Maine Department of Education
Career and Technical Education

Electrical; CIP: 46.0302
National Construction Career Education Research (NCCER)-Electrical
Intersections with
Maine College and Career Readiness-English Language Arts Standards

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
Electrical Level 1 **1. Orientation to the Electrical Trade**			
a. Describe the apprenticeship/ training process for electricians. b. Describe various career paths/opportunities one might follow in the electrical trade. c. Define the various sectors of the electrical industry. d. State the tasks typically performed by an electrician. e. Explain the responsibilities and aptitudes of an electrician.	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and	1. Written test by NCCER	

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	expressing their own clearly and persuasively. **SL.4:** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **SL.6:** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.		
2. Electrical Safety			
a. Recognize safe working practices in the construction environment. b. Explain the purpose of OSHA and how it promotes safety on the job. c. Identify electrical hazards and how to avoid or minimize them in the workplace.	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.	1. Written test by NCCER 2. Perform inspections on ladders 3. Properly set up a ladder to perform a task. 4. Properly don a safety harness. 5. Perform a hazard assessment of a job to include:	

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d. Explain safety issues concerning lockout/tagout procedures, confined space entry, respiratory protection, and fall protection systems. e. Develop a task plan and a hazard assessment for a given task and select the appropriate PPE and work methods to safely perform the task.	**RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.6:** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **RST.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate	a. Work to be performed and hazards involved. b. Locate the nearest phone to worksite and list/post emergency numbers c. Plan an escape route from the worksite in the event of an accident.	

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	effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 11-12 topics, texts, and issues,* building on others' ideas and expressing their own clearly and persuasively. **SL.6:** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
3. Introduction to Electrical Circuits			
a. Define voltage and identify the ways in which it can be produced. b. Explain the difference between conductors and insulators. c. Define the units of measurement that are used to measure the properties of electricity. d. Identify the meters used to	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.4:** Determine the meaning of	1. Written test by NCCER 2. Explain series, parallel and combination circuits.	

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measure voltage, current, and resistance. e. Explain the basic characteristics of series and parallel circuits.	symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.		

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	SL.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
4. Electrical Theory			
a. Explain the basic characteristics of combination circuits. b. Calculate, using Kirchhoff's voltage	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts,	1. Written test by NCCER 2. Be able to complete required calculations.	

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law, the voltage drop in series, parallel, and series-parallel circuits. c. Calculate, using Kirchhoff's current law, the total current in parallel and series-parallel circuits. d. Using Ohm's law, find the unknown parameters in series, parallel, and series-parallel circuits.	processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse		

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	partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.4:** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		

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5. Introduction to the National Electrical Code (NEC)			
a. Explain the purpose and history of the NEC®. b. Describe the layout of the NEC®. c. Demonstrate how to navigate the NEC®. d. Describe the purpose of the National Electrical Manufacturers Association and the NFPA. e. Explain the role of nationally recognized testing laboratories.	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3**: Follow precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.5:** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating	1. Written test by NCCER 2. Use the NEC to determine the scope of the NEC and state what is and what is not covered. 3. Find a given definition in the NEC 4. Look up NEC specifications required for installing an outlet near a swimming pool. 5. Find the minimum wire bending space required for a given set of conductors installed in a junction box or cabinet, entering opposite the terminal.	

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	understanding of the information or ideas. **RST.6:** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **RST.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.9**: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process,		

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	phenomenon, or concept, resolving conflicting information when possible. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.		

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	SL.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
6. Device Boxes			
a. Describe the different types of nonmetallic and metallic boxes. b. Calculate the NEC® fill	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts,	1. Written test by NCCER 2. Identify the appropriate box type and size for a given	

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requirements for boxes under 100 cubic inches. c. Identify the appropriate box type and size for a given application. d. Select and demonstrate the appropriate method for mounting a given box.	processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3**: Follow precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.5:** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **RST.6:** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an	application. 3. Select the minimum size pull box or junction box for the following applications: a. Conduit entering and exiting for a straight pull. b. Conduit entering and exiting at an angle.	

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	experiment in a text, identifying important issues that remain unresolved. **RST.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.9**: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the		

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	grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **SL.4:** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative		

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	or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
7. Hand Bending			
a. Identify the methods for hand bending and installing conduit. b. Determine conduit bends. c. Make 90-degree bends, back-to-back bends, offsets, kicks, and saddle bends using a hand bender. d. Cut, ream, and thread conduit.	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3**: Follow precisely a complex multi-step procedure when	1. Written test by NCCER 2. Make 90-degree bends, back to back bends, offsets, kicks and saddle bends using a hand bender. 3. Cut, ream, and thread conduit.	

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	carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.5:** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **RST.6:** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **RST.7:** Integrate and evaluate multiple sources of information presented in		

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	diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.9**: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions		

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	(one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **SL.4:** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of		

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	formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
8. Raceways and Fittings			
a. Identify and select various types and sizes of raceways and fittings for a given application. b. Identify various methods used to fabricate (join) and install raceway systems. c. Identify uses permitted for selected raceways. d. Demonstrate how to install a flexible raceway system. e. Terminate a selected raceway system. f. Identify the appropriate conduit body for a given application.	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3**: Follow precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.	1. Written test by NCCER 2. Identify and select various types and sizes of raceways, fittings, and fasteners for given applications. 3. Demonstrate how to install a flexible raceway system. 4. Terminate a selected raceway system. 5. Identify the appropriate conduit body for a given application.	

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	RST.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.5:** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **RST.6:** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **RST.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.8:** Evaluate the hypotheses,		

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	data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.9**: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly		

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	and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **SL.4:** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical		

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	processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
9. Conductors and Cables			
a. From the cable markings, describe the insulation and jacket material, conductor size and type, number of conductors, temperature rating, voltage rating, and permitted uses. b. Determine the allowable ampacity of a conductor for a given application. c. Identify the NEC® requirements for color coding of conductors. d. Install conductors in a raceway system.	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3**: Follow precisely a complex multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-*	1. Written test by NCCER 2. Install proper conductors in a raceway system. 3. Identify different types of conductors and their permitted uses.	

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	12 texts and topics. **RST.5:** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **RST.6:** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **RST.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.		

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	RST.9: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make		

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	informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **SL.4:** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		

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10. Basic Electrical Construction Drawings			
a. Explain the basic layout of a set of construction drawings. b. Describe the information included in the title block of a construction drawing. c. Identify the types of lines used on construction drawings. d. Using an architect's scale, state the actual dimension of a given drawing component. e. Interpret electrical drawings, including site plans, floor plans, and detail drawings. f. Interpret equipment schedules found on electrical drawings. g. Describe the type of information included in electrical specifications.	**RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.9**: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process,	1. Written test by NCCER 2. Using an architect's scale, state actual dimensions of a given drawing component 3. Make proper material takeoff lists from a given drawing to include all lighting fixtures types and the correct number of lamps required	

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	phenomenon, or concept, resolving conflicting information when possible. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.		

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	SL.4: Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
11. Residential Electrical Services			
a. Explain the role of the National Electrical Code® in residential wiring and describe how to determine electric service requirements for dwellings. b. Explain the grounding requirements of a residential electric service. c. Calculate and select service-entrance equipment.	**RST.2:** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3**: Follow precisely a complex multi-step procedure when	1. Written test by NCCER 2. Without assistance, for a residential dwelling, compute lighting, laundry and small appliance loads 3. For a residential dwelling, compute loads of large appliances 4. For a residential dwelling,	

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d. Select the proper wiring methods for various types of residences. e. Compute branch circuit loads and explain their installation requirements. f. Explain the types and purposes of equipment grounding conductors. g. Explain the purpose of ground fault circuit interrupters and tell where they must be installed. h. Size outlet boxes and select the proper type for different wiring methods. i. Describe rules for installing electric space heating and HVAC equipment. j. Describe the installation rules for electrical systems around swimming pools, spas, and hot tubs. k. Explain how wiring devices are selected and installed. l. Describe the installation and control of lighting fixtures.	carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.5:** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. **RST.6:** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. **RST.7:** Integrate and evaluate multiple sources of information presented in	determine the number of branch circuits 5. For a residential dwelling, size and select service entrance equipment (conductors, panelboard, and protective devices) 6. Without assistance, properly label the components of a panelboard 7. Without assistance, select the proper type and size outlet box needed for a given set of wiring conditions	

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	diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.9**: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions		

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	(one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **SL.4:** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of		

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
	formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **WHST.4**: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.		
12. Residential Electrical Services			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
a. Explain the operation of and describe the following pieces of test equipment: • Voltmeter • Ohmmeter • Clamp-on ammeter • Multimeter • Megohmmeter • Motor and phase rotation testers b. Select the appropriate meter for a given work environment based on category ratings. c. Identify the safety hazards associated with various types of test equipment.	**RST.4:** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11-12 texts and topics.* **RST.7:** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. **RST.9**: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. **RST.8:** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with	1. Written test by NCCER 2. Measure voltage from line to neutral. 3. Measure voltage from line to ground 4. Measure values of various resistors	

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
	other sources of information. **RST.10:** By the end of grade 12, read and comprehend science/technical texts in the grades 11-12 text complexity band independently and proficiently. **SL.1:** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11-12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. **SL.2:** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. **SL.4:** Present information, findings, and supporting		

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
	evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance and style are appropriate to purpose, audience, and a range of formal and informal tasks. **WHST.2:** Write informative/ explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.		
ELECTRICAL LEVEL 2 To be removed as standard **13. Alternating Current**			
a. Calculate the peak and effective voltage or current values for an AC waveform. b. Calculate the phase relationship between two AC waveforms. c. Describe the voltage and current			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
phase relationship in a resistive AC circuit. d. Describe the voltage and current transients that occur in an inductive circuit. e. Define inductive reactance and state how it is affected by frequency. f. Describe the voltage and current transients that occur in a capacitive circuit. g. Define capacitive reactance and state how it is affected by frequency. h. Explain the relationship between voltage and current in the following types of AC circuits: • RL circuit • RC circuit • LC circuit • RLC circuit i. Explain the following terms as they relate to AC circuits: • True power • Apparent power • Reactive power • Power factor j. Explain basic transformer action.			
14. Motors: Theory and Application			
a. Define the following terms: • Controller			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
• Duty cycle • Full-load amps • Interrupting rating • Thermal protection • NEMAdesign letter • Overcurrent • Overload • Power factor • Rated full-load speed • Rated horsepower • Service factor b. Describe the various types of motor enclosures. c. Explain the relationships among speed, frequency, and the number of poles in a three-phase induction motor. d. Define percent slip and speed regulation. e. Explain how the direction of a three-phase motor is changed. f. Describe the component parts and operating characteristics of a three-phase wound-rotor induction motor. g. Describe the component parts and operating characteristics of a three-phase synchronous motor. h. Describe the design and operating characteristics of various DC motors.			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
i. Describe the methods for determining various motor connections. j. Describe general motor protection requirements as delineated in the National Electrical Code® (NEC®). k. Define the braking requirements for AC and DC motors. l. Explain how the direction of rotation of a DC motor is changed.			
15. Electric Lighting			
a. Describe the characteristics of light. b. Recognize the different kinds of lamps and explain the advantages and disadvantages of each type: • Incandescent • Halogen • Fluorescent • High-intensity discharge (HID) c. Properly select and install various lamps in lighting fixtures. d. Recognize and describe the installation requirements for various types of lighting fixtures: • Surface-mounted • Recessed • Suspended • Track-mounted			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
e. Recognize ballasts and describe their use in fluorescent and HID lighting fixtures. f. Explain the relationship of Kelvin temperature to the color of light produced by a lamp. g. Recognize basic occupancy sensors, photoelectric sensors, and timers used to control lighting circuits and describe how each device operates.			
16. Conduit Bending			
a. Describe the process of conduit bending using power tools. b. Identify all parts of electric and hydraulic benders. c. Bend offsets, kicks, saddles, segmented, and parallel bends. d. Explain the requirements of the National Electrical Code® (NEC®) for bending conduit. e. Compute the radius, degrees in bend, developed length, and gain for conduit up to six inches.			
17. Pull and Junction Boxes			
a. Describe the different types of nonmetallic and metallic pull and junction boxes. b. Properly select, install, and			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
support pull and junction boxes and their associated fittings. c. Describe the National Electrical Code® (NEC®) regulations governing pull and junction boxes. d. Size pull and junction boxes for various applications. e. Understand the NEMA and IP classifications for pull and junction boxes. f. Describe the purpose of conduit bodies and Type FS boxes.			
18. Conductor Installations			
a. Explain the importance of communication during a cable-pulling operation. b. Plan and set up for a cable pull. c. Set up reel stands and spindles for a wire-pulling installation. d. Explain how mandrels, swabs, and brushes are used to prepare conduit for conductors. e. Properly install a pull line for a cable-pulling operation. f. Explain how and when to support conductors in vertical conduit runs. g. Describe the installation of cables in cable trays.			

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h. Calculate the probable stress or tension in cable pulls.			
19. Cable Tray			
a. Describe the components that make up a cable tray assembly. b. Explain the methods used to hang and secure cable tray. c. Describe how cable enters and exits cable tray. d. Select the proper cable tray fitting for the situation. e. Explain the National Electrical Code® (NEC®) requirements for cable tray installations. f. Select the required fittings to ensure equipment grounding continuity in cable tray systems. g. Interpret electrical working drawings showing cable tray fittings. h. Size cable tray for the number and type of conductors contained in the system.			
20. Conductor Terminations and Splices			
a. Describe how to make a good conductor termination. b. Prepare cable ends for terminations and splices and connect using lugs or connectors. c. Train cable at termination points.			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
d. Understand the National Electrical Code® (NEC®) requirements for making cable terminations and splices. e. Demonstrate crimping techniques. f. Select the proper lug or connector for the job.			
21. Grounding and Bonding			
a. Explain the purpose of grounding and bonding and the scope of NEC Article 250. b. Distinguish between a short circuit and a ground fault. c. Define the National Electrical Code® requirements related to bonding and grounding. d. Distinguish between grounded systems and equipment grounding. e. Use NEC Table 250.66 to size the grounding electrode conductor for various AC systems. f. Explain the function of the grounding electrode system and determine the grounding electrodes to be used. g. Define electrodes and explain the resistance requirements for electrodes using NEC Section 250.56. h. Use NEC Table 250.122 to size the			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
equipment grounding conductor for raceways and equipment. i. Explain the function of the main and system bonding jumpers in the grounding system and size the main and system bonding jumpers for various applications. j. Size the main bonding jumper for a service utilizing multiple service disconnecting means. k. Explain the importance of bonding equipment in clearing ground faults in a system. l. Explain the purposes of the grounded conductor (neutral) in the operation of overcurrent devices.			
22. Circuit Breakers and Fuses			
a. Explain the necessity of overcurrent protection devices in electrical circuits. b. Define the terms associated with fuses and circuit breakers. c. Describe the operation of a circuit breaker. d. Apply the National Electrical Code® (NEC®) requirements for overcurrent devices. e. Describe the operation of single-element and time-delay fuses.			

Framework, Duties and Tasks	English Language Arts Standards (CCSS)	Criteria for Demonstration of Proficiency (possible but not required; must be determined at the District level)	Maine Learning Results – Guiding Principles And Career and Education Development (optional)
23. Control Systems and Fundamental Concepts			
a. Describe the operating principles of contactors and relays. b. Select contactors and relays for use in specific electrical systems. c. Explain how mechanical contactors operate. d. Explain how solid-state contactors operate. e. Install contactors and relays according to the NEC® requirements. f. Select and install contactors and relays for lighting control. g. Read wiring diagrams involving contactors and relays. h. Describe how overload relays operate. i. Connect a simple control circuit. j. Test control circuits.			