NASCLA offices in Phoenix, Arizona. A list of the SMEs that attended the meeting and their qualifications are included in Appendix U. Prior to attending the meeting, the SMEs were provided with the Examination Plans for the three electrical exams. The Examination Plans consisted of the examination content areas, the number of items in each content area, and the KSAs that have been linked to each examination content area. The SMEs were given a half-day of standard setting training by the NASCLA Psychometrician, Brian Moritsch, and the Chairperson for the NASCLA Accredited Examination Program Committee, Doug Traylor. The training consisted of describing the modified Angoff methodology; group discussions on what constituted a minimally qualified, a highly qualified, and a non-qualified candidate for each of the three NASCLA electrician classifications; training on the item rating sheets and the rating scales (Relevance Scale, Application/Recall Scale, and the Angoff Scale); and a discussion on the open book/closed book status for the various references used to create the test items.

On the rating sheets, the SMEs were also asked to confirm the keyed response and the Knowledge/Skill linkages for each test item. The SMEs were also asked to either accept the item as written, delete the item, or accept the item with edits. The SMEs were also asked to identify any items that they felt needed to be edited for content or format; when such items were encountered they were typically edited by the entire group. The SMEs were also asked to determine whether the test item was a Recall item (e.g., a knowledge-based test item) or an Application test item that requires the candidate to apply a knowledge or skill (e.g., blueprint reading). The following Relevance Scale used to assess the item: 0 = no relevance, 1 = little relevance, 2 = moderate relevance, 3 = very relevant, and 4 = extremely relevant. The SMEs were informed that test items that did not achieve an average score of 2.0 on the Relevance Scale would not be included on the test. The modified Angoff ratings reflected the score that the SMEs thought that a minimally qualified candidate would achieve on a particular test item. The modified Angoff rating is a reflection on how difficult the SMEs believed a test item was. The SMEs were told to rate the Angoff score in increments of 5, between 25 (chance score) and 100 (all candidates get the item correct). The rating sheet contained sections for rating each test item separately for each of the three examinations within the NASCLA Accredited Electrical Examination Program. A sample copy of the rating sheet is included in Appendix V.

Upon completion of the training, the SMEs were asked to rate the first test item on their own. The NASCLA Psychometrician inspected each SME's rating sheet to ensure they were properly filling out each section of the form. The SMEs were then asked to share their ratings aloud to the rest of the group. The purpose for sharing ratings was to calibrate the group, i.e., to get them to rate consistently between raters. If two of the SMEs' Angoff ratings were greater than 15 points

apart then they were asked to discuss the factors they considered when determining their ratings. The SMEs were instructed that they could change their ratings anytime based on the rating discussions, but they were not to feel compelled to change their ratings if they did not want to. The first 20 test questions were discussed in this same manner, after which the NASCLA Psychometrician felt confident that the group was rating consistently between SMEs. On the second day of rating, the SMEs were split into 2 groups of 7 SMEs in order to assess a greater number of items. In August 2017, a group of nine SMEs were convened via webinar to rate the new 47 items developed the previous month. All of the SMEs had participated in the previous Angoff rating session. At the beginning of the webinar, the NASCLA Psychometrician gave refresher training to the SMEs on the rating sheet and the modified Angoff rating methodology. Test items that did not achieve a relevancy rating of at least 2.0 were eliminated from the rating pool. Upon completion of the standard setting rating process, the initial item banks for the 3 examinations within the NASCLA Accredited Electrical Examination Program were as follows: 511 test items for the Electrical Contractor/Master Electrician examination; 516 test items for the Journeyman Electrician examination; and 408 test items for the Residential Electrician/Residential Electrical Contractor examination. The average modified Angoff ratings for the items pools were as follows: 76.72 for the Electrical Contractor/Master Electrician examination; 72.50 for the Journeyman Electrician examination; and 69.66 for the Residential Electrician/Residential Electrical Contractor examination.

In November 2017, the NASCLA Accredited Examination Program Committee met to discuss where to set the cutscores for the 3 examinations. Information considered during the NASCLA Accredited Examination Program Committee meeting included the mandated cutscores of various states and the average modified Angoff ratings for the electrical examinations item pools. The NASCLA Accredited Electrical Examination Program Committee set the following cutscores for the NASCLA Accredited Electrical Examination Program: 75 out of 100 for the Electrical Contractor/Master Electrician examination; 70 out of 100 for the Journeyman Electrician examination; and 70 out of 100 for the Residential Electrician/Residential Electrical Contractor examination.

Item Banking

In April 2017, a Request for Proposal (RFP) was sent out to various item banking companies to house the 3 examinations within the NASCLA Accredited Electrical Examination Program and forms. Seven companies sent proposals to NASCLA. The NASCLA Accredited Examination Program Committee evaluated the proposals and selected 2 finalists. At the NASCLA 2018 Annual Conference in Denver, Colorado, the NASCLA Accredited Examination Program Committee met with representatives from the 2 finalist item banking companies. In October 2017, NASCLA entered into an agreement with Assessment Systems to house the NASCLA electrical items and examination forms. In November 2017, the NASCLA Psychometrician and

members of the NASCLA administrative staff attended a series of online training workshops with Assessment Systems staff on the use of the test assembly and test administration platforms. In December 2017, NASCLA administrative staff uploaded the electrical items, examination forms, and graphics into the Assessment Systems platform.

Test Assembly

The NASCLA Psychometrician assembled 3 fixed versions of each of the 3 examinations within the NASCLA Accredited Electrical Examination Program. Per the examination plans, each form of the tests had 100 items and 10 experimental items. Each form also had between 16 – 33 anchor items, i.e., the same item in each form, so as to be able to assess if the forms are equated. Each of the 3 forms of a particular test had identical average Angoff ratings based on the cutscores determined by the NASCLA Accredited Examination Program Committee: the average Angoff ratings for the three forms of the Electrical Contractor/Master Electrician examination is 75.00; the average Angoff ratings for the three forms of the Journeyman Electrician examination is 70.00; and the average Angoff ratings for the three forms of the Residential Electrician/Residential Electrical Contractor examination is 70.00. When selecting the items to be included in each form of the examination, the NASCLA Psychometrician ensured that no 2 enemy items were included on the same form.

Pretesting of Test Items/Forms

In February 2018, 15 of the SMEs used in the Test Development and Standard Setting phases were enlisted to pretest the test items/forms through the Assessment Systems platform. The primary purposes of the pilot tests were to: assess the Assessment Systems test administration platform's ability to adequately present the NASCLA electrical items; assess the ease of the test administration process (such as logon and logoff procedures, toggling between items, accessing the calculator and reference library, etc.); identify any problem test items with regard to wording, formatting, or key issues; assess the clarity of the graphics and plan sets; ensure the score reporting procedures are working properly; and identify any concerns or issues the SMEs had with the test administration process. The SMEs used to pilot test the examinations were given a checkoff sheet for reviewing the examination forms (see Appendix W). Each of the 9 examination forms were reviewed by the NASCLA Psychometrician and at least 3 SMEs.

Operational Administration of the NASCLA Accredited Electrical Examination Program

In August 2018, the NASCLA Accredited Electrical Examination Program became operational.

Appendix A

Employment Statistics for Electrical Contractors and Personnel

Occupational Employment Statistics Research Estimates for Electricians	
Electricians	916,870
Helpers--Electricians	371,680
Construction Managers for Electrical Contractors and Other Wiring Installation Contractors	16,420
Cost Estimators for Electrical Contractors and Other Wiring Installation Contractors	14,890
Electrical and Electronics Repairers, Commercial and Industrial Equipment	22,040
Security and Fire Alarm Systems Installers	13,190
Solar Photovoltaic Installers	21,050
Telecommunications Equipment Installers and Repairers, Except Line Installers	111,750
Total	**1,487,890**

The above statistics were gleaned from the United States Department of Labor, Bureau of Labor Statistics for May of 2016. The Department reported that there are 607,120 electricians nationwide. However, a review of the statistics by state reveals a larger number. The numbers above do not include electricians stating that they are self-employed, and personnel who work on power plants, electrical transmission/distribution lines, or electrical power substations.

Appendix B

Electrical Contractor Job Analysis Meeting SME Panel Demographics

Electrical Contractor SME Panel Demographics

The tables listed below detail the demographics of the SMEs who participated in the panel meetings for the NASCLA Electrical Contractor/Master Electrician job analysis.

The number of years that the SMEs reported that they spent supervising electricians, estimating, or preparing contracts each ranged from 0 years to 40 years. Table 1 depicts their estimate of the average cost of contracts their company undertakes, ranging from less than $10,000 per job to over $100,000 per job, as follows:

Table 1
Size of Job Undertaken by SMEs' Companies

Average Size of Job	No. of SMEs
Less than $10K	**8**
$10K to $50K	**5**
$50K to $100K	**2**
Greater than $100K	**8**

Not all SMEs answered this question, as a few of them now work for electrical associations or licensing or code authority agencies or other public agencies, and do not perform independent contract work. Their estimated number of total employees for their firms ranged from 1 to 700 both total full time employees, and 0 to 30 part time employees. Four of the SMEs listed their business as a sole proprietorship, 1 as a Limited Liability Company, and 15 as a corporation.

Fifteen of the SMEs noted types of work that their companies perform other than electrical work as follows:

Table 2
Types of Work Performed by SMEs' Companies

Type of Work Performed	No. of SMEs
Building	12
Home Building	4
Home/Building Renovations	11
Mechanical Work	7
Plumbing	7
Earthwork	2
Deep Foundations	2
General Concrete	5
Paving	2
Hazardous Materials	1
Drainage	2
Underground Distribution Pipelines	4
Power Plants	4
Industrial Plants	4
Demolishing	5
Bridges	2
Mining	1
Oil fields	1
Offshore	0

The SMEs were also asked the number of jobs of each type of work below that they have performed during their career. Table 3 depicts the diversity and breadth among the SMEs throughout the electrical field.

Table 3
Types of Electrical Work Experience of SMEs

Type of Electrical Work	Zero Jobs	1-5 jobs	6-10 jobs	11-25 jobs	More than 25 jobs
Residential	**1**		**1**	**4**	**16**
Commercial		**1**	**1**	**4**	**16**
Industrial	**1**	**2**	**2**	**2**	**12**
Instrumentation	**5**	**4**	**1**	**1**	**7**
Fire alarms		**4**	**3**	**3**	**11**
Security alarms	**1**	**7**	**1**	**1**	**10**
Door/gate access	**2**	**2**	**4**	**3**	**8**
Telecommunications	**1**	**1**	**3**	**5**	**10**
Temporary Installations		**1**	**3**	**4**	**12**
Equipment		**3**	**1**	**4**	**10**
Towers	**11**	**3**	**1**	**1**	**1**
Underground Conduit			**2**	**3**	**16**
Fiber optic cable	**7**	**1**	**2**		**8**
Electrical Signs	**2**	**7**	**1**	**3**	**6**
Traffic signals	**11**	**4**	**1**	**1**	
Electrical Transmission Lines	**10**	**1**	**4**	**1**	**3**
Electrical substations	**13**	**1**	**2**		**2**
Transformers	**1**	**1**	**2**	**6**	**11**
Electrical inspections	**3**	**1**	**2**	**5**	**8**
Fuel cell systems	**14**	**2**		**2**	
Photovoltaic systems	**4**	**6**	**5**	**2**	**3**
Wind energy systems	**13**	**1**	**2**	**2**	**1**
Battery systems	**3**	**5**	**3**	**3**	**4**

Tables 4 and 5 indicate where the SMEs reside and the locations in which the SMEs have worked as an electrical contractor.

Table 4
State of Residence of the SMEs

State of Current Residence	No. of SMEs
Arizona	1
California	5
Florida	6
Hawaii	1
Louisiana	1
Massachusetts	1
Maryland	1
Mississippi	1

State of Current Residence	No. of SMEs
New Hampshire	1
New York	1
Oregon	1
South Carolina	1
Texas	4
Utah	1
Wisconsin	1

Table 5
States in Which the SMEs Have Practiced as an Electrical Contractor

State	No. of SMEs Who Have Worked There
Alabama	2
Arizona	3
Arkansas	2
California	9
Colorado	2
Connecticut	1
Florida	7
Georgia	2
Hawaii	1
Idaho	3
Louisiana	1
Maine	2
Massachusetts	1
Mississippi	1
Nebraska	1
Nevada	1
New Hampshire	1

State	No. of SMEs Who Have Worked There
New York	3
Oklahoma	1
Oregon	1
Pennsylvania	2
South Carolina	1
Tennessee	1
Texas	4
Utah	2
Vermont	1
Washington	1
West Virginia	1
Wisconsin	1
Wyoming	1
Washington, DC	1
Iraq	1
Kuwait	1

Appendix C

List of Electrical Contractor SME Participants

First Electrical Contractor Meeting

March 25 – 26, 2015, Salt Lake City, Utah
Location: Independent Electrical Contractors (IEC) of Utah

Jose Barragan
Owner, Barragan Construction Services
California City, CA

Jay Cannava
President, P.I. Electric, Inc.
Lake Park, FL

Les Converse
President, Converse Construction, Inc.
Redding, CA

Pete Gregson
President, Advance: Solar, Hydro, Wind Power Co Inc.
Redwood Valley, CA

Robert Jones
Deputy Executive Director, Independent Electrical Contractors, (IEC) of Texas Gulf Coast
Houston, TX

Jack Lyons
Northeast Field Representative, National Electrical Manufacturers Association (NEMA)
West Chesterfield, MA

David Mims
President, Georgia-Florida Alarm Company
Tallahassee, FL

Nathan Philips
Owner, Integrated Electronic Systems
Eugene, OR

Mike Querry
Construction Inspector Supervisor, Trinity River Authority
Arlington, TX

Hamp Smith
VP/Division Manager, JESCO, Inc.
Tupelo, MS

Brad Stevens
Executive Director, Independent Electrical Contractors (IEC) of Utah
Midvale, UT

Michael Tamburro
Owner, Current Solutions Electric
Rohnert Park, CA

Joseph Wages Jr.
Technical Advisor, Education, Codes and Standards, International Association of Electrical Inspectors (IAEI)
Richardson, TX

Wesley Lamar Wheeler
National Director of Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Second Electrical Contractor Meeting

September 2, 2015, San Diego, California
Location: Omni San Diego Hotel

Daniel Bierly
Senior Education Advisor, Western Electrical Contractors Association (WECA)
Flower Mound, TX

Jay Cannava
President, P.I. Electric, Inc.
Lake Park, FL

Pete Gregson
President, Advanced: Solar, Hydro, Wind Power Co, Inc.
Redwood Valley, CA

Matthew Hadsell
Senior Power Systems Engineer, Blattner Energy, Inc.
Avon, MN

Joseph Hertel
Owner, Joseph A. Hertel Consulting
Madison, WI

Robert Jones
Deputy Executive Director, Independent Electrical Contractors (IEC) of Texas Gulf Coast
Houston, TX

Jack Lyons
Northeast Field Representative, National Electrical Manufacturers Association (NEMA)
West Chesterfield, MA

Jeffrey Sargent
Regional Electrical Code Specialist, National Fire Protection Association (NFPA)
Hampton Falls, NH

Hamp Smith
VP/Division Manager, JESCO, Inc.
Tupelo, MS

Michael Tamburro
Owner, Current Solutions Electric
Rohnert Park, CA

Clarence Tibbs
President, STE Electrical Systems, Inc.
Apopka, FL

Wesley Lamar Wheeler
National Director of Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Independent Reviewers of the Job Analyses, Tasks and KSA Lists

Brian Bordelon
President
Triad Electric and Controls
Baton Rouge, LA

Scott Cline
McMurtrey Electric Inc.
Monterey Park, CA

Stan Folz
Morse Electric, Inc.
Las Vegas, NV

Karl Jaeger
Examination Specialist
Contractors State License Board
Sacramento, CA

Bobby Gray
Hoydar Buck, Inc.
Yakima, WA

Rudy Middleton
E.G. Middleton, Inc.
Norfolk, VA

Michael Owen
Branch Manger
White Electrical Construction Company
Chattanooga, TN

Doug Pirkle
Pirkle Electric Company
Winston, GA

Mike Weaver
President
M & W Electric, Inc.
Albany, OR

Mark Melancon
Owner
Intelligent Transportation Systems
Baton Rouge, LA

Appendix D

NASCLA Electrical Contractor Job Analysis Survey

Appendix E

Electrical Contractor Job Analysis Survey Respondent Demographics

Electrical Contractor Job Analysis Survey Respondent Demographics

The tables listed below detail the demographics of the respondents for the NASCLA Electrical Contractor/Master Electrician job analysis survey.

The number of years that the Respondents reported that they spent working in the electrical profession, supervising electricians, estimating, or preparing contracts, each ranged from 3 months to 51 years. Table 6 depicts their estimate of the average cost of contracts their company undertakes, ranging from less than $10,000 per job to over $100,000 per job, as follows:

Table 6
Size of Job Undertaken by Respondent's Companies

Average Size of Job	No. of Respondents
Less than $10K	**49**
$10K to $50K	**56**
$50K to $100K	**27**
Greater than $100K	**74**

Table 7 depicts how many people are employed by their organization:

Table 7
Number of People Employed by their Organization

Employee Range	No. of Respondents
Less than 6 people	**82**
6 – 25 people	**53**
25 -50 people	**16**
More than 50 people	**55**

Not all Respondents answered this question, as a few of them now work for electrical associations or licensing or code authority agencies or other public agencies, and do not perform independent contract work.

Table 8 indicates the states where the Respondents are licensed and have performed work as an Electrical Contractor or equivalent to:

Table 8
States in Which the Respondents are Licensed as an Electrical Contractor

State	No. of Respondents Licensed
Alabama	92
Alaska	10
Arizona	24
Arkansas	59
California	33
Colorado	39
Connecticut	13
Delaware	17
District of Columbia	15
Florida	137
Georgia	69
Hawaii	7
Idaho	40
Illinois	13
Iowa	24
Kansas	14
Kentucky	50
Louisiana	102
Maine	10
Maryland	40
Massachusetts	12
Michigan	17
Minnesota	16
Mississippi	63
Missouri	15
Montana	18

State	No. of Respondents Licensed
Nebraska	29
Nevada	14
New Hampshire	13
New Jersey	39
New Mexico	20
New York	12
North Carolina	81
North Dakota	18
Ohio	67
Oklahoma	36
Oregon	18
Pennsylvania	18
Rhode Island	9
South Carolina	79
South Dakota	20
Tennessee	72
Texas	77
Utah	20
Vermont	12
Virginia	122
Washington	13
West Virginia	47
Wisconsin	21
Wyoming	22

Appendix F

Electrical Contractor Job Analysis Survey Results

Appendix G

Electrical Contractor Examination Plan

Appendix H

Journeyman Electrician Job Analysis Meeting SME Demographics

The tables listed below detail the demographics of the SMEs who participated in the panel meetings for the NASCLA Journeyman Electrician job analysis.

Table 9 depicts their estimate of the average price of contracts their company undertakes, ranging from less than $10,000 per job to over $100,000 per job, as follows:

Table 9
Size of Job Undertaken by SMEs' Companies

Average Size of Job	No. of SMEs
Less than $10K	**1**
$10K to $50K	**2**
$50K to $100K	**0**
Greater than $100K	**7**

The SMEs were also asked the number of jobs of each type of work below that they have performed during their career. Table 10 depicts the diversity and breadth among the SMEs throughout the electrical field.

Table 10
Types of Electrical Work Experience of Journeyman SMEs

Type of Electrical Work	Zero Jobs	1-5 jobs	6-10 jobs	11-25 jobs	More than 25 jobs
General Residential Wiring		2	1	3	8
General Commercial Wiring			4	2	12
General Industrial Wiring	1	5	1	2	7
Instrumentation/Calibration	7	4			5
Fire alarms/Fire Pumps	1	2	7	1	5
Security alarms/CCTV	2	7	2	1	3
Door/Gate Access Systems	2	7	2	2	2
Telecommunications	1	5	2	2	5
Temporary Installations		3	3	3	8
Equipment/Machinery/Engine/ Generator Installation/Repair/ Maintenance		2	4	3	5
Tower Construction	9	2		1	2
Underground Conduit			4	3	10
Fiber Optic Cable	2	6	1	2	2
Electrical Signs/Displays/ Scoreboards	1	7	2	2	3
Traffic Signals/Intelligent Transportation Systems	5	8	1		
Electrical Transmission/ Distribution Line Work	8	4	2		1
Electrical Substations	8	5			1
Transformers		2	4	2	8
Electrical Inspections	2	3	2	1	7
Fuel cell systems	11	2	1		
Photovoltaic systems	2	5	2	3	2
Wind energy systems	11	3			
Battery systems	4	3	2	3	3
Electrical Systems and Bonding for Swimming Pools	2	4	4	2	2

Tables 11 and 12 indicate where the SMEs reside and the locations in which the SMEs have worked as an electrical contractor.

Table 11
State of Residence of the Journeyman SMEs

State of Current Residence	No. of SMEs
Alaska	**1**
Arizona	**1**
California	**2**
Colorado	**1**
Florida	**3**
Idaho	**1**
Louisiana	**2**
Maryland	**2**

State of Current Residence	No. of SMEs
Nevada	**2**
New Hampshire	**1**
Oregon	**1**
Texas	**1**
Utah	**1**
Washington	**1**

Table 12
States in Which the SMEs Have Practiced as a Journeyman Electrical

State	No. of SMEs Who Have Worked There
Alabama	**1**
Alaska	**1**
Arizona	**1**
Arkansas	**1**
California	**4**
Colorado	**1**
Florida	**2**
Idaho	**2**
Louisiana	**2**
Maine	**1**
Nevada	**3**
New Hampshire	**1**

State	No. of SMEs Who Have Worked There
New York	**1**
North Carolina	**1**
Oregon	**1**
Pennsylvania	**1**
South Carolina	**1**
Texas	**2**
Utah	**1**
Vermont	**1**
Washington	**1**
Wisconsin	**1**
Wyoming	**1**
Canada	**1**

Appendix I

List of Journeyman Electrician SME Participants

First Journeyman Electrician Meeting

June 9 – 12, 2015, Dallas, Texas
Location: International Association of Electrical Inspectors

Madison Burnett
Training Director, Electrical JATC of Southern Nevada
Las Vegas, NV

Ronnie Gulino
Director of Field Services, ISC Contractors, LLC
Baton Rouge, LA

Palmer Hickman
Director of Code & Safety Training Curriculum Development
Electrical Training ALLIANCE
Upper Marlboro, MD

Jesse Jameson
Construction Compliance Supervisor, Washington Department of Labor & Industries
Tumwater, WA

Keith Lofland
Director of Education, International Association of Electrical Inspectors (IAEI),
Richardson, TX

Craig Monin
President, Lon's Electrical Service, Inc.
San Bernardino, CA

Nathan Philips
Owner, Integrated Electronic Systems
Eugene, OR

Roy Pollack
Director of Training and Compliance, Comcast Xfinity Home
Wellington, FL

Mike Querry
Construction Inspector Supervisor, Trinity River Authority
Arlington, TX

Alvin Leo Riley
Owner, Alvin Leo Riley
New Orleans, LA

Brad Stevens
Executive Director, Independent Electrical Contractors (IEC) of Utah
Midvale, UT

Joseph Wages Jr.
Technical Advisor, Education, Codes and Standards, International Association of Electrical Inspectors (IAEI)
Richardson, TX

Wesley Lamar Wheeler
National Director of Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Mick Williams
Electrical Program Manager, Idaho Division of Building Safety
Meridian, ID

Second Journeyman Electrician Meeting

September 1, 2015, San Diego, California
Location: Omni San Diego Hotel

Ryan Andrew
Wireman Instructor, Alaska Joint Electrical Apprenticeship and Training Trust
Anchorage, AK

Daniel Bierly
Senior Education Advisor, Western Electrical Contractors Association (WECA)
Flower Mound, TX

Jay Cannava
President, P.I. Electric, Inc.
Lake Park, FL

Palmer Hickman
Director of Code & Safety Training Curriculum Development
Electrical Training ALLIANCE
Upper Marlboro, MD

Jesse Jameson
Construction Compliance Supervisor, Washington Department of Labor & Industries
Tumwater, WA

Paul Lingo
Training Director, Independent Electrical Contractors (IEC) Rocky Mountain
Denver, CO

Matt Kuiper
Service Manager, K2 Electric
Phoenix, AZ

Craig Monin
President, Lon's Electrical Service, Inc.
San Bernardino, CA

Al Nyman
Director of Licensing Compliance & Regulatory Affairs, Sears Home Improvement Products, Inc.
Longwood, FL

Jack Lyons
Northeast Field Representative, National Electrical Manufacturers Association (NEMA)
West Chesterfield, MA

Jeffrey Sargent
Regional Electrical Code Specialist, National Fire Protection Association (NFPA)
Hampton Falls, NH

Wesley Lamar Wheeler
National Director of Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Mick Williams
Electrical Program Manager, Idaho Division of Building Safety
Meridian, ID

Doug Ziegenhogen
Instructor/Journeyman Wireman
Electrical JATC of Southern Nevada/IBEW LO 357
Las Vegas, NV

Appendix J

NASCLA Journeyman Electrician Job Analysis Survey

Appendix K

Journeyman Electrician Job Analysis Survey Respondent Demographics

Journeyman Electrician Job Analysis Survey Respondent Demographics

The tables listed below detail the demographics of the respondents for the NASCLA Journeyman Electrician job analysis survey.

The number of years that the Respondents reported that they spent working in the electrical profession, supervising electricians, estimating, or preparing contracts, each ranged from 1 year to 43 years. Table 13 depicts their estimate of the average cost of contracts their company undertakes, ranging from less than $10,000 per job to over $100,000 per job, as follows:

Table 13
Size of Job Undertaken by Respondent's Companies

Average Size of Job	No. of Respondents
Less than $10K	28
$10K to $50K	40
$50K to $100K	42
Greater than $100K	105

Table 14 depicts how many people are employed by their organization:

Table 14
Number of People Employed by their Organization

Employee Range	No. of Respondents
Less than 6 people	40
6 – 25 people	59
25 -50 people	17
More than 50 people	100

Not all Respondents answered this question, as a few of them now work for electrical associations or licensing or code authority agencies or other public agencies, and do not perform independent contract work.

Table 15 indicates the states where the Respondents have performed work as a Journeyman Electrician or equivalent to:

Table 15
States in Which the Respondents have Performed Work as a Journeyman Electrician

State	No. of Respondents Licensed
Alabama	38
Alaska	4
Arizona	5
Arkansas	37
California	19
Colorado	7
Connecticut	4
Delaware	3
District of Columbia	11
Florida	19
Georgia	14
Hawaii	0
Idaho	41
Illinois	11
Iowa	14
Kansas	8
Kentucky	7
Louisiana	20
Maine	4
Maryland	18
Massachusetts	4
Michigan	5
Minnesota	5
Mississippi	12
Missouri	7
Montana	6

State	No. of Respondents Licensed
Nevada	7
New Hampshire	3
New Jersey	6
New Mexico	4
New York	6
North Carolina	25
North Dakota	6
Ohio	14
Oklahoma	11
Oregon	12
Pennsylvania	13
Rhode Island	0
South Carolina	11
South Dakota	4
Tennessee	19
Texas	21
Utah	12
Vermont	2
Virginia	51
Washington	15
West Virginia	14
Wisconsin	3
Wyoming	14

Appendix L

Journeyman Electrician Job Analysis Survey Results

Appendix M

Journeyman Electrician Examination Plan

Appendix N

Residential Electrical Contractor Job Analysis Meeting SME Demographics

The tables listed below detail the demographics of the SMEs who participated in the panel meetings for the NASCLA Electrical Contractor/Master Electrician job analysis.

Table 16 depicts their estimate of the average price of contracts their company undertakes, ranging from less than $10,000 per job to over $100,000 per job, as follows:

Table 16
Size of Job Undertaken by Residential Electrician SMEs' Companies

Average Size of Job	No. of SMEs
Less than $10K	**7**
$10K to $50K	**3**
$50K to $100K	**2**
Greater than $100K	**7**

The SMEs were also asked the number of jobs of each type of work below that they have performed during their career. Table 17 depicts the diversity and breadth among the SMEs throughout the electrical field.

Table 17
Types of Electrical Work Experience of Residential Electrician SMEs

Type of Electrical Work	Zero Jobs	1-5 jobs	6-10 jobs	11-25 jobs	More than 25 jobs
General Residential Wiring				5	10
General Commercial Wiring		1		4	10
General Industrial Wiring	3	2	2		5
Instrumentation/Calibration	7	2	1		3
Fire alarms/Fire Pumps	1	1	6	1	7
Security alarms/CCTV	2	3	2	1	7
Door/Gate Access Systems		7	3	2	4
Telecommunications		4	1	2	7
Temporary Installations		2	3	1	7
Equipment/Machinery/Engine/ Generator Installation/Repair/ Maintenance		3	2	2	6
Tower Construction	6	5		1	
Underground Conduit		1	1	5	8
Fiber Optic Cable	4	3	2	2	1
Electrical Signs/Displays/ Scoreboards	1	5	2	3	3
Traffic Signals/Intelligent Transportation Systems	9	3	1		
Electrical Transmission/ Distribution Line Work	9	3	1		
Electrical Substations	9	3	1		
Transformers	3	2	1	3	5
Electrical Inspections	2	1	1	3	6
Fuel cell systems	9	2	1	1	
Photovoltaic systems	4	4	2	2	1
Wind energy systems	9	3	1		
Battery systems	4	4	2	3	
Electrical Systems and Bonding for Swimming Pools	1	3	2	2	3

Tables 18 and 19 indicate where the SMEs reside and the locations in which the SMEs have worked as an electrical contractor.

Table 18
State of Residence of the Residential Electrician SMEs

State of Current Residence	No. of SMEs
Arizona	1
California	2
Colorado	1
Florida	5
Hawaii	1
Iowa	1
Louisiana	2

State of Current Residence	No. of SMEs
Massachusetts	1
Maryland	1
New York	1
Texas	1
Washington	1

Table 19
States in Which the SMEs Have Practiced as a Residential Electrician

State	No. of SMEs Who Have Worked There
Alabama	2
Arizona	2
Arkansas	1
California	4
Colorado	2
Florida	7
Hawaii	1
Idaho	1
Iowa	1
Louisiana	3

State	No. of SMEs Who Have Worked There
Nebraska	1
New York	1
Oklahoma	1
South Carolina	1
Tennessee	1
Texas	2
Washington	1
Wyoming	2
Canada	1

Appendix O

List of Residential Electrical Contractors SME Participants

First Residential Electrical Contractors Meeting

October 28 – 29, 2015, Phoenix, Arizona
Location: Sheraton Mesa Hotel at Wrigleyville West

Pierre Bellemare
President, Bellemare, Inc. DBA FELLAS
Ellenton, FL

Rocco Deluca, Jr.
Electrical Plans Examiner II, City of Phoenix, Arizona
Gilbert, AZ

Paul Lingo
Training Director, Independent Electrical Contractors (IEC) Rocky Mountain
Denver, CO

Phillip J. Lucero
Owner, Preferred Electricians
Ewa Beach, HI

Bob Ludecke
Owner, Bob Ludecke Electrical Service
Big Bear City, CA

Gary Luke
Electrical Inspector, City of Jacksonville, Florida
Jacksonville, FL

Jeff Masterson
Services License/Compliance Manager, The Home Depot
Rock Hill, SC

Al Nyman
Director of Licensing Compliance & Regulatory Affairs, Sears Home Improvement Products, Inc.
Longwood, FL

Brian Price
President, B P Price Electric, Inc.
San Jose, CA

Jeffrey Sargent
NFPA Regional Electrical Code Specialist, National Fire Protection Association (NFPA)
Hampton Falls, NH

Clarence Tibbs
President, STE Electrical Systems, Inc.
Apopka, FL

Richard Tousey
Regional Compliance Manager, The Home Depot
Old Bethpage, NY

Joseph Wages Jr.
Technical Advisor, Education, Codes and Standards, International Association of Electrical Inspectors (IAEI)
Richardson, TX

Wesley Lamar Wheeler
National Director of Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Bo Wilkinson, Jr.
President, BW Electric of Louisiana Inc.
Shreveport, LA

Second Residential Electrical Contractors Meeting

February 17 – 18, 2016, Phoenix, Arizona
Location: Sheraton Mesa Hotel at Wrigleyville West

Pierre Bellemare
President, Bellemare, Inc. DBA FELLAS
Ellenton, FL

Jay Cannava
President, P.I. Electric, Inc.
Lake Park, FL

Rocco Deluca, Jr.
Electrical Plans Examiner II, City of Phoenix, Arizona
Gilbert, AZ

Julie Gauthreaux
CEO, Pelican Electrical Services, LLC
Theriot, LA

Joseph Hertel
Owner, Joseph A. Hertel Consulting
Madison, WI

Jesse Jameson
Construction Compliance Supervisor, Washington Department of Labor & Industries
Tumwater, WA

Paul Lingo
Training Director, Independent Electrical Contractors (IEC) Rocky Mountain
Denver, CO

Phillip J. Lucero
Owner, Preferred Electricians
Ewa Beach, HI

Bob Ludecke
Owner, Bob Ludecke Electrical Service
Big Bear City, CA

David Mims
President, Georgia-Florida Alarm Company
Tallahassee, FL

Daniel Morphew
Electrical Inspector, Electrical Bureau State Fire Marshal Division – Iowa Department of Public Safety
Des Moines, IA

Al Nyman
Director of Licensing Compliance & Regulatory Affairs, Sears Home Improvement Products, Inc.
Longwood, FL

Jeffrey Sargent
NFPA Regional Electrical Code Specialist, National Fire Protection Association (NFPA)
Hampton Falls, NH

Clarence Tibbs
President, STE Electrical Systems, Inc.
Apopka, FL

Joseph Wages Jr.
Technical Advisor, Education, Codes and Standards, International Association of Electrical Inspectors (IAEI)
Richardson, TX

Wesley Lamar Wheeler
National Director of Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Bo Wilkinson, Jr.
President, BW Electric of Louisiana Inc.
Shreveport, L

Appendix P

NASCLA Residential Electrical Contractor Job Analysis Survey

Appendix Q

Residential Electrical Contractor Job Analysis Survey Respondent Demographics

Residential Electrical Contractor Job Analysis Survey Respondent Demographics

The tables listed below detail the demographics of the respondents for the NASCLA Residential Electrical Contractor job analysis survey.

The number of years that the Respondents reported that they spent working in the electrical profession, supervising electricians, estimating, or preparing contracts, each ranged from 1 year to 50 years. Table 20 depicts their estimate of the average cost of contracts their company undertakes, ranging from less than $10,000 per job to over $100,000 per job, as follows:

Table 20
Size of Job Undertaken by Respondent's Companies

Average Size of Job	No. of Respondents
Less than $10K	69
$10K to $50K	41
$50K to $100K	11
Greater than $100K	15

Table 21 depicts how many people are employed by their organization:

Table 21
Number of People Employed by their Organization

Employee Range	No. of Respondents
Less than 6 people	87
6 – 25 people	24
25 -50 people	10
More than 50 people	16

Not all Respondents answered this question, as a few of them now work for electrical associations or licensing or code authority agencies or other public agencies, and do not perform independent contract work.

Table 22 indicates the states where the Respondents are licensed or have performed work as a Residential Electrical Contractor or equivalent to:

Table 22
States in Which the Respondents are Licensed or have Performed work as a Residential Electrical Contractor

State	No. of Respondents Licensed
Alabama	11
Alaska	0
Arizona	3
Arkansas	8
California	14
Colorado	8
Connecticut	1
Delaware	0
District of Columbia	2
Florida	13
Georgia	9
Hawaii	0
Idaho	4
Illinois	4
Iowa	2
Kansas	1
Kentucky	4
Louisiana	9
Maine	3
Maryland	8
Massachusetts	4
Michigan	6
Minnesota	3
Mississippi	8
Missouri	3
Montana	2

State	No. of Respondents Licensed
Nebraska	1
Nevada	3
New Hampshire	1
New Jersey	15
New Mexico	4
New York	7
North Carolina	13
North Dakota	2
Ohio	24
Oklahoma	2
Oregon	1
Pennsylvania	9
Rhode Island	0
South Carolina	31
South Dakota	1
Tennessee	11
Texas	17
Utah	2
Vermont	1
Virginia	12
Washington	4
West Virginia	12
Wisconsin	4
Wyoming	4

Appendix R

Residential Electrical Contractor Job Analysis Survey Results

Appendix S

Residential Electrical Contractor Examination Plan

Appendix T

List of SMEs Participating in the Test Development Meeting

Test Development Meeting

January 9 – 13, 2017, Phoenix, Arizona
Location: NASCLA Association Office

Jose Barragan
Owner, Barragan Construction Services
California City, CA

Jay Cannava
President, P.I. Electric, Inc.
Lake Park, FL

Julie Gauthreaux
CEO, Pelican Electrical Services, LLC
Theriot, LA

Steve Grayson
Construction Inspector, John Guth Associates
Shreveport, LA

Jesse Jameson
Construction Compliance Supervisor, Washington Department of Labor & Industries
Tumwater, WA

Mike Johnston
Executive Director Standards and Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Robert Jones
Deputy Executive Director, IEC Texas Gulf Coast
Houston, TX

Jack Lyons
Northeast Field Representative, National Electrical Manufacturers Association (NEMA)
West Chesterfield, MA

Jeff Masterson
Services License/Compliance Manager, The Home Depot
Rock Hill, SC

David Mims
President, Georgia-Florida Alarm Company
Tallahassee, FL

Craig Monin
President, Lon's Electrical Service, Inc.
San Bernardino, CA

Tim Norman
Executive Director, North Carolina State Board of Examiners of Electrical Contractors
Raleigh, NC

Richard Tousey
Regional Compliance Manager, The Home Depot
Old Bethpage, NY

Michael Travers, Sr.
Master Electrician, State of Delaware
Milton, DE

Joseph Wages Jr.
Technical Advisor, Education, Codes and Standards, International Association of Electrical Inspectors (IAEI)
Richardson, TX

Wesley Lamar Wheeler
National Director of Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Appendix U

List of SMEs Participating in the Standard Setting Meeting

Standard Setting Meeting

February 6 – 10, 2017, Phoenix, Arizona
Location: NASCLA Association Office

Pierre Bellemare
President, Bellemare, Inc.
Ellenton, FL

Steve Grayson
Construction Inspector, John Guth Associates
Shreveport, LA

Jesse Jameson
Construction Compliance Supervisor, Washington Department of Labor & Industries
Tumwater, WA

Mike Johnston
Executive Director Standards and Safety, National Electrical Contractors Association (NECA)
Bethesda, MD

Robert Jones
Deputy Executive Director, IEC Texas Gulf Coast
Houston, TX

Jack Lyons
Northeast Field Representative, National Electrical Manufacturers Association (NEMA)
West Chesterfield, MA

Craig Monin
President, Lon's Electrical Service, Inc.
San Bernardino, CA

Brooks Myers
Regional Compliance Manager, The Home Depot
Bandera, TX

Tim Norman
Executive Director, North Carolina State Board of Examiners of Electrical Contractors
Raleigh, NC

Lou Petrucci
Manager, L & M Electric, LLC
Cranston, RI

Mark Ptashkin
Consultant, MEP Consulting
Surprise, AZ

Clarence Tibbs
President, STE Electrical Systems, Inc.
Apopka, FL

Michael Travers, Sr.
Master Electrician, State of Delaware
Milton, DE

Joseph Wages Jr.
Technical Advisor, Education, Codes and Standards, International Association of Electrical Inspectors (IAEI)
Richardson, TX

Appendix V

Item Review/Sample Angoff Rating Sheet

Appendix W

Pilot Testing Item/Test Review Sheet