

***POWER GENERATION  
SKILL STANDARDS***

***Plant Operators***

***Plant Mechanics***

FOR MORE INFORMATION

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- Jay Pickett, Hydro Operations Supervisor, PSE
- Dale Singer, Senior Operator, Bureau of Reclamation, Grand Coulee Dam

## **Focus Group Participants**

The focus groups consisted of front-line workers, first line supervisors and professionals in the power generation industry within the Pacific Northwest power grid region. They determined the critical work functions and key activities performed by power generation plant operators and mechanics. They then listed the performance indicators, technical knowledge, skills and abilities, and employability skills required to succeed in this field. Their insights were an invaluable contribution to this work.



*Dale Singer during a recent visit to the Centralia College Center of Excellence.*

## Mechanic and operator panels meet to develop long-awaited skill standards for the industry

*by Dale Singer, Operations Specialist, Bureau of Reclamation, Grand Coulee Dam*

Our industry is faced with the fact that the “Baby Boomers” will be starting to retire. We will see losses of around 50% of our experienced, qualified, knowledgeable journeyman workforce. Combine this with the fact that for decades our industry has had a low turnover rate due to good pay, benefits, and job security requiring little training for new employees. Because of this, training budgets were cut and training programs were eliminated, placing us behind in our programs. Traditional journeyman training programs range from three to five years (6,000 to 10,000 hours), meaning that if we start today we will be years behind in training plus there will be little transfer of knowledge from the existing workforce to the new one.

Because of this I feel it is important to look at new ways of training our future workforce, hence the Center of Excellence. The community college system for a significant number of years has had excellent programs that have helped industry and provided quality education at a cost lower than more traditional

The steps have been started to achieve this. Centralia College has been in contact with industry to find out our needs. They received a grant to develop a skills panel for mechanic and operator in the generation side of our industry. Over two different two-day sessions industry provided ten mechanics and ten operators at a pretty good expense to industry to help develop these skill sets. These individuals were the actual hands-on personnel who do these jobs and know what it takes to be an operator or mechanic. Using this information faculty will be able to develop courses and a curriculum for a degree program so we could hire employees into an advanced step apprenticeship program. A further benefit to industry will be the common course numbering from one college to the next that participate in this program. With this, industry can feel confident that someone hired from Centralia College will have the same course work as someone from Wenatchee Valley or any other college that participates in the program.

### PLANT MECHANICS

*Hosted by PSE at Snoqualmie Falls Project*

**February 1-2, 2006**

- Guy Elms - PSE
- Quentin Elms - PSE
- Steven Ferris - Grand Coulee Dam
- Todd Fosness - PSE
- Dan Fugate - TransAlta
- Denis Kern - PGE
- Christopher Martin - IBEW Local #77
- Chad Miller - Douglas PUD
- Brian Odell - Chelan PUD
- Ron Jacobson - Tacoma Power
- Steven VanDusen - PSE



*The operator panel met at Rocky Reach Dam to develop their part of the skill standards.*



*The mechanic panel traveled to the PSE Snoqualmie facility for their skill standards work.*

### PLANT OPERATORS

*Hosted by Chelan PUD and Douglas PUD at Rocky Reach Dam*

**February 7-8, 2006**

- Todd Arendt - TransAlta
- Jim Byrd - Lewis County PUD
- Calvin Christoph - PSE
- Wayne Grevell - Chelan PUD
- Ryan Mathena - TransAlta
- Jay Pickett - PSE
- Dale Singer - Bureau of Reclamation, Grand Coulee Dam
- Michael Prey - Douglas County PUD
- Jim Kaiser - Chelan PUD

four-year institutions. It seems logical for the energy industry to partner with these institutions. By presenting industries needs in training the colleges can modify current classes to meet our needs. Courses like AC and DC theory are the same for utilities as they are for an electrician or electrical engineer.

If we can have the colleges teach courses like communications, computers, AC and DC theory, mechanical theory, and even some hands-on classes like welding and HVAC, this can drastically reduce our costs. It becomes a bigger benefit to the power industry in finding a pool of workers that would better serve our needs. How nice it would be for management to hire workers that have already shown motivation and taken the initiative of going to class on their own.

Through partnering and working together industry can revive their training programs and save time and money in doing so. The colleges can do what they do best: teach; industry can do what they do best: train about the specifics of our facilities. Most importantly we will not sacrifice anything in the quality of the end product, our journeyman.

*“Building a set of industry skill standards gives us the chance to develop training programs that are supported and needed as we prepare new people in energy technology. I think students will come from far and wide to take advantage of the training as it becomes more well known in the region.”*

*—Dr. Jim Walton, president, Centralia College—*

## **Special Thanks**

The Power Generation Skill Standards project was launched at the Grant County PUD SeaTac conference room where industry training supervisors, plant managers and labor representatives determined the scope of the power generation skills project. Amazing project results were achieved in two day work sessions for plant mechanics hosted by PSE Snoqualmie Plant and plant operators hosted by Chelan County PUD and Douglas County PUD at Rocky Reach Dam. The resource costs for this project were high, but the results provide a knowledge capture of the skilled crafts that will serve industry, labor and educational needs as we collaboratively create a benchmark standard for the power generation workforce. We sincerely thank our industry and labor partners for supporting this work.

## **The Power Generation Skill Standards Project Outcomes**

The following are the outcomes of *Power Generation Skill Standards*, as determined by the partnership:

- Skill standards needed for power generation careers consistent with the current and future needs of the public and business
- Verification of worker input by written survey
- A report for power generation employers, labor unions and educators showing the standards and the data that supported those standards

## **The Next Steps**

The completion of the skill standards represents phase one of this endeavor. The next step is to provide oversight to the development of curriculum based on the skill standards. This is a cooperative and collaborative project with power generation industry, labor unions, high schools, and colleges throughout the state. Additionally, the skill standards will serve as a foundation for Credit for Prior Learning and industry human resource job requirements.

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# **OVERVIEW**

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## **OVERVIEW**

### **Introduction**

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The Power Generation Skill Standards for Plant Operators and Plant Mechanics are the result of a collaborative project led by the Centralia College Center of Excellence for Energy Technology. The funding was provided by the Washington State Education and Training Coordinating Board. The initial work on Energy Industry Distribution Skill Standards for Electricians, Lineman, Instrument/Control/Relay/Meter Technician, and Millwright was conducted in 2003 by Walla Walla Community College.

The Power Generation and Power Distribution Skill Standards serve as companion documents to create a standard for curriculum development, skills training and human resource needs for energy production and distribution. Bonneville Power Administration (BPA) is concurrently developing skill standards that will serve the transmission needs of the Pacific Northwest power grid. Collectively, the skill standards will continue to be expanded by position to standardize the knowledge management processes for power generation, transmission and distribution.

## **Executive Summary**

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Energy is an important economic driver for the State of Washington. In 2004, power plants in Washington generated 24% more electricity than consumed in the state; electricity that was sold regionally and internationally on the commodities market. Further, more than 9500 megawatts of gas-fired generation capacity are now sited or proposed in Washington and between 1600-2900 megawatts are likely to be built in the next five years.

Concurrently, as power production expands a severe shortage of skilled workers is impending over the next decade due to retirement of 50% of the industry's workforce. Demographic studies reflect even higher retirement statistics within power generation. Employees have historically entered the industry at a young age and have been employed by the same organization until retirement. Transfer of knowledge has occurred through on-the-job training with little emphasis placed on documentation of that knowledge.

Industry wide succession and workforce demographics projects have emerged as high profile corporate initiatives. Facing a talent war, there will be limited resources to safely train the incumbent workforce. All of this is happening while the industry must simultaneously focus on recruitment of its future workforce.

The Center of Excellence for Energy Technology is poised to bridge the energy industry workforce development gap by building partnerships with industry, labor, government, education, workforce and economic councils. Alliances such as these, - driven by partnerships - are a solution to collaboratively develop a systemic approach to workforce planning. This need can only be met with input from the subject matter experts who so skillfully keep the power generating on a daily basis. Skill standards provide a critical foundation for the industry and a venue to shape the human capital that will become the future of energy.

Barbara Hins-Turner, Executive Director  
Center of Excellence for Energy Technology

## **The State of the Industry**

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### ***Message from the Chair***

Steve Milistefr, BPA

Chair, Center of Excellence for Energy Technology Advisory Board

The costs for industry to train a skilled workforce are considerable. It would be impossible to total the costs to the energy industry of NOT having a skilled workforce when you consider the huge investment in infrastructure, the need for system reliability, the inherent safety hazards of the work, and customer relations. Both labor and management have a vested interest in maintaining the skills of the current workforce and in preparing the future work force.

When developing effective training programs those responsible must know what the results of the training need to be. This generates questions. Where do we start? How deep do we teach the subject(s)? How will we measure success? Skills Standards answer a multitude of questions. They clearly identify the knowledge and skills required to perform the identified job.

The work represented in the power generation skill standards for plant operators and plant mechanics is just the beginning. As additional standards are completed for specific crafts and disciplines, curriculum developers will be able to clearly identify the knowledge, skills and abilities that are common to certain job groupings and which are specific to each job. Using skill standards will enable training developers to focus on identified training outcomes and provide consistency in delivery. We must come together now as an industry to put these standards to work and to develop the rest.

On behalf of the Center of Excellence for Energy Technology and Bonneville Power Administration, I thank you for your supporting this work.

### ***Message from Labor***

Bob Guenther, President, Thurston, Lewis, Mason, CLC, Vice President, 3<sup>rd</sup> District Washington State Labor Council AFL/CIO

The Center of Excellence (COE) has met with labor leaders across the state of Washington, Pacific Northwest Region and the National IBEW. Organized labor is committed to help train the workforce of the future; we have many Journeymen in the field with lifelong experiences to offer. We offer an opportunity for students to learn from people who are doing the job. I know that documenting the basic skills needed for these job classifications will result in advancement opportunities for workers not only in the Electrical Generating field but in many other industrial jobs that pay good wages.

Industry is short on skilled labor. The training that will result from the work of the skill standards will provide opportunities to advance the skills needed to do these jobs. Journeymen who wish, will be provided an opportunity to get college credit for prior learning, that will give them the credentials they need to teach at the college level.

The power industry has always provided good paying jobs for their workers. We expect to provide the best trained workers, stockholders depend on a trained workforce, good WAGES depend on good skills and this country needs a dependable electrical grid.

I am proud of Organized Labor's participation in the skill standards process.

# **NATIONAL CONTEXT**

## **A National Context for Skill Standards**

### **What Are Skill Standards?**

### **Why Are Skill Standards Important?**

### **The Benefits and Uses of Skill Standards**

## **Skill Standards to Curriculum: A Continuous Development Process**

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## A National Context for Skill Standards

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The National Skill Standards Board was established by Congress in 1994 to encourage the creation and adoption of a national system of voluntary skill standards that would enhance the ability of the U.S. to compete effectively in a global economy. Several national voluntary skill standards projects have been developed by various industries in full partnership with education, labor and community-based organizations. The intent is to have voluntary skill standards that are flexible, portable, and continuously updated and improved.

### What Are Skill Standards?

Skill standards are performance specifications that identify the knowledge, skills and abilities an individual needs to succeed in the workplace. They are critical to improving workforce skills, raising living standards, and improving the competitiveness of the U.S. economy. To be effective, skill standards must reflect the consensus of power generation professionals.

Skill standards provide measurable benchmarks of skill and performance achievement. They answer two critical questions: What do workers need to know and be able to do to succeed in today's workplace? And, how do we know when workers are performing well? Without this fundamental information, employers do not know whom to hire or where to focus their limited training dollars; employees and new entrants to the workforce do not know what they need to do to improve their performance; educators do not know how to prepare students for the challenge of the workplace.

Voluntary, industry based skill standards should be:

Responsive to changing work organizations, technologies and market structure.

Benchmarked to world-class levels of industry performance and free from gender, racial, or other forms of bias.

Tied to measurable, competency-based outcomes that can be readily assessed.

Inclusive of basic reading, writing, and critical thinking skills.

Useful for qualifying new hires and continuously upgrading employees' skills.

Applicable to a wide variety of education and training providers, both work and school-based.

Based on a relatively simple structure to make the system user-friendly.

A cooperative effort among all stakeholders.

Developed independently of any single training/education provider or type of education/training provider.

## **Why Are Skill Standards Important?**

In today's workplaces, the only constant is change. Jobs that once were relatively simple now require high performance work processes and enhanced skills. Because skill standards reflect changing workplace realities, they are a tool that can be used by applicants and employees to access greater career opportunities.

National recognition of skill standards in career fields provides a common basis for certifying achievement against those standards, thereby allowing for the portability of skills across geographic areas, companies and careers.

Updating skills and knowledge is now a lifelong endeavor, causing many employers and employees to spend more effort, time, and money on education and training. Skill standards provide benchmarks for making education and training decisions, shaping curricula, and directing funds toward highest value education and training investments.

## **The Benefits and Uses of Skill Standards**

Skill standards benefit all the stakeholders—business, labor, educators, government, and the community. The success of a skill standards development project and its usefulness to the community is dependent on the full participation and commitment of all stakeholders. These benefits can be used as a benchmark for evaluating the effectiveness of collaborative efforts.

### ***How Skill Standards Benefit Employers***

Employers can use skill standards to establish personnel qualification requirements. Interviews, performance reviews, and productivity can be evaluated and assessed to a higher degree of accuracy and efficacy. Employers are also able to identify core competencies and workers' abilities to demonstrate competencies. By matching competencies to critical work functions and key activities, employers can significantly improve efficiencies and productivity. Performance-based skill standards also provide a vehicle for varying degrees of job certainty and the structure for establishing competency-based pay scales. In addition, employers use skill standards to:

- Align personnel qualification requirements with nationally adopted certificates of competence.
- Modify employee training.
- Simplify measurement of employee training effectiveness.
- Assess employee skill levels based on industry standards.
- Match employee skills to the work needed.
- More easily document employee skills, training needs, and performance criteria.
- Improve consumer satisfaction and confidence through better developed evaluation skills for customer contact personnel.
- Improve employee satisfaction and morale by clarifying expectations.
- Improve quality, productivity, time-to-market and competitiveness.
- Achieve business goals.
- Partner with education and labor in developing school-to-work initiatives.

### ***How Skill Standards Benefit Educators***

Educators can identify core competencies and assessments based on the skill standards and implement them in their curricula. Students can then be required to demonstrate competency throughout their coursework. Academia and industry can build a cohesive relationship through a like-minded expectation of student competencies and work readiness. This enhances an instructor's ability to teach information consistent with industry's entry level expectations and needs. In addition, educators use skill standards to:

- Partner with business and labor in developing school-to-work initiatives.
- Provide effective, targeted instruction.
- Develop benchmarks for certificates of competence earned by students.
- Communicate what companies expect of employees.
- Develop new and evaluate existing curriculum and programs based on industry needs.
- Develop assessments to evaluate skills, knowledge, and abilities in classrooms and internships.
- Develop a common language on workforce preparation with business and labor.
- Improve relationships with local businesses, labor unions, other educators and agencies.
- Provide students with relevant career education and counseling.

### ***How Skill Standards Benefit Labor Unions***

Labor unions can use skill standards to gain support for company-sponsored worker training programs and to identify career paths for workers within companies and industries. Unions can provide this information to union members and develop strategies to improve career mobility and stability. Skill standards help unions to:

- Improve member value to the company.
- Provide a greater worker voice in the company.
- Link skill standards to increased training and upward career mobility for union members.
- Assist employers to match employee skills to the work needed.
- Develop skills-based training and certification initiatives that complement union apprenticeship programs.
- Communicate effectively with employers about worker training and retraining needs.
- Cooperate with education and industry in developing school-to-work initiatives.

### ***How Skill Standards Benefit Students and Workers***

Skill standards assist students in making career choices by providing industry expectations for success in the workplace. In addition, standards-based curriculum and assessments provide students with credentials that certify work-readiness. Work-ready students can anticipate being hired at higher rates of pay and can experience faster advancement in their chosen fields. Workers can accurately assess their skills against those required for career advancement and plan effectively for their career pathways. They can determine the skills and abilities needed for advancement or transfer within industries, and determine the continuous learning and training they need to upgrade their skills. In addition, students and workers can use skill standards to:

- Achieve clarity regarding what they are expected to learn and how to prepare for work.
- Enter and reenter the workforce with better control of their choices of high paying jobs

- requiring high skills.
- Accurately assess business expectations of the skills needed for positions and careers of their choice.
  - Improve mobility and portability of their credentials.
  - Obtain certification of competence of the skills they gain through experience, school, training, or self-study.
  - Enhance their performance and achievement by self-evaluation against known standards.
  - Be active contributors to the activities that make their organizations successful.

### ***How Skill Standards Benefit Government***

Government can provide information that will ensure a better skill match between workers and employers and initiate education reform to better educate future members of the workforce. Skill standards better enable agencies to provide options for career and job mobility and link learning to the needs of the workplace. In addition, government can use skill standards to:

- Assist in the development of a highly skilled, high-quality, and competitive workforce and industry base.
- Evaluate the effectiveness of publicly funded education and training.
- Increase opportunities for under-represented populations by making public the information that defines the skills required for success, and by facilitating the national adoption of those definitions and their use.
- Support the creation of high performance organizations where they improve living standards for all members of the population.
- Facilitate collaboration between educators and industry.
- Communicate the need and basis for education reform to business, education, labor, and the community-at-large on both local and national levels.

## **Skill Standards to Curriculum: A Continuous Development Process**

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The skill standards generated in this project are designed to be used by participating education partners to develop or modify curriculum at the high school and community college level. By providing the necessary input from industry, this skill standards document is a first step in curriculum development to serve the power generation industry in particular, and to demonstrate what can be done across industries.

In order to keep current with a rapidly changing workplace, standards need to be reevaluated and updated on a regular basis, with full partner participation at each step. New technological developments impact the ways that workers organize and apply their skills, including time management and interpersonal relationships. Increased technological complexity may simplify some of the job tasks but make others more intricate. Today's successful power generation workers are challenged to acquire a broader range of decision making and customer service skills as well as keep current with emerging technologies. Ongoing changes like these must be reflected in curriculum in order to meet the needs of industry, where expectations for workers are evolving.

### **A model of continuous improvement for economic development: Using Skill Standards**

#### ***Step 1: Skill Standards Identification***

- Compile and research existing standards in related jobs and careers.
- Conduct focus groups to identify critical work functions and key activities, define key activity performance indicators, and identify technical knowledge, foundation skills, and personal qualities.
- Conduct a survey of current workers to determine level of SCANS skills required for each job.
- Develop work-related scenarios to place the skill standards in the context of the work environment.
- Verify the data gathered from focus groups.
- Disseminate skill standards information to involved parties from industry, education, and labor for their review and editing.

#### ***Step 2: Assessment***

- Develop assessments through the collaboration of industry and education to reflect competent performance as defined by the skill standards.
- Collect evidence of a person's ability to perform at the levels determined by the skill standards.
- Determine present skill level through direct and indirect evidence by assessing a student, trainee, apprentice, prospective worker, or worker seeking additional training.
- Use products and items produced by the person being assessed as direct evidence.
- Gather supporting information to use as indirect evidence.
- Assess results using the criteria of validity, currency, authenticity, and sufficiency.
- Demonstrate validity using a tangible item or record of action.
- Demonstrate authenticity by having the individual being assessed produce the item or specific piece of a team-effort.
- Demonstrate sufficiency by providing enough evidence to match key tasks and performance criteria of the skill standards.

### ***Step 3: Curriculum Development***

- Identify necessary competencies based on the skill standards information and assessments.
- Develop program outcomes for specific academic and training programs, including Tech Prep, 2-year, and apprenticeship programs.
- Perform gap analysis to determine changes or additions to be made to curriculum.
- Revise existing curriculum to better meet the current and future needs of the industry.
- Develop new curriculum and establish new programs based on these competencies.

### ***Step 4: Articulation***

- Develop models to support the articulation of program outcomes and competencies between academic and training systems.
- Establish articulation agreements between existing programs to ensure portability of skills.
- Connect competencies and Certificates of Competence with benchmark documentation to build national portability systems.

### **A Continuous Updating Process**

A continuous exercise is necessary: all partners must revise and verify skill standards on a regular basis. For national economic development success, curriculum and current training methods must be updated to meet workplace standards..

Individual workers must have access to clearly stated competency goals and direct access to skill development assistance. With cooperative effort on local and national levels, we can begin to resolve the workforce shortages in the power generation industry that face us today.

## Pyramid of Competencies

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The Pyramid of Competencies is a depiction of skill standards in three broad skill categories.

### ***Tier I***

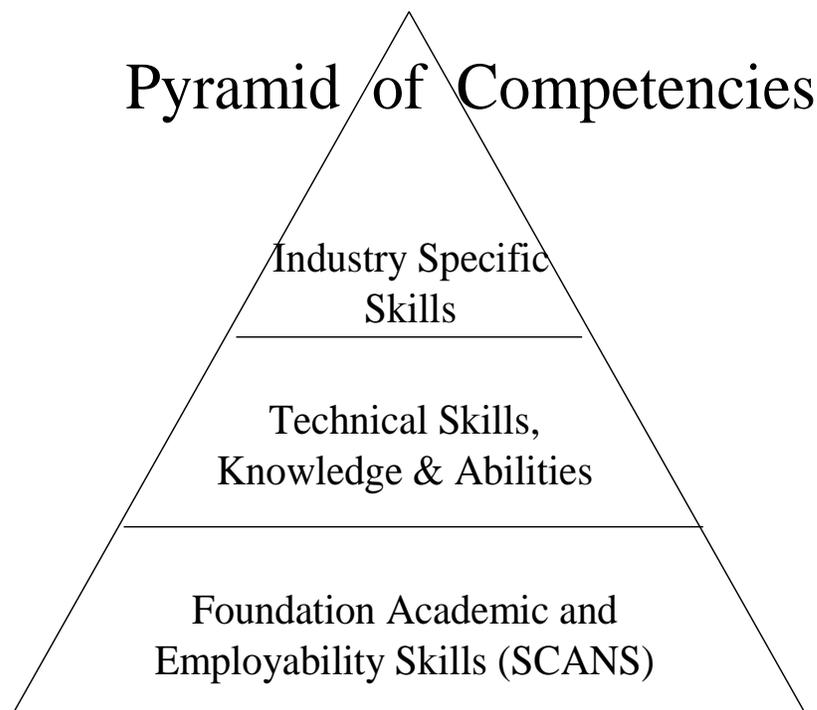
Tier I represents the broadest level of competencies, and is the set of employability (SCANS) skills, knowledge, abilities, and personal qualities required of all workers to be successful in today's workplace. These are the universal skills that are needed to apply technical knowledge and tools effectively.

### ***Tier II***

Tier II represents technical skills, knowledge, and abilities common to all jobs within a cluster across all industries or industry sectors. For workers in power generation, for example, knowledge of the applicable federal, state, and local laws would be applicable across all sectors.

### ***Tier III***

Tier III represents industry-specific technical skills, knowledge, and abilities that are unique to individual jobs or clusters and are the most prone to rapid change. For example, many workers need to upgrade their skills based on sudden market shifts.



# **POWER GENERATION SKILL STANDARDS PROJECT**

**Project Goals, Guidelines and Methodology**

**Employability Skills: SCANS Profile**

**Verification Survey**

**Definition of Terms**

## **Power Generation Skill Standards Project Goals, Guiding Principles, and Methodology**

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### **Goals**

- Identify voluntary skill standards for the power generation industry. The standards will serve as benchmarks for entry into power generation careers at the technical level.
- Disseminate the results and support the use of skill standards by educators, businesses, unions, students, workers, and government agencies.

### **Guiding Principles**

- Experienced workers are the experts in their career field and are best able to identify the work performed and the skills, knowledge, and abilities required to be successful.
- Business, labor, and education must work as partners to ensure the creation of a link between the work expectations and the curriculum.
- The standards must be consistent with existing civil rights laws and practices.
- Standards must be flexible, portable, and should be updated continuously.
- Skill standards describe the major functions and key activities, as well as the performance indicators, technical knowledge and skills, employability skills, and personal attributes needed to succeed in the workplace.
- Integrated skill standards define work duties and the skills required to perform them in the context of work settings.

The experience of the partners involved in this project holds that the success of any skill standards project is critically linked to the full participation and commitment of all partners.

### **Identification of Skill Standards: Research Methodology**

#### **Research Methodology**

##### **Background**

These industry-defined skill standards were developed using specific research-based processes. The project followed the process required by the Washington State Board for Community and Technical Colleges (SBCTC) as described in *Skill Standards Guidebook I*, Washington State Board for Community and Technical Colleges, 1996 and the process developed by the National Skill Standards Board (NSSB). In particular, the protocols used for the ICT (Information Communications Technology) skill standards were applied to this project.

The Center of Excellence for Energy was formed in 2003, in response to the desire of industry to address the ever-widening shortfall in skilled workers in the power generation

industry. The Center represents the education and training needs of the Energy industry through its partnership with employers, labor and educators. In 2006, funds were granted this project by the Washington State Workforce Training and Education Coordinating Board to conduct a skill standards study.

Dr. Alan Hardcastle of the WSU Social and Economic Sciences Research Center, and Terryll Bailey of The Allison Group, conducted extensive secondary research to identify trends, current jobs and existing skill standards in the power generation sector including data from the SBCTC Skill Standards Web site and the NSSB. On November 10, 2005 researchers met with industry representatives to determine the goals and research design of the skill standards project, to obtain their input on the research to date, and to finalize the clusters to be covered in the study.

On January 9, 2006 a focus group session was conducted with Senior Experts from industry to review the preliminary research and advise the research process. These employers and labor leaders established the project direction and timeline, and identified an initial list of critical work functions and key activities. This initial list was subsequently reviewed by panels of subject matter experts; primarily current workers who perform those jobs.

### **Focus Groups**

Two focus groups of subject matter experts were conducted. The first, held on February 1-2, 2006, included a panel of 11 Plant Mechanics. The second, held on February 7-8, 2006, included a panel of 10 Operators. The panelists represented both thermal and hydroelectric power generation sectors, and all geographical regions of the State were represented. Panelists had a minimum of three years experience in the occupational cluster, although most had 10 or more years experience.

In both focus groups, a structured process was used to guide the panel through the development of the critical work functions and key activities. In each focus group, the process included the following elements:

- Panelists were facilitated by a professional skill standards focus group leader.
- Panelists received an orientation to skill standards. Examples were provided.
- Panelists from diverse areas of the power generation industry arrived at consensus regarding the components of the skill standards.
- Panelists clarified the organization and structure of the critical work functions and key activities, filled in gaps, and confirmed the accuracy of the critical work functions and key activities.
- Panelists identified Performance Indicators for each key activity.
- Panelists identified occupational technical knowledge and skills for each key activity.
- Panelists brainstormed the topics that need to be covered in training and education programs to prepare people to enter the work.
- Panelists completed a survey to level SCANS skills (see below).

After a thorough orientation to skill standards, panelists were asked to brainstorm critical work functions for the cluster (Plant Operators or Plant Mechanics). After composing their own critical work functions, they were then provided with the draft critical work functions identified by the Senior Experts and through research. Panelists were asked to compare the critical work functions from the Senior Experts with those they brainstormed as a group, and to consider the following criteria:

- Is the function a broad responsibility?
- Does it take a significant amount of time to achieve?
- Are there groupings of Key Activities associated with it?

Participants were asked to review the key activities for each critical work function, and to posit appropriate changes wherever necessary. The criteria used for this purpose were:

- Does the activity describe what you have to do to achieve this function?
- Is it a major area of task responsibility?
- Is it concrete and specific?
- Does it have relatively equal importance to the other Key Activities?
- Does each Key Activity require distinct, definable skills?

Once the critical work functions and key activities were finalized, performance indicators were developed for each key activity. Panelists were asked how they know when a task is performed well, and what elements need to be in place so they would be ensured that this key activity is performed competently. The following criteria were provided regarding performance indicators:

Performance Indicators should...

- Describe competent performance.
- Be directly observable, concrete and measurable.
- Capture the essential aspects of performance.
- Be as precise and explicit as possible but still apply across the industry cluster.
- Reflect what the individual can control.

Panelists brainstormed performance indicators, and then arrived at consensus with respect to the final list. The group was assisted in putting the content into appropriate language format.

Panelists next moved to identify the occupational technical knowledge and skills for each key activity. They brainstormed occupational technical knowledge and skills, and then arrived at the final list through consensus. Panelists were asked what a person needs to know and be able to do to accomplish the key activity at the level defined by the performance indicators.

In each focus group an informal discussion was held to identify the subjects and topics most important for new entrants to the industry.

## **Surveys**

A survey was conducted to level SCANS skills and personal qualities for the cluster. SCANS (Secretary's Commission on Achieving Necessary skills) are foundation abilities required of workers in all occupations at varying levels specific to their jobs, ranging from basic academic skills to problem solving, working in teams, and the use of technology. Surveys were distributed to panelists in the focus groups and to workers across the State of Washington. Complete survey data from 27 Plant Mechanics and 31 Plant Operators was collected and analyzed. The SCANS survey results are presented on pages 33-34 and 62-63.

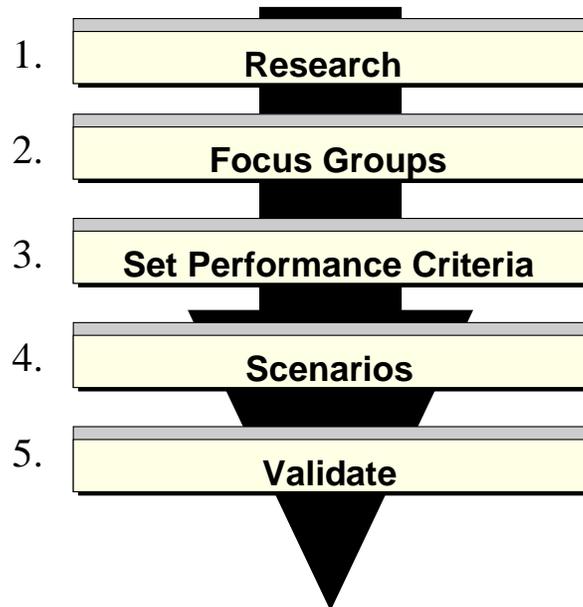
## **Senior Expert Review**

Three Senior Experts from the energy generation sector reviewed the critical work functions, key activities and performance indicators produced by the focus group panels. The Senior Experts provided a few minor edits, and answered some follow up questions from the research team. All of the Senior Experts confirmed the content of the skill standards.

## **Industry-wide Review**

The preliminary skill standards will be reviewed and verified in the latter part of 2006 by a survey of the energy industry. Survey respondents will be asked to comment on the standards, and to rank the relative importance of the critical work functions and key activities identified by the focus groups. These results will be included in a final version of the skill standards document.

## Process: Building Skill Standards



**Employability Skills: SCANS Profile**

During the data-gathering process of this project, employability skills for power generation careers were identified. Employability, or workplace skills, are basic academic and foundation skills needed to build more advanced competencies. The foundation skills are based on broad workplace categories, known as SCANS (Secretary’s Commission on Achieving Necessary Skills, U.S. Department of Labor). This federal report issued in 1991 identifies 37 foundation and workplace competencies required for work readiness.

SCANS are comprised of a three-part foundation of skills and personal qualities and five workplace competencies needed for successful job performance in today’s workforce. Professionals currently working in the field were asked to identify the level of difficulty for each of the 37 SCANS skills most required for successful workplace performance in each cluster. The information in the charts on the following pages was compiled by taking a weighted average of the responses across the cluster. This summary information provides a general view of the key workplace skills deemed relevant and necessary for the front line worker in power generation as well as providing the foundation for the employability skills within the skill standards.

**Basic skills**

- Reading
- Writing
- Arithmetic
- Mathematics
- Listening
- Speaking

**Personal qualities**

- Responsibility
- Self-worth
- Sociability
- Self-management
- Integrity/Honesty

**Thinking skills**

- Creative Thinking
- Decision Making
- Problem Solving
- Visualization
- Knows/Learns
- Reasoning

**Workplace competencies**

- Utilizing Resources
- Interpersonal Skills
- Utilizing Information
- Using Systems
- Using Technology

The *ADVANCE™ Workplace Standards Skill Inventory* from Advance Educational Spectrums, Inc., was used to capture industry views on foundation skills for power generation workers. Industry professionals ranked the SCANS skill levels required. The chart on the following pages contains information created by taking the average of the profiles across the clusters. This summary information provides a general view of the key foundation skills deemed relevant and necessary for the entry-level power generation worker.

<i>Applies creative thinking</i>	Level I <input type="checkbox"/> • Makes connections between old & new • Recognizes patterns/relationships	Level II <input type="checkbox"/> • Paraphrases/summarizes/parodies existing ideas • Demonstrates creative thinking process while problem solving • Utilizes brainstorming techniques	Level III <input checked="" type="checkbox"/> • Develops creative solutions • Applies creative solutions to new situations	Level IV <input type="checkbox"/> • Generates unique solutions • Formulates new ideas/plans/approaches • Organizes new processes/procedures	Level V <input type="checkbox"/> • Judges/validates creative expressions • Actively pursues creative expression
<i>Applies decision making strategies</i>	Level I <input type="checkbox"/> • Understands decision making process • Recalls basic rules/principles • Identifies goals and constraints	Level II <input type="checkbox"/> • Applies rules/principles to situations • Gathers information	Level III <input checked="" type="checkbox"/> • Analyzes situation/information • Considers risks/implications • Compiles multiple viewpoints	Level IV <input type="checkbox"/> • Generates alternative solutions • Evaluates alternative solutions • Formulates plan of action	Level V <input type="checkbox"/> • Judges cost/pros/cons • Justifies purpose/results • Sets decision-making parameters
<i>Recognizes and solves problems</i>	Level I <input type="checkbox"/> • Identifies the problem	Level II <input type="checkbox"/> • Understands the complexity/discrepancy • Appropriately refers complex/discrepancy	Level III <input checked="" type="checkbox"/> • Examines information/data • Considers risks/implications • Compiles multiple viewpoints	Level IV <input type="checkbox"/> • Generates/evaluates solutions • Devises/implements plan of action	Level V <input type="checkbox"/> • Evaluates/adjusts plan of action

Sample survey questions from the Advance Workplace Standards Skill Inventory

## **Verification**

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The skill standards were reviewed by industry and labor representatives who participated in the research. Further industry verification is in process and will be completed over the coming months.

## **Definition of Terms**

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Each chart in the following skill standards templates contains the following components:

### ***Clusters***

Clusters describe the major areas of work carried out across an industry cluster. They apply across specific industry segments (e.g. automobile manufacturing, furniture manufacturing, airplane manufacturing, etc.) and often cover families of related job titles. Plant Operators and Plant Mechanics are the clusters within power generation.

### ***Critical Work Functions***

Critical work functions represent the general areas of responsibility for the front-line worker in power generation. The functions tell us what must be done to achieve the key purpose of an occupation cluster.

### ***Employability Skills***

Employability skills are basic academic and personal skills that are needed to build more advanced competencies. They are competencies required by all workers in order to obtain meaningful work and participate in the modern workforce.

### ***Key Activities***

Key activities are the tasks related to the functional area of the career cluster and performed by workers in a given occupation. They are made up of work activities which are measurable and observable, and which result in a decision, product or service.

### ***Level of Importance***

Professionals who are actively working in this occupation rated the level of importance for each critical work function and key activity, ranging from not important to critical. All critical work functions were rated and verified as being important, very important or critical.

### ***Performance Indicators***

Performance indicators are specific behavioral evidence of a worker's achievement of skills, knowledge, and task completion. The question answered is: "How do we know when this key activity is performed well?" Performance indicators provide the standard of performance required to produce the necessary outcomes of key activities.

### ***Technical Skills, Knowledge, Abilities and Tools***

Technical skills, knowledge, and abilities are those areas of expertise which workers must have in order to perform a given occupational task with excellence. A collection of skills, knowledge, abilities, and tools make up competencies.

Skills refer to proficiency in an applied activity. This activity could be physical, mental, or interpersonal in nature.

Knowledge is a particular set of information.

Abilities are broad human characteristics that result from natural talent, training, or experience.

Tools are materials, equipment, and implements a worker must be able to use competently to meet the requirements of the job.

# **RESULTS: Skill Standards for Plant Operators**

## **Typical Job Description**

## **Scenarios: Routine, Crisis, and Long Term**

## **SCANS Survey Results**

## **Summary of Critical Work Functions and Key Activities**

## **Skill Standards**

## **Verification Results**

## Typical Job Description

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# Plant Operator

Job Description:

### **PRIMARY PURPOSE:**

Operate and monitor plant generating equipment and take appropriate actions to ensure safe, efficient and reliable operation of the plant.

### **RESPONSIBILITIES/ACCOUNTABILITIES:**

May be responsible to perform a combination of the following duties based upon job assignment:

- Knowledge of operating auxiliary systems.
- Comply with and practice proper equipment clearance procedures.
- Properly apply control room guidelines during unit start up and shutdown.
- Swap fuel oil suction strainers using correct procedures.
- Startup and shutdown of boiler fuel supply systems.
- Locate and properly apply, according to control room guidelines, all high pressure boiler and turbine drains during unit startup and shutdown.
- Perform all work in compliance with applicable codes, standards, safety and environment regulations.
- Keep plant supervisor informed of unusual conditions that might affect plant operations.
- Assist with plant operations, performance testing, and other plant maintenance as needed.
- Maintain required operations documentation including records, log sheets and charts.
- Ensure that all auxiliary equipment is started up and operated to assure maximum reliability.
- Set up auxiliary equipment for startup in accordance with established operating procedures.
- Monitor functioning of auxiliary equipment and report problems to appropriate personnel.
- Stay informed of all operating procedures and changing conditions of the plant from shift to shift.
- Responsible for station lockout/tagout procedures as mandated by company policy.
- Perform weekly PM checklists assigned to this position.

### **Qualifications**

#### **SKILLS/COMPETENCIES:**

- General knowledge of safety and environmental regulations.
- Ability to read, understand and apply information contained in material safety data sheets.
- Ability to interpret data readings and results of equipment checks to identify equipment or process problems.

- General knowledge of units startup and shut down basic equipment procedures as they relate to the equipment and/or auxiliary operator.
- General computer skills.
- Must have the ability to manipulate keyboards.
- Must have a positive team attitude when working with other team members.
- Demonstrated knowledge of plant fuel supply.
- Demonstrated knowledge of fuel unloading, transfer and storage systems.
- Demonstrated knowledge of the water treatment systems and the basic procedures related to operating reverse osmosis systems.
- Demonstrated knowledge of local alarms and corrective action required for each alarm.
- General knowledge of pressure, temperature, water level, and other types of indicating instruments.
- General knowledge of operating a high pressure steam boiler and the operation of all auxiliary systems.
- Proficient written and verbal communication skills.

DEGREES/CERTIFICATIONS/LICENSE/EXPERIENCE:

Required:

- High School diploma or equivalent.
- Minimum 1 year experience preferred related to a power plant and/or chemical plant environment or college level associate degree in related field of study.
- Basic knowledge of First Aid & CPR.
- Possession of a valid drivers license.

## Scenarios

### Routine Scenario:

It is a normal night shift, you read the log to review the plant conditions and you have just completed your rounds of the powerhouse. During your tour you completed all of your readings, checked your equipment and found everything was within specifications with nothing abnormal in the powerhouse. You look at your SCADA display and G-5 (one of nine generators) was tripped offline on a generator differential and CO2 has discharged on this unit.

You notify your control center (dispatcher) that you are checking the situation. You grab a SCBA (breathing apparatus) and put it on. You may not have to use it yet but at least you will be ready:

1. Proceed to verify the unit is shutdown (safe condition)
  - a. Verify the breaker is open
  - b. Verify the unit is stopped or coasting down
2. Check to see if there is smoke leaving the unit (indication the fire was real)
3. If there is no smoke do not assume there was no fire
4. Verify your fire system discharged
5. Verify your targets on the unit and ensure you have checked all possible causes and alarms
6. Your fire system would have had an initial discharge so you will need to determine if a delayed is necessary
  - a. Presence of smoke means the fire is still present
  - b. While wearing an air pack you could check the unit for hot spots
  - c. Check you air housing temperatures on SCADA and look for hot spots
  - d. DO NOT open an air housing door to look around and reintroduce atmosphere (oxygen) into the area
7. Reevaluate everything so far and ask do you have a fire
  - a. If you have no hot spots and no smoke odds are you do not
8. You have determined there was no fire
9. Fire or not to be on the safe side you will have a minimum amount of time to keep CO2 in you air housing (generator enclosure) to ensure if there was any chance of a fire that it has been extinguished
10. With no fire what do you need to do to return this unit to service
  - a. You will want to do an air housing inspection however, it is filled with CO2 so you will have to remove the hazardous environment
  - b. After ventilating the unit you will have to do air quality tests
  - c. You may want to have an electrician available to inspect the unit
11. If all inspections are fine this unit could be returned to service
12. Ensure all relays, alarms, and the fire system is reset and ready
13. Restart the unit if needed or declare it available with the dispatch office

## Primary Tasks and Functions Involved in this Scenario

<b>Critical Work Functions</b>	<b>Key Activities</b>							
<b>A. Operate and Monitor Project Equipment</b>	A1 <i>Inspect project equipment</i>	A2 <i>Monitor equipment performance</i>	A3 <i>Identify problems or potential problems and take corrective actions</i>	A4 <i>Ensure project / equipment is operating within parameters</i>	A5 <i>Perform logging and record-keeping</i>	A6 <i>Operate equipment</i>	A7	A8
<b>B. Manage Project Systems</b>	B1	B2 <i>Make adjustments to restore or maintain system performance</i>	B3 <i>Monitor system performance</i>	B4 <i>Identify problems or potential problems and take corrective actions</i>	B5 <i>Communicate with internal and external organizations</i>			
<b>C. Support Equipment Maintenance</b>	C1 <i>Perform pre-maintenance activities</i>	C2 <i>Monitor and assist maintenance activities</i>	C3	C4 <i>Log maintenance activities</i>				
<b>D. Comply with Safety &amp; Environmental Programs</b>	D1	D2 <i>Conduct safety and environmental inspections</i>	D3 <i>Document inspection results and regulatory compliance</i>	D4	D5	D6 <i>Keep current on safety and environmental equipment, requirements and procedures</i>		

### **Crisis Scenario:**

The cell phone rings and caller ID says, "Hydro Operation Center". I answer the call and the message is clear "Unit 1 tripped off line." I grab my belongings and get down to the power house – “where are my keys?”

As I pull up, I perform visual check of the area including the river and the power house. Once in the power house my investigation begins. I look for alarms, relay flags or any clues to what has happened. The clues help determine who I will call out -- do I need mechanics or electricians? Is it worth calling someone out if the load can be picked up elsewhere or if there is a sufficient power supply already on the grid?

I decide on the course of action and call out the appropriate repair people. I inform the Load Office, Hydro Operations and supervision of the situation. The crew arrives, and it is time to help with Lock-out/Tag-out and anything else needed to get the situation remedied. Upon completion of repairs/corrections it is time to start up the machine, turn it back over to the Operations Center and inform the appropriate people of the incident and outcomes.

## Primary Tasks and Functions Involved in this Scenario

<b>Critical Work Functions</b>	<b>Key Activities</b>							
<b>A. Operate and Monitor Project Equipment</b>	<i>A1 Inspect project equipment</i>	<i>A2 Monitor equipment performance</i>	<i>A3 Identify problems or potential problems and take corrective actions</i>	<i>A4 Ensure project / equipment is operating within parameters</i>	<i>A5 Perform logging and record-keeping</i>	<i>A6 Operate equipment</i>	<i>A7 Respond to equipment emergencies, malfunctions and alarms</i>	<i>A8</i>
<b>B. Manage Project Systems</b>	<i>B1</i>	<i>B2 Make adjustments to restore or maintain system performance</i>	<i>B3 Monitor system performance</i>	<i>B4 Identify problems or potential problems and take corrective actions</i>	<i>B5 Communicate with internal and external organizations</i>			
<b>C. Support Equipment Maintenance</b>	<i>C1</i>	<i>C2</i>	<i>C3</i>	<i>C4 Log maintenance activities</i>				
<b>D. Comply with Safety &amp; Environmental Programs</b>	<i>D1</i>	<i>D2 Conduct safety and environmental inspections</i>	<i>D3 Document inspection results and regulatory compliance</i>	<i>D4 Participate in drills and response teams</i>	<i>D5 Initiate emergency response</i>	<i>D6 Keep current on safety and environmental equipment, requirements and procedures</i>		

**Long-Term Scenario:**

As the summer fades and the storm season nears, the nights come sooner and thoughts of flood control enter operator’s minds. The rains begin and bring the hope of snow. The run off from the rain brings huge amounts of energy, but it can't all be saved. The water has run through the project so precious space for more water can be maintained for flood season. This space will protect local low lands and is very precious when the high water hits.

As the rain turns to snow, the snow can turn to rain. The energy of the rain will melt the snow quickly and cause large runoffs and fat rivers. Government control centers are manned and hydro projects call in all available staff. The mission is to cut the peak of the high water off for the good of the public.

**Primary Tasks and Functions Involved in this Scenario**

<b>Critical Work Functions</b>	<b>Key Activities</b>						
<b>A. Operate and Monitor Project Equipment</b>	A1	A2	A3 <i>Identify problems or potential problems and take corrective actions</i>	A4 <i>Ensure project / equipment is operating within parameters</i>	A5 <i>Perform logging and record-keeping</i>		
<b>B. Manage Project Systems</b>	B1	B2	B3 <i>Monitor system performance</i>	B4 <i>Identify problems or potential problems and take corrective actions</i>	B5 <i>Communicate with internal and external organizations</i>		
<b>C. Support Equipment Maintenance</b>	C1	C2 <i>Monitor and assist maintenance activities</i>	C3	C4	C5		
<b>D. Comply with Safety &amp; Environmental Programs</b>	D1	D2 <i>Conduct safety and environmental inspections</i>	D3 <i>Document inspection results and regulatory compliance</i>	D4	D5	D6 <i>Keep current on safety and environmental equipment, requirements and procedures</i>	

## SCANS Survey Results: Plant Operators

<i>Foundation Skills and Personal Qualities</i>	0	1	2	3	4	5	<i>Critical Competencies</i>
<b>Basic Skills</b>							
Demonstrates Effective Reading Strategies							<i>Identifies relevant details, facts, specifications, follows set of instructions and qualifies/analyzes information.</i>
Demonstrates Effective Writing Strategies							<i>Records information accurately, completes forms and writes simple documents.</i>
Applies Arithmetic Processes							<i>Performs basic computations and measurements, performs measurements and predicts arithmetic results.</i>
Applies Mathematics Processes							<i>Utilizes mathematical formulas and processes, summarizes and translates mathematical data.</i>
Demonstrates Effective Listening Skills							<i>Listens attentively and interprets, clarifies and influences communication.</i>
Demonstrates Effective Speaking Skills							<i>Explains concepts, Actively participates in discussion, present complex ideas and information</i>
<b>Thinking Skills</b>							
Applies Creative Thinking/Generates Ideas							<i>Demonstrates creative thinking process while problem solving and develops creative solutions.</i>
Applies Decision Making Strategies							<i>Applies principles to situation, analyzes situation/information and considers risks and implications.</i>
Recognizes and Solves Problems							<i>Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</i>
Demonstrates Visualization							<i>Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</i>
Knows How to Learn							<i>Draws upon experiences and prior knowledge, interprets and applies new knowledge and experience, and interprets symbols, diagrams and schematics.</i>
Applies Reasoning Skills							<i>Uses logic to draw conclusions and analyzes logic/rule/principle</i>
<b>Personal Qualities</b>							
Demonstrates Responsibility							<i>Follows procedures and pays attention to details, works with minimal supervision and demonstrates initiative.</i>
Demonstrates Belief in Self-worth							<i>Maintains a positive self image, responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understands own impact on others.</i>
Demonstrates Sociability in Groups							<i>Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</i>
Demonstrates Self-management							<i>Accepts constructive criticism, sets well defined/realistic goals, demonstrates commitment to self improvement, and applies self management skills.</i>
Demonstrates Integrity/Honesty							<i>Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</i>

<i>Foundation Skills and Personal Qualities</i>	0	1	2	3	4	5	<i>Critical Competencies</i>
<b>Management of Time and Resources</b> Manages Time	■	■	■				<i>Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</i>
Manages Money							<i>Not applicable</i>
Manages Materials/Facilities	■	■					<i>Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</i>
Manages Human Resources	■	■					<i>Recognizes job tasks and distributes work assignments.</i>
<b>Management and Use of Information</b> Acquires/Evaluates Information	■	■	■	■			<i>Selects data relevant to the task, predicts outcomes, analyzes data and integrates multiple items of data.</i>
Organizes/Maintains Information	■	■	■				<i>Selects appropriate categories for information, interprets information and applies processes to new information.</i>
Interprets/Communicates Information	■	■	■				<i>Recognizes accuracy of information, interprets information and prepares basic summaries and reports.</i>
Uses Computers to Process Information	■	■	■				<i>Understands computer operation, utilizes integrated/multiple software and networks, locates and retrieves stored information, manipulates information, integrates multiple platforms, and modifies information.</i>
<b>Interpersonal Skills</b> Participates as Team Member	■	■	■				<i>Completes tasks, actively participates in team activities and volunteers for special tasks and assists team members.</i>
Teaches Others	■	■	■				<i>Models proper performance/attitudes, conducts task specific training and coaches others to apply related concepts.</i>
Serves Customers	■	■	■				<i>Responds to internal/external customer needs and demonstrates sensitivity to customer concerns.</i>
Exhibits Leadership	■	■	■				<i>Adheres to standards, demonstrates commitment to excellence and leads by example.</i>
Negotiates Agreements	■	■	■				<i>Understands negotiations process, identifies conflicts and demonstrates composure.</i>
Works with Diversity	■	■	■				<i>Understands the legal aspects of discrimination, respects the rights of others and demonstrates awareness of diversity.</i>
<b>Understanding and Management of Systems</b> Understands System	■	■	■	■			<i>Follows processes/procedures, responds to system demand, analyzes system configuration/stability, and recognizes system strengths/limitations.</i>
Monitors/Corrects System Performance	■	■	■	■			<i>Monitors system performance, analyzes system operation, distinguishes trends in performance and diagnoses performance deviations.</i>
Improves/Designs Systems	■	■	■				<i>Suggests system modifications/improvements and determines system components to be improved.</i>
<b>Use of Technology</b> Selects Appropriate Technology	■	■	■				<i>Understands the requirements of the task &amp; technological results and technological results.</i>
Applies Technology to Task	■	■	■				<i>Understands technology applications and manipulates technology for desired results..</i>
Maintains/Troubleshoots Technology	■	■	■				<i>Follows specified maintenance, identifies and corrects malfunctions, troubleshoots failures, evaluates performance of technology.</i>

## Skill Standards: Plant Operators

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<b>Critical Work Functions</b>	<b>Key Activities</b>							
<b>A. Operate and Monitor Project Equipment</b>	A1 <i>Inspect project equipment</i>	A2 <i>Monitor equipment performance</i>	A3 <i>Identify problems or potential problems and take corrective actions</i>	A4 <i>Ensure project / equipment is operating within parameters</i>	A5 <i>Perform logging and record-keeping</i>	A6 <i>Operate equipment</i>	A7 <i>Respond to equipment emergencies, malfunctions and alarms</i>	A8 <i>Train others to use equipment</i>
<b>B. Manage Project Systems</b>	B1 <i>Manage resources to ensure continuous production of power</i>	B2 <i>Make adjustments to restore or maintain system performance</i>	B3 <i>Monitor system performance</i>	B4 <i>Identify problems or potential problems and take corrective actions</i>	B5 <i>Communicate with internal and external organizations</i>			
<b>C. Support Equipment Maintenance</b>	C1 <i>Perform pre-maintenance activities</i>	C2 <i>Monitor and assist maintenance activities</i>	C3 <i>Perform post-maintenance activities</i>	C4 <i>Log maintenance activities</i>				
<b>D. Comply with Safety &amp; Environmental Programs</b>	D1 <i>Familiarize others with safety procedures and environmental processes</i>	D2 <i>Conduct safety and environmental inspections</i>	D3 <i>Document inspection results and regulatory compliance</i>	D4 <i>Participate in drills and response teams</i>	D5 <i>Initiate emergency response</i>	D6 <i>Keep current on safety and environmental equipment, requirements and procedures</i>		

## **Cluster: Plant Operators**

Knowledge of foundational science and engineering concepts and theories is essential in order to perform functions required of an Operator. These are listed below, and are required in addition to the technical knowledge and skills listed with each key activity.

- Electrical theory (AC/DC), transforming theory, mechanics (fluids, hydraulics), pneumatics, solids gases, liquids
- Basic structure of matter.
- The theory of operation for motors and generators,
- Thermodynamics and combustion, basic water chemistry and general chemistry and
- Transmission and power transfer theory.
- Pump theory and design and fan theory and design.
- Bearing design and lubrication.
- Valve design.
- Turbine design and types of power plants, and
- Power plant design and theory.

**Cluster: Operators**  
**Critical Work Function: A. Operate and Monitor Project Equipment**

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>A1.</b> <b>Inspect project equipment</b>	<ul style="list-style-type: none"> <li>• Sights, sounds, smells and vibrations of equipment are thoroughly inspected.</li> <li>• Gauges and indicators are read and recorded, and fall within normal operating parameters</li> <li>• Equipment history and trend data are consulted when applicable.</li> <li>• Checklists and proper tools are used correctly.</li> <li>• Problems are reported or communicated and/or corrective action is taken after verification of problem.</li> <li>• Logs and status information systems are checked prior to inspections.</li> <li>• Inspection is thorough and conducted in a timely manner.</li> <li>• Safety inspections are conducted on tools, equipment and personal protective equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of high voltage switching and substation components, and circuit breakers and disconnects.</li> <li>• Knowledge of safety standards and regulations such as OSHA 1910.269 (Occupational Safety and Health Administration) and WAC 296.45 (Washington Administrative Code), and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of industry, plant, company, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of how plant operating systems interrelate and the impact of this interrelationship on plant operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Selects data relevant to the task, predicts outcomes, analyzes data and integrates multiple items of data.</li> <li>• Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</li> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Accepts constructive criticism, sets well defined/realistic goals, demonstrates commitment to self improvement, and applies self management skills.</li> </ul>

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<b>A2.</b> <b>Monitor equipment performance</b>	<ul style="list-style-type: none"> <li>• Equipment history and trend data are consulted when applicable.</li> <li>• Equipment is monitored for efficiency, safety, and operation within parameters.</li> <li>• Corrective actions are identified, and documentation is completed once corrective actions are taken.</li> <li>• Corrective actions are taken promptly according to company procedures.</li> <li>• Indications are properly verified.</li> <li>• Out of compliance or unsafe conditions are communicated to appropriate personnel effectively and in a timely manner.</li> <li>• Communication and collaboration with resident experts are conducted effectively.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of monitoring devices (such as meters, level indicators, manometers, flow indicators, pressure indicators, charts, computer programs), how to read them and the ability to interpret readings.</li> <li>• Basic understanding of control and protective relays (pre-start, start, shut down, overcurrent, distance) and metering, the ability to read and interpret relay targets and knowledge of IEEE standards.</li> <li>• Basic understanding of PLC's</li> <li>• Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Ability to read and document equipment histories and trend data.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of corrective actions and responses for specific problems</li> <li>• Knowledge of industry, plant, company, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of how systems interrelate and the impact of this interrelationship on plant operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Identifies relevant details, facts, specifications, follows set of instructions and qualifies/analyzes information.</li> <li>• Follows procedures and pays attention to details, works with minimal supervision and demonstrates initiative.</li> <li>• Monitors system performance, analyzes system operation, distinguishes trends in performance and diagnoses performance deviations.</li> <li>• Selects appropriate categories for information, interprets information and applies processes to new information.</li> <li>• Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</li> </ul>

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<p><b>A3.</b> <b>Identify problems or potential problems and suggest or perform corrective actions</b></p>	<ul style="list-style-type: none"> <li>• Equipment data is continuously assessed and problems are identified.</li> <li>• Criticality of problem is determined and minor adjustments are made immediately.</li> <li>• Problem and solution are correctly documented.</li> <li>• Underlying root cause is identified and addressed where possible.</li> <li>• Problem and implications of problem are communicated with appropriate people in a timely manner.</li> <li>• Problems are correctly recognized and corrective actions are performed in a timely manner.</li> <li>• Equipment continues to operate properly and safely.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of monitoring devices (such as meters, level indicators, manometers, flow indicators pressure indicators), how to read them and the ability to interpret readings.</li> <li>• Basic understanding of control and protective relays (pre-start, start, shut down, overcurrent, distance) and metering, the ability to read and interpret relay targets and knowledge of IEEE standards.</li> <li>• Basic understanding of PLC's.</li> <li>• Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of high voltage switching and substation components, and circuit breakers and disconnects.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Ability to read and document equipment histories and trend data.</li> <li>• Knowledge of corrective actions and responses for specific problems</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of priorities and criticality of problems and root causes of problems.</li> <li>• Knowledge of industry, plant, company, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of common equipment malfunctions.</li> <li>• Ability to operate project control systems such as DCS and SCADA.</li> <li>• Knowledge of how systems interrelate and the impact of this interrelationship on plant operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates creative thinking process while problem solving and develops creative solutions.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle.</li> <li>• Explains concepts, Actively participates in discussion, present complex ideas and information</li> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Suggests system modifications/improvements and determines system components to be improved.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries and reports.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Follows specified maintenance, identifies and corrects malfunctions, troubleshoots failures, evaluates performance of technology.</li> </ul>

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<p><b>A4.</b> <b>Ensure project/equipment is operating within parameters</b></p>	<ul style="list-style-type: none"> <li>• Adjustments are made to prevent and/or alleviate deviations and maintain parameters</li> <li>• Adjustments, corrections, and equipment data are logged in accordance with company procedures.</li> <li>• Follow up is conducted to see how adjustments impact overall system.</li> <li>• Seasonal and climatic adjustments are correctly executed.</li> <li>• Compliance with environmental regulations is maintained.</li> <li>• Compliance with FERC (Federal Energy Regulatory Commission) license is maintained.</li> <li>• Equipment operation complies with all applicable laws and regulations.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the types of adjustments to make, and the correct quantity of adjustment.</li> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of monitoring devices (such as meters, level indicators, manometers, flow indicators pressure indicators), how to read them and the ability to interpret readings.</li> <li>• Control and protective relays (pre-start, start, shut down, overcurrent, distance) and metering—basic understanding, read and interpret relay targets and IEEE standards</li> <li>• Basic understanding of PLC's (Programmable Logic Controllers).</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Ability to read and document equipment histories and trend data.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of industry, plant, company, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of adjustments which are required seasonally.</li> <li>• Knowledge of Federal Energy Regulatory Commission (FERC) and environmental regulations.</li> <li>• Ability to operate project control systems such as DCS (Digital Control System), SCADA (Supervisory Control and Data Acquisition).</li> </ul>	<ul style="list-style-type: none"> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Performs basic computations and measurements, performs measurements and predicts arithmetic results.</li> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> <li>• Applies principles to situation, analyzes situation/information and considers risks and implications.</li> <li>• Follows procedures and pays attention to details, works with minimal supervision and demonstrates initiative.</li> <li>• Monitors system performance, analyzes system operation, distinguishes trends in performance and diagnoses performance deviations.</li> <li>• Adheres to standards, demonstrates commitment to excellence and leads by example.</li> </ul>

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<p><b>A5.</b> <b>Perform logging and record-keeping</b></p>	<ul style="list-style-type: none"> <li>• Logging is performed according to company and department policies and procedures.</li> <li>• Logs and appropriate files are input into database, filed or distributed to correct parties.</li> <li>• Logs are accurate, legible and complete and are completed in a timely manner.</li> <li>• Logging is relevant, understandable and succinct.</li> <li>• Correct terminology and abbreviations are used.</li> <li>• Status reports and other information are clearly communicated from shift to shift.</li> <li>• Logs are reviewed to keep current on plant conditions.</li> <li>• Changes in status are logged accurately and in a timely manner.</li> <li>• Policies and procedures regarding sensitive documents are carefully followed.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of industry terminology and military time.</li> <li>• Knowledge of procedures to access, file and use the logs.</li> <li>• Knowledge of company procedures.</li> <li>• Ability to prioritize content of logs and communications.</li> <li>• Ability to communicate status report and other information to coworkers at shift change.</li> <li>• Knowledge of procedures for securing or shredding sensitive documents.</li> </ul>	<ul style="list-style-type: none"> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Understands computer operation, utilizes integrated/multiple software and networks, locates and retrieves stored information, manipulates information, integrates multiple platforms, and modifies information.</li> <li>• Understands the requirements of the task &amp; technological results and technological results.</li> <li>• Completes tasks, actively participates in team activities and volunteers for special tasks and assists team members.</li> <li>• Listens attentively and interprets, clarifies and influences communication.</li> <li>• Follows processes/procedures, responds to system demand, analyzes system configuration/stability, and recognizes system strengths/limitations.</li> </ul>

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<b>A6.</b> <b>Operate equipment</b>	<ul style="list-style-type: none"> <li>• Appropriate tests are performed correctly, and test data is correctly analyzed.</li> <li>• Pre-start inspections are performed and checklists are used properly.</li> <li>• Equipment start up occurs correctly and safely and post start-up inspections are conducted.</li> <li>• Equipment shut-down is completed correctly and safely.</li> <li>• Equipment is operated properly and safely.</li> <li>• Equipment is correctly positioned, cross-tied and lined up for maintenance and other required conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of monitoring devices (such as meters, level indicators, manometers, flow indicators and pressure indicators), including how to read them and the ability to interpret readings.</li> <li>• Basic understanding of control and protective relays (pre-start, start, shut down, overcurrent, distance) and metering, the ability to read and interpret relay targets and knowledge of IEEE standards.</li> <li>• Basic understanding of PLC's.</li> <li>• Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of high voltage switching, use of hotsticks, substation components, and circuit breakers and disconnects.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, meters)</li> <li>• Ability to read and document equipment histories and trend data.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of industry, plant, company, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of how systems interrelate and the impact of this interrelationship on plant operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Draws upon experiences and prior knowledge, interprets and applies new knowledge and experience, and interprets symbols, diagrams and schematics.</li> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> <li>• Applies principles to situation, analyzes situation/information and considers risks and implications.</li> <li>• Identifies relevant details, facts, specifications, follows set of instructions and qualifies/analyzes information.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle.</li> <li>• Responds to internal/external customer needs and demonstrates sensitivity to customer concerns.</li> <li>• Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</li> </ul>

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<p><b>A7.</b> <b>Respond to equipment emergencies, malfunctions and alarms</b></p>	<ul style="list-style-type: none"> <li>• Responses to alarms are appropriate to the alarm.</li> <li>• Emergencies and malfunctions are investigated in accordance with company policies and procedures.</li> <li>• Proper corrective actions are taken in a timely manner.</li> <li>• Emergencies and malfunctions are properly documented.</li> <li>• Equipment is tested following malfunction or emergency to ensure it is working properly.</li> <li>• Equipment is correctly returned to service.</li> <li>• Emergency responses are properly initiated where applicable.</li> <li>• Alarms and responses to alarms are communicated to appropriate personnel effectively and in a timely manner.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to recognize alarms, and knowledge of the meaning of the alarm and the associated corrective action/s.</li> <li>• Knowledge of company policies and procedures and emergency procedures and policies, including fire and evacuation procedures.</li> <li>• Knowledge of monitoring devices (such as meters, level indicators, manometers, flow indicators and pressure indicators), including how to read them and the ability to interpret readings.</li> <li>• Basic understanding of control and protective relays (pre-start, start, shut down, overcurrent, distance) and metering, the ability to read and interpret relay targets and knowledge of IEEE standards.</li> <li>• Basic understanding of PLC's.</li> <li>• Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of high voltage switching and substation components, and circuit breakers and disconnects.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Ability to read and document equipment histories and trend data.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of industry, plant, company, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of how systems interrelate and the impact of this interrelationship on plant operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries and reports.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Maintains a positive self image, responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understands own impact on others.</li> <li>• Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</li> <li>• Understands the requirements of the task &amp; technological results and technological results.</li> <li>• Draws upon experiences and prior knowledge, interprets and applies new knowledge and experience, and interprets symbols, diagrams and schematics.</li> <li>• Listens attentively and interprets, clarifies and influences communication.</li> </ul>

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<p><b>A8.</b> <b><i>Train others to use equipment</i></b></p>	<ul style="list-style-type: none"> <li>• Trainees are given a complete orientation to the equipment.</li> <li>• All important information regarding equipment safety is communicated clearly and effectively.</li> <li>• Proper use of equipment is demonstrated and reviewed where appropriate.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of monitoring devices (such as meters, level indicators, manometers, flow indicators and pressure indicators), including how to read them and the ability to interpret readings.</li> <li>• Basic understanding of control and protective relays (pre-start, start, shut down, overcurrent, distance) and metering, the ability to read and interpret relay targets and knowledge of IEEE standards.</li> <li>• Basic understanding of PLC's.</li> <li>• Schematics and diagrams (mechanical, Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of high voltage switching and substation components, and circuit breakers and disconnects.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Ability to read and document equipment histories and trend data.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of industry, plant, company, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of how systems interrelate and the impact of this interrelationship on plant operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Models proper performance/attitudes, conducts task specific training and coaches others to apply related concepts.</li> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> <li>• Adheres to standards, demonstrates commitment to excellence and leads by example.</li> <li>• Understands the legal aspects of discrimination, respects the rights of others and demonstrates awareness of diversity.</li> <li>• Explains concepts, Actively participates in discussion, present complex ideas and information</li> <li>• Draws upon experiences and prior knowledge, interprets and applies new knowledge and experience, and interprets symbols, diagrams and schematics.</li> <li>• Follows processes/procedures, responds to system demand, analyzes system configuration/stability, and recognizes system strengths/limitations.</li> </ul>

**Cluster: Operators**  
**Critical Work Function: B. Manage Project Systems**

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<p><b>B1.</b>  <b>Manage resources to ensure continuous generation of power</b></p>	<ul style="list-style-type: none"> <li>• Adequate supplies of resources such as fuel, water, air pressure, oil, chemicals, and electricity are maintained.</li> <li>• Resources are monitored correctly.</li> <li>• Deficiencies are reported and communicated to appropriate personnel effectively and in a timely manner.</li> <li>• Documentation is performed according to company procedures.</li> <li>• Compliance with FERC (Federal Energy Regulatory Commission) license is maintained.</li> <li>• Resource requirements are communicated to appropriate personnel effectively and in a timely manner.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the characteristics of fuel and the quantities required to produce a given output.</li> <li>• Knowledge of hydraulics and travel time.</li> <li>• Knowledge of inventory and logistics control systems and procedures.</li> <li>• Knowledge of FERC Federal Energy Regulatory Commission) requirements.</li> <li>• Ability to identify the levels of resource availability and to estimate amounts required to meet output requirements.</li> <li>• Knowledge of the impact of variable weather conditions.</li> <li>• Knowledge of how flow and level of fuel impact one another.</li> <li>• Knowledge of flow versus level of fuel.</li> <li>• Ability to access and use equipment availability information.</li> <li>• Knowledge of monitoring equipment and ability to access resource data and trend information.</li> <li>• Knowledge of documentation and communication procedures.</li> <li>• Ability to identify deficiencies in resources and knowledge of reporting procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</li> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data.</li> <li>• Organizing information</li> <li>• Demonstrates creative thinking process while problem solving and develops creative solutions.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Performs basic computations and measurements, performs measurements and predicts arithmetic results.</li> </ul>

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<p><b>B2.</b> <b><i>Make adjustments to restore or maintain system performance</i></b></p>	<ul style="list-style-type: none"> <li>• The correct adjustments are made to prevent and/or alleviate deviations and maintain parameters.</li> <li>• Adjustments, corrections, and equipment data are logged in accordance with company procedures.</li> <li>• Follow up is correctly conducted to ensure adjustments resulted in the desired outcome.</li> <li>• Compliance with environmental regulations required for the project is maintained.</li> <li>• Compliance with FERC (Federal Energy Regulatory Commission) license is maintained.</li> <li>• System performance complies with all applicable laws and regulations.</li> <li>• Adjustments take into account the impact on the system and status.</li> <li>• System needs are recognized/anticipated and adjustments are made accordingly to prevent and mitigate problems.</li> <li>• Manual adjustments are made when required.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of how all the project systems operate and normal parameters (systems such as oil, water, coal, pneumatic, HVAC, electrical, auxiliary systems, plant load control, steam generator, fire suppression) and how systems interrelate.</li> <li>• Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of high voltage switching and substation components, and circuit breakers and disconnects.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Ability to read and document system histories and trend data.</li> <li>• Knowledge of corrective actions for specific problems</li> <li>• Knowledge of industry, plant, company, system, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge environmental regulations and FERC requirements and all other applicable laws and regulations.</li> <li>• Ability to make manual adjustments.</li> <li>• Ability to operate project control systems such as DCS, SCADA.</li> </ul>	<ul style="list-style-type: none"> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle.</li> <li>• Suggests system modifications/improvements and determines system components to be improved.</li> <li>• Understands the requirements of the task &amp; technological results and technological results.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries and reports.</li> </ul>

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<b>B3.</b> <b>Monitor system performance</b>	<ul style="list-style-type: none"> <li>• System history and trend data are consulted when applicable.</li> <li>• System is monitored for efficiency, safety, and operation within parameters.</li> <li>• Out of compliance or unsafe conditions are logged and communicated to appropriate personnel effectively and in a timely manner.</li> <li>• Indications are correctly verified.</li> <li>• Compliance with environmental regulations is maintained.</li> <li>• Compliance with FERC (Federal Energy Regulatory Commission) license is maintained.</li> <li>• System performance and monitoring activities are correctly logged.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to locate and analyze trend data.</li> <li>• Ability to identify and report out of compliance or unsafe conditions.</li> <li>• Knowledge of procedures to verify indications.</li> <li>• Knowledge and understanding of the desired outcomes and benchmarks.</li> <li>• Knowledge of the location of equipment in the project.</li> <li>• Knowledge of how all the project systems operate and normal parameters (systems such as oil, water, coal, pneumatic, HVAC, electrical, auxiliary systems, plant load control, steam generator, fire suppression) and how systems interrelate.</li> <li>• Knowledge of monitoring devices, how to read them and the ability to interpret readings.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Ability to read and document system histories and trend data.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of industry, plant, company, system, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge environmental regulations and FERC requirements and all applicable laws and regulations</li> <li>• Ability to operate project control systems such as DCS, SCADA.</li> </ul>	<ul style="list-style-type: none"> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries and reports.</li> <li>• Understands the requirements of the task &amp; technological results and technological results.</li> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> </ul>

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<p><b>B4.</b> <b>Identify problems or potential problems and take corrective actions</b></p>	<ul style="list-style-type: none"> <li>• System data is continuously assessed and problems are identified.</li> <li>• Criticality of problem is determined and minor adjustments are made as soon as possible.</li> <li>• Problem and solution are properly documented.</li> <li>• Underlying root cause is identified and addressed where possible.</li> <li>• Problem and implications of problem are communicated with appropriate people in a timely manner.</li> <li>• Problems are correctly recognized and corrective actions are performed in a timely manner.</li> <li>• Problems are correctly anticipated and mitigation actions are implemented.</li> <li>• Collateral effects of corrective action on subsystems are considered.</li> <li>• Communication and collaboration with resident experts are conducted effectively.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to locate and analyze system data and to identify problems.</li> <li>• Ability to assess criticality of problems, and to make minor adjustments.</li> <li>• Knowledge of problem documentation and communication procedures.</li> <li>• Knowledge of corrective actions for specific problems</li> <li>• Knowledge of root causes and ability to troubleshoot the system.</li> <li>• Knowledge of chronic problems and system malfunctions and their resolutions.</li> <li>• Knowledge of the location of equipment in the project.</li> <li>• Knowledge of how all the project systems operate and normal parameters (systems such as oil, water, coal, pneumatic, HVAC, electrical, auxiliary systems, plant load control, steam generator, fire suppression) and how systems interrelate.</li> <li>• Knowledge of monitoring devices, how to read them and the ability to interpret readings.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Ability to read and document system histories and trend data.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of industry, plant, company, system, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge environmental regulations and FERC requirements and all applicable laws and regulations</li> <li>• Ability to operate project control systems such as DCS, SCADA.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Selects data relevant to the task, predicts outcomes, analyzes data and integrates multiple items of data.</li> <li>• Accepts constructive criticism, sets well defined/realistic goals, demonstrates commitment to self improvement, and applies self management skills.</li> <li>• Applies principles to situation, analyzes situation/information and considers risks and implications.</li> <li>• Monitors system performance, analyzes system operation, distinguishes trends in performance and diagnoses performance deviations.</li> <li>• Follows specified maintenance, identifies and corrects malfunctions, troubleshoots failures, evaluates performance of technology.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>B5.</b> <b>Communicate with internal and external organizations</b></p>	<ul style="list-style-type: none"> <li>• Information is accurately given and received, is appropriate to the situation and is timely.</li> <li>• Questions are answered in a courteous and respectful manner.</li> <li>• Internal and external customer issues are accurately and thoroughly discussed and solutions are defined.</li> <li>• Communication is concise and performed without discrimination.</li> <li>• Proper terminology is used to communicate with internal organizations and personnel such as Engineering, Information Technology, Biologists, and Contractors.</li> <li>• Proper messages are delivered to external organizations such as Tribes, state and federal agencies, irrigation districts, and insurance companies.</li> <li>• Organizations are referred to the public relations department when appropriate.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of industry, plant, company, system, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Knowledge of company policies regarding required and allowable communications.</li> <li>• Ability to locate and use communications devices such as telephones, radios, pagers, code system, PA systems, email.</li> <li>• Ability to identify and report internal and external customer issues.</li> </ul>	<ul style="list-style-type: none"> <li>• Responds to internal/external customer needs and demonstrates sensitivity to customer concerns.</li> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> <li>• Demonstrates creative thinking process while problem solving and develops creative solutions.</li> <li>• Follows processes/procedures, responds to system demand, analyzes system configuration/stability, and recognizes system strengths/limitations.</li> <li>• Understands the legal aspects of discrimination, respects the rights of others and demonstrates awareness of diversity.</li> <li>• Explains concepts, Actively participates in discussion, present complex ideas and information</li> <li>• Listens attentively and interprets, clarifies and influences communication.</li> </ul>

**Cluster: Operators**  
**Critical Work Function: C. Support Equipment Maintenance**

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>C1.</b> <b>Perform pre-maintenance activities</b>	<ul style="list-style-type: none"> <li>• Equipment is properly shut down.</li> <li>• Equipment is placed in the proper condition for maintenance.</li> <li>• Lockout tagout is properly applied in accordance with written procedures.</li> <li>• Checklists are followed where applicable.</li> <li>• Plant equipment is correctly reconfigured to allow the maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of scope of work of the maintenance to be performed.</li> <li>• Knowledge of energy isolation and how to remove all potential energy to put equipment in a safe condition such as deenergizing pressure, electrical, rotation, and springs.</li> <li>• Knowledge of lockout/tagout requirements and procedures.</li> <li>• Knowledge of how all the project systems operate and normal parameters (systems such as oil, water, coal, pneumatic, HVAC, electrical, auxiliary systems, plant load control, steam generator, fire suppression) and how systems interrelate.</li> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters.</li> <li>• Knowledge of schematics and diagrams (mechanical, electrical, civil) and symbols.</li> <li>• Knowledge of high voltage switching and substation components, and circuit breakers and disconnects.</li> <li>• Knowledge of safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment and how to use it.</li> <li>• Ability to use tools such as hand tools, power tools, and meters.</li> <li>• Knowledge of standard operating procedures, documentation requirements, and required logs.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of industry, plant, company, system, equipment, scientific, technical, tool, safety, and personnel terminology.</li> </ul>	<ul style="list-style-type: none"> <li>• Completes tasks, actively participates in team activities and volunteers for special tasks and assists team members.</li> <li>• Demonstrates creative thinking process while problem solving and develops creative solutions.</li> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> <li>• Accepts constructive criticism, sets well defined/realistic goals, demonstrates commitment to self improvement, and applies self management skills.</li> <li>• Understands negotiations process, identifies conflicts and demonstrates composure.</li> <li>• Identifies relevant details, facts, specifications, follows set of instructions and qualifies/analyzes information.</li> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
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<b>C2.</b> <b>Monitor and assist maintenance activities</b>	<ul style="list-style-type: none"> <li>• Maintenance processes are monitored visually.</li> <li>• Scope of maintenance work is correctly identified.</li> <li>• Communication is maintained with maintenance crew.</li> <li>• Equipment is prepared as required for the maintenance process.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of scope of work of the maintenance to be performed.</li> <li>• Basic understanding of maintenance process.</li> <li>• Knowledge of how all the project systems operate and normal parameters (systems such as oil, water, coal, pneumatic, HVAC, electrical, auxiliary systems, plant load control, steam generator, fire suppression) and how systems interrelate</li> <li>• Knowledge of how to position or configure equipment.</li> <li>• Knowledge of energy isolation and how to remove all potential energy to put equipment in a safe condition such as deenergizing pressure, electrical, rotation, and springs.</li> <li>• Knowledge of lockout/tagout requirements and procedures.</li> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters and under maintenance and test conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Listens attentively and interprets, clarifies and influences communication.</li> <li>• Selects data relevant to the task, predicts outcomes, analyzes data and integrates multiple items of data.</li> <li>• Completes tasks, actively participates in team activities and volunteers for special tasks and assists team members.</li> <li>• Responds to internal/external customer needs and demonstrates sensitivity to customer concerns.</li> <li>• Adheres to standards, demonstrates commitment to excellence and leads by example.</li> <li>• Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>C3.</b> <b>Perform post-maintenance activities</b>	<ul style="list-style-type: none"> <li>• Equipment is test-run to ensure it is in good working order following maintenance.</li> <li>• Equipment is inspected to ensure it is properly reassembled and ready for service.</li> <li>• Lockout tag outs are properly removed</li> <li>• Pre Start up check list is followed prior to start-up, which is properly conducted.</li> <li>• Auxiliary equipment is returned to service.</li> <li>• Unit availability is communicated with system operator or other appropriate personnel.</li> <li>• Coordinate everything with the maintenance other employees</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of scope of work of the maintenance to be performed.</li> <li>• Knowledge of how all the project systems operate and normal parameters (systems such as oil, water, coal, pneumatic, HVAC, electrical, auxiliary systems, plant load control, steam generator, fire suppression) and how systems interrelate.</li> <li>• Knowledge of the location of equipment in the project, how the equipment operates and normal operating parameters and under maintenance and test conditions.</li> <li>• Knowledge of lockout tagout removal requirements and procedures.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of procedures for restoring equipment to service.</li> <li>• Restore equipment to service</li> <li>• Ability to observe and identify abnormalities and deviations.</li> </ul>	<ul style="list-style-type: none"> <li>• Completes tasks, actively participates in team activities and volunteers for special tasks and assists team members.</li> <li>• Responds to internal/external customer needs and demonstrates sensitivity to customer concerns.</li> <li>• Maintains a positive self image, responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understands own impact on others.</li> <li>• Applies principles to situation, analyzes situation/information and considers risks and implications.</li> <li>• Understands negotiations process, identifies conflicts and demonstrates composure.</li> <li>• Understands the legal aspects of discrimination, respects the rights of others and demonstrates awareness of diversity.</li> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>C4.</b> <b>Log</b> <b>maintenance</b> <b>activities</b>	<ul style="list-style-type: none"> <li>• Logging is performed according to company and department policies and procedures.</li> <li>• Logs and appropriate files are input into database, filed or distributed to correct parties.</li> <li>• Logs are accurate, legible and complete and are completed in a timely manner.</li> <li>• Logging is relevant, understandable and succinct.</li> <li>• Correct terminology and abbreviations are used.</li> <li>• Status reports and other information are clearly communicated from shift to shift.</li> <li>• Logs are reviewed to keep current on plant conditions.</li> <li>• Changes in status are logged accurately and in a timely manner.</li> <li>• Abnormal conditions are accurately recorded.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of company policies and procedures.</li> <li>• Knowledge of industry, plant, company, system, equipment, scientific, technical, tool, safety, and personnel terminology.</li> <li>• Ability to input relevant and accurate data into manual and electronic system.</li> <li>• Knowledge of log distribution procedures.</li> <li>• Knowledge of industry, plant, company, system, equipment, scientific, technical, tool, safety, and personnel terminology and acronyms.</li> <li>• Knowledge of turnover procedures.</li> <li>• Knowledge of changes in status and abnormal conditions and procedures for logging them.</li> </ul>	<ul style="list-style-type: none"> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Understands computer operation, utilizes integrated/multiple software and networks, locates and retrieves stored information, manipulates information, integrates multiple platforms, and modifies information.</li> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> <li>• Follows procedures and pays attention to details, works with minimal supervision and demonstrates initiative.</li> <li>• Responds to internal/external customer needs and demonstrates sensitivity to customer concerns.</li> </ul>

**Cluster: Operators**  
**Critical Work Function: D. Comply with Safety and Environmental Programs**

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>D1. Familiarize others with safety procedures and environmental processes</b></p>	<ul style="list-style-type: none"> <li>• Familiarization includes evacuation codes, lockout tag out, emergency contact information, location of emergency equipment, site specific standard operating procedures, restricted areas and location of environmental regulations.</li> <li>• Familiarization is clear and concise.</li> <li>• Familiarization builds on the organization's safety training.</li> <li>• Unsafe work practices are clearly communicated.</li> <li>• Familiarization covers equipment that maintains or monitors environmental conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of evacuation codes, lockout tag out, emergency contact information, location of emergency equipment, site specific standard operating procedures, restricted areas and location of environmental regulations.</li> <li>• Knowledge of organization's safety training.</li> <li>• Knowledge of unsafe work practices.</li> <li>• Knowledge of equipment that maintains or monitors current conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Models proper performance/attitudes, conducts task specific training and coaches others to apply related concepts.</li> <li>• Draws upon experiences and prior knowledge, interprets and applies new knowledge and experience, and interprets symbols, diagrams and schematics.</li> <li>• Follows procedures and pays attention to details, works with minimal supervision and demonstrates initiative.</li> <li>• Follows processes/procedures, responds to system demand, analyzes system configuration/stability, and recognizes system strengths/limitations.</li> <li>• Understands the legal aspects of discrimination, respects the rights of others and demonstrates awareness of diversity.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>D2.</b> <b>Conduct safety and environmental inspections</b></p>	<ul style="list-style-type: none"> <li>• Potential hazards are correctly identified.</li> <li>• Inspection findings are accurately logged.</li> <li>• Routine tests / inspections are conducted on all safety equipment.</li> <li>• Inspections meet in all applicable laws and regulations.</li> <li>• Inspections are thorough and are conducted on a regular basis.</li> <li>• Corrective actions for safety deviations are taken when possible.</li> <li>• Safety concerns are communicated to appropriate personnel effectively and in a timely manner.</li> <li>• Inspections include security equipment where applicable.</li> <li>• Inspections include environmental emissions and findings outside of regulatory requirements, and they are corrected where possible and properly reported.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of security issues and challenges, and emergency contact information.</li> <li>• Knowledge of seismic inspection requirements.</li> <li>• Knowledge of the use of checklists and how to access them.</li> <li>• Knowledge of monitoring devices such as CEMs (continuous emission monitoring), and how to read them.</li> <li>• Knowledge of restricted areas such as confined space and CO2 areas.</li> <li>• Knowledge of potential hazards</li> <li>• Knowledge of logging procedures.</li> <li>• Ability to perform routine tests on safety equipment.</li> <li>• Knowledge of corrective actions for safety deviations.</li> <li>• Knowledge of environmental emissions requirements, inspection procedures and reporting protocols.</li> <li>• Knowledge of all applicable environmental and safety laws and regulations.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> <li>• Selects data relevant to the task, predicts outcomes, analyzes data and integrates multiple items of data.</li> <li>• Follows specified maintenance, identifies and corrects malfunctions, troubleshoots failures, evaluates performance of technology.</li> <li>• Completes tasks, actively participates in team activities and volunteers for special tasks and assists team members.</li> <li>• Follows procedures and pays attention to details, works with minimal supervision and demonstrates initiative.</li> <li>• Records information accurately, completes forms and writes simple documents.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>D3.</b> <b>Document inspection results and regulatory compliance</b></p>	<ul style="list-style-type: none"> <li>• Logging is performed according to company and department policies and procedures.</li> <li>• Logs and appropriate files are input into database, filed or distributed to correct parties.</li> <li>• Logs are accurate, legible and complete and are completed in a timely manner.</li> <li>• Logging is relevant, understandable and succinct.</li> <li>• Correct terminology and abbreviations are used.</li> <li>• Logs are reviewed to keep current on plant conditions.</li> <li>• Abnormal conditions are accurately recorded.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of industry terminology, abbreviations and acronyms.</li> <li>• Knowledge of company procedures and log protocols.</li> <li>• Knowledge of the priority items to log with respect to abnormal conditions.</li> <li>• Knowledge of required documentation for each compliance requirement.</li> </ul>	<ul style="list-style-type: none"> <li>• Responds to internal/external customer needs and demonstrates sensitivity to customer concerns.</li> <li>• Selects appropriate categories for information, interprets information and applies processes to new information.</li> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Understands computer operation, utilizes integrated/multiple software and networks, locates and retrieves stored information, manipulates information, integrates multiple platforms, and modifies information.</li> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>D4.</b> <b>Participate in drills and emergency response teams</b>	<ul style="list-style-type: none"> <li>• Training and certification on relevant emergency, first aid and CPR procedures are complete and up to date.</li> <li>• Emergency response complies with company and regulatory policies and procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to use emergency equipment.</li> <li>• Knowledge of Safety standards and regulations (OSHA 1910.269 and WAC 296.45) and personal protective equipment.</li> <li>• Ability to obtain certifications.</li> <li>• Knowledge of emergency policies and procedures and emergency responses.</li> <li>• Knowledge of emergency phone numbers and address/locations within facilities.</li> </ul>	<ul style="list-style-type: none"> <li>• Completes tasks, actively participates in team activities and volunteers for special tasks and assists team members.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> <li>• Maintains a positive self image, responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understands own impact on others.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle.</li> <li>• Understands the legal aspects of discrimination, respects the rights of others and demonstrates awareness of diversity.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>D5</b> <b>Initiate emergency response</b>	<ul style="list-style-type: none"> <li>• Spill response plan (SPCC—Spill Prevention, Control and Countermeasure) is followed when applicable.</li> <li>• Emergency responses are executed in accordance with company regulations.</li> <li>• EAP (Emergency Action Plan) for hydro facilities is executed in accordance with company and state regulations.</li> <li>• Appropriate departments, agencies and personnel are notified in correct priority and in a timely manner.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of spill response plan and ability to execute it.</li> <li>• Knowledge of company regulations regarding emergencies.</li> <li>• Knowledge of EAP for hydro facilities.</li> <li>• Knowledge of communications protocols and industry terminology.</li> <li>• Ability to operate the emergency alarm equipment.</li> <li>• Knowledge of emergency exits.</li> <li>• Knowledge of emergency phone numbers and address/locations within facilities.</li> </ul>	<ul style="list-style-type: none"> <li>• Adheres to standards, demonstrates commitment to excellence and leads by example.[</li> <li>• Explains concepts, Actively participates in discussion, present complex ideas and information</li> <li>• Accepts constructive criticism, sets well defined/realistic goals, demonstrates commitment to self improvement, and applies self management skills.</li> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> </ul>
<b>D6</b> <b>Keep current on safety and environmental equipment, requirements and procedures</b>	<ul style="list-style-type: none"> <li>• Trainings mandated by the organization are attended with full participation</li> <li>• Safety and environmental materials are reviewed on a regular basis.</li> <li>• Currency and proficiency are maintained for all safety and environmental equipment, requirements and procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of location of materials and information.</li> <li>• Ability to access trainings provided by the organization.</li> <li>• Knowledge of safety and environmental equipment, requirements and procedures such as evacuation codes, lockout tag out, emergency contact information, location of emergency equipment, site specific standard operating procedures, restricted areas, location of environmental regulations, special conditions personal protective equipment, first aid/CPR cards, and fire extinguishers.</li> </ul>	<ul style="list-style-type: none"> <li>• Draws upon experiences and prior knowledge, interprets and applies new knowledge and experience, and interprets symbols, diagrams and schematics.</li> <li>• Identifies relevant details, facts, specifications, follows set of instructions and qualifies/analyzes information.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries and reports.</li> <li>• Listens attentively and interprets, clarifies and influences communication.</li> <li>• Follows procedures and pays attention to details, works with minimal supervision and demonstrates initiative.</li> </ul>

# **RESULTS: Skill Standards for Plant Mechanics**

## **Typical Job Description**

## **Scenarios: Routine, Crisis and Long Term**

## **SCANS Survey Results**

## **Summary of Critical Work Functions and Key Activities**

## **Skill Standards**

## **Verification Results**

## Plant Mechanic

### Job Description:

**Position Summary/Accountabilities** This position is responsible for all aspects of the maintenance, testing, safety and monitoring of equipment.

**Job Functions** The requirements listed below are representative of, but not limited to, the knowledge, skills and/or abilities required to do the job.

- Demonstrates leadership in the area of safety. This requires observing and enforcing safety rules, polices, and practices, encouraging safe work behaviors, and promptly correcting conditions and unsafe behaviors, which may lead to accidents.
- Ensures that all aspects of plant operations remain in compliance with environmental rules and regulations. Operates control equipment to obtain safe and economical operation of HRSG, turbines, and auxiliary equipment.
- Performs a variety of work connected with the operations, inspections and maintenance of sites.
- Performs the mechanical, electrical and basic instrument and control troubleshooting, maintaining, repairing, cleaning, inspecting and constructing of equipment and systems for the generation facility.
- Performs clean-up and preservation tasks throughout the facility.
- Responsible for the assembly, repair and testing of equipment such as turbines, pumps, compressors, etc.
- Performs maintenance and repairs on bearings, seals, packing glands, etc.
- Repairs and maintains equipment and machinery, in accordance with proscribed manuals, specifications and codes using hand tools, shop equipment and test and analysis equipment such as micrometers, calipers, feeler gauges, and dial indicators.
- Operates switchboard to obtain safe and proper operation of plant and system electrical equipment.
- Performs various welding activities including weld repairs on equipment and structures.
- Installs, repairs and replaces piping.
- Performs all work according to established procedures and safety practices.
- Performs various generating plant and shop area housekeeping functions.
- Participates in outage work in all areas of operations, maintenance, repair and testing.
- Possesses skills in reading, basic math and electricity and have mechanical aptitude.
- Performs indoors and outdoors with exposure to temperature extremes, weather, dirt, dust and grease.
- Work could keep employee on his/her feet for long periods of time.
- Is exposed to normal workplace hazards where normal safety precautions are required.
- Subject to both inside & outside environmental conditions; confined spaces, height and moving mechanical parts.

#### SKILLS/COMPETENCIES:

- Applies knowledge in the operation of plant equipment and safety requirements specific to the area of assignment.
- Applies knowledge of the design and function of utility related equipment.
- Skill in the operation of mechanical, electrical, pneumatic, and hydraulic equipment.
- May require knowledge of monitoring, recording, sampling and testing related to utility plant operations.
- Ability to interpret and follow direction.
- Follows industry or specific guidelines, particularly as they relate to safety, health and environmental practices.
- Must have a positive team attitude when working with other team members.
- Proficient written and verbal communication skills.

#### DEGREES/CERTIFICATIONS/LICENSE/EXPERIENCE:

##### Required:

- High School diploma or equivalent.
  - Minimum 1 year experience preferred related to a power plant and/or chemical plant environment or college level associate degree in related field of study.
  - Basic knowledge of First Aid & CPR.
  - Possession of a valid drivers license.
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## Scenarios

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### Routine:

It's 6:00am and the morning meeting has started. The exact date of the outage for unit 1 is revealed and the planning starts. We must secure the unit and get it opened up for inspection. There are about 10 days to get the boom truck and the crane checked. Engineering will be present and operations are informed. We review the check list for this unit to ensure we have enough people and equipment to do the job. After the 20 minute meeting, everyone goes on their way, some to set up for the unit outage, and others to make sure the daily work is handled.

### Primary Tasks and Functions Involved in this Scenario

<b>Critical Work Functions</b>	<b>Key Activities</b>					
<b>A. Maintain a Safe and Environmentally-Conscious work Environment</b>	A1 <i>Perform environmental and safety inspections</i>	A2 <i>Perform emergency drills and participate in emergency response teams</i>	A3 <i>Identify and report unsafe conditions and take corrective action</i>	A4		
<b>B. Maintain and Repair Equipment</b>	B1 <i>Perform troubleshooting</i>	B2 <i>Perform preventive maintenance</i>	B3 <i>Gather materials, tools and equipment</i>	B4 <i>Document equipment maintenance</i>	B5	B6
<b>C. Operate Auxiliary Equipment</b>	C1 <i>Inspect equipment</i>	C2 <i>Monitor equipment indicators to ensure it is operating correctly</i>	C3	C4		
<b>D. Install Equipment</b>	D1 <i>Participate on the installation, customization or upgrade team</i>	D2 <i>Move or remove equipment</i>	D3	D4		
<b>E. Communicate with Co-Workers to Promote Safety and Productivity</b>	E1 <i>Prepare maintenance and repair logs</i>	E2 <i>Participate in meetings and problem solving groups</i>	E3 <i>Communicate safety and job-specific needs</i>	E4 <i>Suggest ways to prevent future equipment malfunction or improve equipment performance</i>		
<b>F. Fabricate parts, pieces and systems, specialty devices, tools</b>	F1	F2	F3	F4	F5	

**Crisis Mechanic E-mail Arrives:**

*I'd like to schedule a black start test for Upper Baker for compliance purposes. Given the price of power is this a good time to proceed? Levy estimated about three hours maximum required to complete it. We are still checking into some of the details with respect to our interlocks at Shannon for such testing but should be ready to proceed in short order. Please let me know if we can take the unit during the next week or so and the time of day which is best to proceed.*

Senior Electrical Engineer  
Puget Sound Energy

**Primary Tasks and Functions Involved in this Scenario**

<b>Critical Work Functions</b>	<b>Key Activities</b>					
<b>A. Maintain a Safe and Environmentally-Conscious work Environment</b>	A1 Perform environmental and safety inspections	A2 Perform emergency drills and participate in emergency response teams	A3 Identify and report unsafe conditions and take corrective action	A4		
<b>B. Maintain and Repair Equipment</b>	B1 Perform troubleshooting	B2 Perform preventive maintenance	B3 Gather materials, tools and equipment	B4 Document equipment maintenance	B5 Perform repairs	B6 Perform housekeeping
<b>C. Operate Auxiliary Equipment</b>	C1 Inspect equipment	C2 Monitor equipment indicators to ensure it is operating correctly	C3 Operate rolling / mobile equipment	C4 Operate heavy equipment		
<b>D. Install Equipment</b>	D1 Participate on the installation, customization or upgrade team	D2 Move or remove equipment	D3	D4		
<b>E. Communicate with Co-Workers to Promote Safety and Productivity</b>	E1 Prepare maintenance and repair logs	E2 Participate in meetings and problem solving groups	E3 Communicate safety and job-specific needs	E4		
<b>F. Fabricate parts, pieces and systems, specialty devices, tools</b>	F1	F2	F3	F4	F5	

**Long Term Mechanic:**

All of the agencies have been notified that the power house will be secured for three weeks. There is little water, but the prices are high. The dewatering process will be complex and safety is the key concern. We will have 24 hours to get the plant secured and make sure everything runs according to plan and within compliance requirements.

We have a crew ready for the dewater process and a crew ready for the clearance and teardown. Engineering has a new runner on the way. They would like some support for an inspection of the runner before it is shipped out. Two mechanics will need to fly to Canada for a status check with two engineers. Bearings are being re-babbited and there is concern of the cooling water passages and final bearing clearances.

The mechanics will be augmented from other crews from around the company and long hours are expected. This is only one of the three required major maintenance outages of this year. They all need to be completed within the year.

**Primary Tasks and Functions Involved in this Scenario**

<b>Critical Work Functions</b>	<b>Key Activities</b>					
<b>A. Maintain a Safe and Environmentally-Conscious work Environment</b>	<b>A1</b> <i>Perform environmental and safety inspections</i>	<b>A2</b> <i>Perform emergency drills and participate in emergency response teams</i>	<b>A3</b> <i>Identify and report unsafe conditions and take corrective action</i>	<b>A4</b> <i>Provide safety training for other employees</i>		
<b>B. Maintain and Repair Equipment</b>	<b>B1</b> <i>Perform troubleshooting</i>	<b>B2</b> <i>Perform preventive maintenance</i>	<b>B3</b> <i>Gather materials, tools and equipment</i>	<b>B4</b> <i>Document equipment maintenance</i>	<b>B5</b> <i>Perform repairs</i>	<b>B6</b> <i>Perform housekeeping</i>
<b>C. Operate Auxiliary Equipment</b>	<b>C1</b> <i>Inspect equipment</i>	<b>C2</b> <i>Monitor equipment indicators to ensure it is operating correctly</i>	<b>C3</b> <i>Operate rolling / mobile equipment</i>	<b>C4</b> <i>Operate heavy equipment</i>		
<b>D. Install Equipment</b>	<b>D1</b> <i>Participate on the installation, customization or upgrade team</i>	<b>D2</b> <i>Move or remove equipment</i>	<b>D3</b> <i>Test to ensure proper function after installation, customization, move or upgrade</i>	<b>D4</b> <i>Document installation</i>		

<b>E.</b> <b>Communicate with Co-Workers to Promote Safety and Productivity</b>	<b>E1</b> <i>Prepare maintenance and repair logs</i>	<b>E2</b> <i>Participate in meetings and problem solving groups</i>	<b>E3</b> <i>Communicate safety and job-specific needs</i>	<b>E4</b> <i>Suggest ways to prevent future equipment malfunction or improve equipment performance</i>		
<b>F.</b> <b>Fabricate parts, pieces and systems, specialty devices, tools</b>	<b>F1</b> <i>Build structures</i>	<b>F2</b> <i>Perform carpentry and foundation work</i>	<b>F3</b> <i>Perform plumbing</i>	<b>F4</b> <i>Perform welding</i>	<b>F5</b> <i>Perform machining</i>	

**SCANS Survey Results: Plant Mechanics**

<i>Foundation Skills and Personal Qualities</i>	0	1	2	3	4	5	<i>Critical Competencies</i>
<b>Basic Skills</b> Demonstrates Effective Reading Strategies	█	█	█				<i>Identifies relevant details, facts, specifications; follows set of instructions.</i>
Demonstrates Effective Writing Strategies	█	█	█				<i>Records information accurately, completes forms and writes simple documents.</i>
Applies Arithmetic Processes	█	█	█				<i>Performs basic computations and measurements, performs measurements and predicts arithmetic results.</i>
Applies Mathematics Processes	█	█	█				<i>Utilizes mathematical formulas and processes, Summarizes and translates mathematical data.</i>
Demonstrates Effective Listening Skills	█	█	█				<i>Listens attentively and Confirms information and Interprets communication.</i>
Demonstrates Effective Speaking Skills	█	█	█				<i>Communicates appropriate verbal/non-verbal messages, actively participates in discussion and present complex ideas and information.</i>
<b>Thinking Skills</b> Applies Creative Thinking/Generates Ideas	█	█	█				<i>Demonstrates creative thinking process while problem solving.</i>
Applies Decision Making Strategies	█	█	█				<i>Understands decision making process, analyzes situation/information and considers risks/implications.</i>
Recognizes and Solves Problems	█	█	█				<i>Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</i>
Demonstrates Visualization	█	█	█				<i>Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</i>
Knows How to Learn	█	█	█				<i>Draws upon experiences and prior knowledge; Interprets and applies new knowledge and experience.</i>
Applies Reasoning Skills	█	█	█				<i>Uses logic to draw conclusions and analyzes logic/rule/principle</i>
<b>Personal Qualities</b> Demonstrates Responsibility	█	█	█	█			<i>Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</i>
Demonstrates Belief in Self Worth	█	█	█	█	█		<i>Responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understand own impact on others.</i>
Demonstrates Sociability in Groups	█	█	█	█			<i>Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</i>
Demonstrates Self-Management	█	█	█				<i>Maintains self control, accepts constructive criticism, sets well defined/realistic goals and demonstrates commitment to self improvement.</i>
Demonstrates Integrity/Honesty	█	█	█				<i>Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</i>

<i>Foundation Skills and Personal Qualities</i>	0	1	2	3	4	5	<i>Critical Competencies</i>
<b>Management of Time and Resources</b> Manages Time							<i>Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</i>
Manages Money							<i>Performs routine recordkeeping.</i>
Manages Materials/Facilities							<i>Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</i>
Manages Human Resources							<i>Recognizes job tasks and distributes work assignments.</i>
<b>Management and Use of Information</b> Acquires/Evaluates Information							<i>Selects and obtains information relevant to the task and identifies the need for information.</i>
Organizes/Maintains Information							<i>Selects appropriate categories for information and interprets information.</i>
Interprets/Communicates Information							<i>Recognizes accuracy of information, interprets information and prepares basic summaries.</i>
Uses Computers to Process Information							<i>Understands computer operation, locates and retrieves information and uses integrated/multiple software.</i>
<b>Interpersonal Skills</b> Participates as Team Member							<i>Identifies with team, completes tasks, actively participates in team activities and volunteers for special tasks.</i>
Teaches Others							<i>Models proper performance/attitudes, and conducts task specific training.</i>
Serves Customers							<i>Responds to customer needs and demonstrates sensitivity to customer concerns and interests.</i>
Exhibits Leadership							<i>Adheres to standards, demonstrates commitment to excellence and leads by example.</i>
Negotiates Agreements							<i>Understands negotiations process, identifies conflicts and demonstrates composure.</i>
Works with Diversity							<i>Recognizes differences, understands the legal aspects of discrimination, respects the rights of others and encourages individuality.</i>
<b>Understanding and Management of Systems</b> Understands System							<i>Understands the system organization and follows procedures.</i>
Monitors/Corrects System Performance							<i>Monitors system performance and troubleshoots malfunction/failure.</i>
Improves/Designs Systems							<i>Identifies needed systemic improvements and suggests system modifications/improvements.</i>
<b>Use of Technology</b> Selects Appropriate Technology							<i>Understands the requirements of the task and technological results.</i>
Applies Technology to Task							<i>Understands technology applications and manipulates technology for desired results...</i>
Maintains/Troubleshoots Technology							<i>Follows specified maintenance and identifies, troubleshoots and corrects failures.</i>

## Skill Standards: Plant Mechanics

<b>Critical Work Functions</b>	<b>Key Activities</b>					
<b>A. Maintain a Safe and Environmentally-Conscious work Environment</b>	<b>A1</b> <i>Perform environmental and safety inspections</i>	<b>A2</b> <i>Perform emergency drills and participate in emergency response teams</i>	<b>A3</b> <i>Identify and report unsafe conditions and take corrective action</i>	<b>A4</b> <i>Provide safety training for other employees</i>		
<b>B. Maintain and Repair Equipment</b>	<b>B1</b> <i>Perform troubleshooting</i>	<b>B2</b> <i>Perform preventive maintenance</i>	<b>B3</b> <i>Gather materials, tools and equipment</i>	<b>B4</b> <i>Document equipment maintenance</i>	<b>B5</b> <i>Perform repairs</i>	<b>B6</b> <i>Perform housekeeping</i>
<b>C. Operate Auxiliary Equipment</b>	<b>C1</b> <i>Inspect equipment</i>	<b>C2</b> <i>Monitor equipment indicators to ensure it is operating correctly</i>	<b>C3</b> <i>Operate rolling / mobile equipment</i>	<b>C4</b> <i>Operate heavy equipment</i>		
<b>D. Install Equipment</b>	<b>D1</b> <i>Participate on the installation, customization or upgrade team</i>	<b>D2</b> <i>Move or remove equipment</i>	<b>D3</b> <i>Test to ensure proper function after installation, customization, move or upgrade</i>	<b>D4</b> <i>Document installation</i>		
<b>E. Communicate with Co-Workers to Promote Safety and Productivity</b>	<b>E1</b> <i>Prepare maintenance and repair logs</i>	<b>E2</b> <i>Participate in meetings and problem solving groups</i>	<b>E3</b> <i>Communicate safety and job-specific needs</i>	<b>E4</b> <i>Suggest ways to prevent future equipment malfunction or improve equipment performance</i>		
<b>F. Fabricate parts, pieces and systems, specialty devices, tools</b>	<b>F1</b> <i>Build structures</i>	<b>F2</b> <i>Perform carpentry and foundation work</i>	<b>F3</b> <i>Perform plumbing</i>	<b>F4</b> <i>Perform welding</i>	<b>F5</b> <i>Perform machining</i>	

## **Cluster: Plant Mechanics**

Knowledge of foundational science and engineering concepts and theories is essential in order to perform functions required of a Mechanic. These are listed below, and are important supplements to the technical knowledge and skills listed with each key activity.

### SCIENCE AND ENGINEERING THEORIES AND CONCEPTS

#### Core Topics:

- Behavior of matter
- Pressure and Chemistry of steam/water, boiler water, air and oil
- Gasses and liquids
- Mechanical energy
- Introductory mechanical engineering concepts
- Lever, pulleys, machines
- Hydraulics, pneumatics
- Cavitations: principles and causes
- Basic system design and components: hydraulics, pneumatics, terminology, symbols, functions, etc
- Water treatment and purification
- Basic electricity
- Environmental stewardship
- Machines, friction and bearings
- Lubrication and cooling
- Hydrologic life cycles (hydro fuel delivery/source)

#### Supplemental Topics

- Physics of dams
- Renewable energy processes and industries
- Properties of fossil fuels

### MATH FOR MECHANICS

#### Core Topics

- Working knowledge of: measurement, layout, computation, formulae, functions
- Algebra
- Principles of alignment
- Torque
- Properties and behavior of motion
- Trigonometry (sin/cosine)

#### Supplemental Topics

- Basic logic
- Solid geometry
- 3-D computation
- Computational technology

### THERMAL CONCEPTS

#### Core Topics

- Sources of fuel: quality, composition, chemistry
- Processing fuel
- Fuel storage

Generation process (speed)  
Demand and stability of the industry

Supplemental Topics

Number and type of systems

Use of more diverse fuels

Co-Gen (combined cycle steam plants)

Industry is interdependent system, not just individual companies operating autonomously;  
tied to a market system.

**Cluster: Mechanics**

**Critical Work Function: A. Maintain a Safe and Environmentally-Conscious Work Environment**

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>A1.</b> <b>Perform environmental and safety inspections</b></p>	<ul style="list-style-type: none"> <li>• Inspections are thorough and complete.</li> <li>• Reference is made to technical manuals during the course of inspections.</li> <li>• Checklists and procedures are followed.</li> <li>• The environment is scanned for hazardous conditions.</li> <li>• Documentation is complete and accurate and submitted to appropriate personnel in a timely manner.</li> <li>• Personal protective equipment is worn as required.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of terminology for generation (hydro and thermal), including tools, equipment and systems</li> <li>• Knowledge of the components and processes utilized in a safe work environment</li> <li>• Knowledge of typical hazards</li> <li>• Knowledge of MSDS sheets and their locations</li> <li>• Ability to identify and use personal protective equipment</li> <li>• Knowledge of procedures for storing hazardous materials</li> <li>• Knowledge of documentation procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies relevant details, facts, specifications; follows set of instructions</li> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Selects and obtains information relevant to the task and identifies the need for information.</li> <li>• Records information accurately, completes forms and writes simple documents.</li> </ul>
<p><b>A2.</b> <b>Perform emergency drills and participate in emergency response teams</b></p>	<ul style="list-style-type: none"> <li>• Training and certification on relevant emergency, first aid and CPR procedures are complete and up to date.</li> <li>• Emergency response complies with company and regulatory policies and procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to obtain certifications</li> <li>• Knowledge of emergency policies and procedures</li> <li>• Knowledge of emergency responses</li> <li>• Knowledge of emergency phone numbers and address/locations within facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Understands the system organization and follows procedures.</li> <li>• Models proper performance/attitudes, and conducts task specific training.</li> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> <li>• Listens attentively and Confirms information and Interprets communication.</li> </ul>

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>A3.</b> <i>Identify and report unsafe conditions and take corrective action</i></p>	<ul style="list-style-type: none"> <li>• Conditions that present a threat to health, safety and the environment are identified, reported, and documented promptly.</li> <li>• Corrective actions are identified, and documentation is completed once corrective actions are taken.</li> <li>• Appropriate parties are consulted about corrective actions.</li> <li>• Corrective actions are taken promptly according to company procedures.</li> <li>• Follow-up procedures are followed.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to identify an unsafe condition</li> <li>• Knowledge of the components, conditions and procedures utilized in a safe working environment</li> <li>• Knowledge of the consequences of safety situations such as systems under pressure and stored energy systems vs. low risk maintenance items</li> <li>• Knowledge of documentation procedures</li> <li>• Knowledge of procedures for taking corrective actions</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies relevant details, facts, specifications; follows set of instructions</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Maintains self control, accepts constructive criticism, sets well defined/realistic goals and demonstrates commitment to self improvement.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle</li> </ul>

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>A4.</b> <i>Provide safety training and training for other employees</i></p>	<ul style="list-style-type: none"> <li>• Training covers all topics and procedures needed to facilitate employee safety.</li> <li>• Training makes clear the need and processes for employees to raise safety concerns, ask questions, and receive additional training.</li> <li>• Training is documented according to company requirements.</li> <li>• Training meets all relevant laws, policies, and regulations.</li> <li>• Where applicable safety information is tailored to meet the requirements of a specific job.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of all topics and procedures required for employee safety</li> <li>• Knowledge of company requirements for training documentation</li> <li>• Knowledge of safety laws and regulations</li> <li>• Knowledge of safe work practices</li> <li>• Knowledge of terminology for generation (hydro and thermal), including tools, equipment and systems</li> <li>• Knowledge of specific job procedures and safety requirements</li> </ul>	<ul style="list-style-type: none"> <li>• Listens attentively and Confirms information and Interprets communication.</li> <li>• Adheres to standards, demonstrates commitment to excellence and leads by example.</li> <li>• Models proper performance/attitudes, and conducts task specific training.</li> <li>• Communicates appropriate verbal/non-verbal messages, actively participates in discussion and present complex ideas and information.</li> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> </ul>

**Cluster: Mechanics**

**Critical Work Function: B. Maintain and Repair Equipment**

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>B1.</b> <b>Perform troubleshooting</b></p>	<ul style="list-style-type: none"> <li>• Blueprints and schematics are consulted as necessary.</li> <li>• Information about the nature and possible causes of failure is systematically gathered through visual inspection, past experience, operator feedback, observation of equipment during operations and disassembly of equipment, as appropriate.</li> <li>• Proper diagnostic tests are performed and repeated as necessary to determine the nature of the problem.</li> <li>• Diagnosis is timely and effective.</li> <li>• Manufacturer's performance specifications are used when evaluating equipment performance.</li> <li>• Procedures for isolating problems are initiated correctly and followed through completely.</li> <li>• Proper procedures and precautions are followed for prime mover versus auxiliary equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the system and equipment, and how it interacts with other systems</li> <li>• Knowledge of and ability to perform diagnostic tests, use test equipment and interpret the output from the tests and diagnostic equipment</li> <li>• Knowledge of basic troubleshooting processes and procedures</li> <li>• Ability to access and read equipment logs and histories</li> <li>• Ability to execute isolation procedures</li> <li>• Ability to read blueprints and schematics</li> <li>• Knowledge of multiple trades and crafts and their functional boundaries and nomenclature</li> <li>• Ability to read and understand manufacturer's specifications and manuals</li> <li>• Knowledge of the differences between prime mover equipment versus auxiliary equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates creative thinking process while problem solving.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Recognizes job tasks and distributes work assignments.</li> <li>• Monitors system performance and troubleshoots malfunction/failure.</li> <li>• Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</li> <li>• Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>B2.</b> <b>Perform preventive maintenance</b>	<ul style="list-style-type: none"> <li>• Hazardous materials procedures are followed with respect to handling and disposal.</li> <li>• Safety procedures are followed and proper personal protective equipment is worn or used.</li> <li>• Preventive maintenance sheet guides and procedures are completely followed.</li> <li>• Completed maintenance is performed with proper workers to ensure that the job is performed safely and efficiently.</li> <li>• Maintenance job is documented and verified according to company or department procedure.</li> <li>• Documentation is turned in to the correct parties for processing.</li> <li>• Required maintenance is performed correctly and completed on time.</li> <li>• Suggestions to revise maintenance plan are made to appropriate personnel effectively and in a timely manner.</li> <li>• Where applicable, lockout tagout is correctly performed.</li> <li>• Equipment outage during preventive maintenance is requested and/or scheduled in accordance with company policy.</li> </ul>	<ul style="list-style-type: none"> <li>• Full understanding of the operational system.</li> <li>• Knowledge of pumps, seals, packing, and alignments.</li> <li>• Knowledge of auxiliary equipment such as bridge and gantry cranes and mobile equipment.</li> <li>• Knowledge of unit plumbing and aligning.</li> <li>• Ability to read and interpret manufacturer's specifications and recommendations and PM sheets.</li> <li>• Understanding of water purification, steam generation and chemical interactions with steam generation.</li> <li>• Knowledge of systems such as thrust bearing systems, guide bearing systems, oil transport systems, cooling water, system water, potable and non-potable water, and ventilation systems.</li> <li>• Knowledge of governors and associated equipment.</li> <li>• Knowledge of oil filtration, fuel delivery systems, fire protection systems, ash removal and disposal, coal processing, and hydraulic and pneumatic systems.</li> <li>• Knowledge of hazardous materials and safety procedures.</li> <li>• Knowledge of preventive maintenance requirements.</li> <li>• Knowledge of company policies and procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Adheres to standards, demonstrates commitment to excellence and leads by example.</li> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Responds to customer needs and demonstrates sensitivity to customer concerns and interests.</li> <li>• Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</li> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>B3.</b> <b>Gather materials, tools and equipment</b></p>	<ul style="list-style-type: none"> <li>• Special tools, parts and equipment are located in a timely manner.</li> <li>• Repaired parts are checked to ensure they meet specifications.</li> <li>• If a part is not available, follow-up occurs to ensure that adequate supplies are maintained.</li> <li>• Calibration and certification of tools are ensured where applicable.</li> <li>• Tool boxes are properly maintained.</li> <li>• All required tools, equipment and lubricants for the job are assembled at the job site.</li> <li>• Tools and equipment are checked to insure they are in safe and proper working order.</li> <li>• Procedures regarding nonfunctioning tools and equipment are followed.</li> <li>• Information regarding broken tools and equipment is communicated to appropriate personnel effectively and in a timely manner.</li> <li>• Recommendations for acquisition of new tools are made to appropriate personnel.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of tool terminology and the locations of tools, parts and equipment.</li> <li>• Knowledge of tools such as hand tools and precision measuring tools</li> <li>• Knowledge of different types of materials and parts and their application</li> <li>• Ability to calibrate and certify tools</li> <li>• Ability to plan and organize relevant materials and tools prior to job site work</li> <li>• Ability to properly inspect tools and submit nonfunctional tools for repair.</li> <li>• Ability to use prior documentation for planning and organizing work.</li> <li>• Ability to anticipate new equipment, tool needs and requisitions to perform necessary work and improve efficiency and safety.</li> <li>• Knowledge of established policies and procedures.</li> </ul>	<ul style="list-style-type: none"> <li>• Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</li> <li>• Performs routine recordkeeping.</li> <li>• Understands the requirements of the task and technological results.</li> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Understands negotiations process, identifies conflicts and demonstrates composure.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>B4.</b> <b>Document equipment maintenance</b></p>	<ul style="list-style-type: none"> <li>• Documentation is performed according to company and department policies and procedures.</li> <li>• Documents and appropriate files are input into database, filed or distributed to correct parties.</li> <li>• Preventive maintenance schedule is properly adjusted to reflect repairs made.</li> <li>• Documentation is accurate, legible and complete and is completed in a timely manner.</li> <li>• Documentation is understandable and succinct.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of documentation policies and procedures.</li> <li>• Ability to input relevant and accurate data into manual and electronic system.</li> <li>• Understanding of how documentation and procedures affect critical operations and timelines.</li> <li>• Ability to report findings and make recommendations based on documented history and findings.</li> <li>• Understanding of the operational system and how equipment maintenance issues can adversely impact operations.</li> <li>• Ability to use correct terminology.</li> </ul>	<ul style="list-style-type: none"> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</li> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> <li>• Understands the system organization and follows procedures.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>B5.</b> <b>Perform repairs</b></p>	<ul style="list-style-type: none"> <li>• Work is performed safely in accordance with company policies and procedures and in accordance with all applicable laws and regulations.</li> <li>• Repair procedures are followed.</li> <li>• Appropriate co-workers are informed regarding the repair process if working alone.</li> <li>• During repair process, equipment is thoroughly inspected to identify other repair needs.</li> <li>• Where appropriate, repair plan and job safety/hazard analysis are effectively communicated to appropriate personnel in a timely manner.</li> <li>• Replaced parts are properly disposed of or refurbished and returned to service.</li> <li>• Post maintenance testing is performed to ensure equipment is in proper working order.</li> <li>• Return to service documentation is prepared and submitted as required.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to track how parts and equipment disassembled so they can be correctly put back together.</li> <li>• Knowledge of safe work practices with respect to repairs.</li> <li>• Knowledge of company policies and procedures.</li> <li>• Knowledge of technical requirements for specifications of parts to be repaired and manufactures recommended procedures.</li> <li>• Knowledge of equipment function and purpose within the system, and how they affect other systems.</li> <li>• Knowledge of equipment inspection procedures.</li> <li>• Knowledge of the different kinds of expertise required to complete the repair, and knowledge of the roles and responsibilities of all parties involved.</li> <li>• Ability to anticipate and communicate expertise and staffing needs prior to and during the repair job.</li> <li>• Ability to identify the root cause and possible adverse effects of malfunction.</li> <li>• Ability to properly test and validate successful repair.</li> <li>• Knowledge of proper disposal and refurbishing procedures for parts and repairs.</li> <li>• Ability to interact with internal and external customers (other departments or vendors).</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates creative thinking process while problem solving.</li> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</li> <li>• Draws upon experiences and prior knowledge; Interprets and applies new knowledge and experience.</li> <li>• Responds to customer needs and demonstrates sensitivity to customer concerns and interests.</li> <li>• Responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understand own impact on others.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>B6.</b> <b>Perform housekeeping</b></p>	<ul style="list-style-type: none"> <li>• Tools are stored in proper location.</li> <li>• Materials are kept in a safe manner.</li> <li>• Unsafe conditions are identified and reported promptly.</li> <li>• Workstation is clean and clear of safety hazards.</li> <li>• Shop is organized to maximize efficiency.</li> <li>• All appropriate safety equipment is present and in proper working order.</li> <li>• Housekeeping protocols are followed.</li> <li>• Tools are cleaned, returned to proper location, and tagged if broken.</li> <li>• All hazardous materials procedures are followed in accordance with applicable laws and regulations.</li> <li>• All equipment repair and maintenance needs discovered during housekeeping are reported to appropriate personnel.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of proper cleaning and storage procedures.</li> <li>• Ability to perform inspection of tools and materials (restock, recycle or repair)</li> <li>• Knowledge and ability to identify and correct for unsafe conditions.</li> <li>• Understanding housekeeping protocols and requirements.</li> <li>• Knowledge of hazardous material laws, rules and regulations.</li> <li>• Ability to identify nonfunctional tools for repair and knowledge of communications and tagging requirements for nonfunctioning tools.</li> <li>• Knowledge of safety equipment and its proper working order.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintains self control, accepts constructive criticism, sets well defined/realistic goals and demonstrates commitment to self improvement.</li> <li>• Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</li> <li>• Communicates appropriate verbal/non-verbal messages, actively participates in discussion and present complex ideas and information.</li> </ul>

**Cluster: Mechanics**

**Critical Work Function: C. Operate Auxiliary Equipment**

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>C1.</b> <b>Inspect equipment</b></p>	<ul style="list-style-type: none"> <li>• Pre start up checks/inspections are thoroughly performed.</li> <li>• The correct checklists are used properly.</li> <li>• Equipment is signed off and sheets are submitted in accordance with company procedures.</li> <li>• Proper tools are used and measurements are accurate.</li> <li>• Safety procedures are followed.</li> <li>• Inspection documentation is filled out completely and in a timely manner.</li> <li>• Equipment malfunctions and readiness are communicated to appropriate personnel effectively and in a timely manner.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of equipment and function and use.</li> <li>• Knowledge of approved company and manufacturers inspection procedures and specifications including WHSA and OSHA.</li> <li>• Knowledge of checklists and how to use them.</li> <li>• Knowledge of equipment sign-off procedures.</li> <li>• Ability to use proper tools for inspection and to measure accurately.</li> <li>• Ability to accurately complete documentation forms manually and electronically.</li> <li>• Knowledge of inspection results and equipment terminology.</li> <li>• Ability to accurately use inspection tools and methods</li> </ul>	<ul style="list-style-type: none"> <li>• Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</li> <li>• Monitors system performance and troubleshoots malfunction/failure.</li> <li>• Selects and obtains information relevant to the task and identifies the need for information. improving sys</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>C2.</b> <b>Monitor equipment indicators to ensure it is operating correctly</b></p>	<ul style="list-style-type: none"> <li>• Gauges and indicators fall within normal operating parameters.</li> <li>• Sights, sounds, and smell of equipment are within normal operating parameters.</li> <li>• Vibrations are normal.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to read and understand gauges and indicators and normal operating levels.</li> <li>• Ability to perceive changes based on sensory perception (sight, sound and smell).</li> <li>• Ability to communicate and respond to sensory based changes.</li> <li>• Knowledge of normal vibrations, sights, sounds and smells of equipment.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitors system performance and troubleshoots malfunction/failure.</li> <li>• Identifies needed systemic improvements and suggests system modifications/improvements.</li> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> <li>• Performs basic computations and measurements, performs measurements and predicts arithmetic results.</li> <li>• Selects and obtains information relevant to the task and identifies the need for information.</li> </ul>

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>C3.</b> <i>Operate rolling / mobile equipment</i></p>	<ul style="list-style-type: none"> <li>• Proper endorsement, license and authorization requirements are met.</li> <li>• Equipment is operated safely, in accordance with all applicable laws and regulations.</li> <li>• Inspection schedule is thoroughly checked to ensure it has been followed.</li> <li>• Proper training and certification for operating and rigging has been obtained.</li> <li>• Rigging requirements are followed.</li> <li>• Lift plans are correctly developed and followed when required.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of and ability to obtain licenses certifications and authorizations.</li> <li>• Knowledge of safe equipment operation and manufactures specifications.</li> <li>• Knowledge of company safety policies and equipment operation procedures.</li> <li>• Knowledge of and ability to apply proper rigging techniques.</li> <li>• Ability to develop and implement a lift plan including staffing and technical requirements.</li> <li>• Knowledge of inspection schedule.</li> </ul>	<ul style="list-style-type: none"> <li>• Understands negotiations process, identifies conflicts and demonstrates composure.</li> <li>• Recognizes job tasks and distributes work assignments.</li> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data.</li> <li>• Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>C4.</b> <b>Operate heavy lifting equipment</b></p>	<ul style="list-style-type: none"> <li>• Checks are made to determine that an adequate number of people are assigned to the operation.</li> <li>• Safety procedures are followed, and personal protective equipment is worn in accordance with all applicable laws and regulations.</li> <li>• Proper training and certification for operating and rigging is obtained and maintained.</li> <li>• Rigging requirements are followed.</li> <li>• Lift plans are developed and followed when required.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of company safety policies and equipment operation procedures.</li> <li>• Knowledge of and ability to apply proper rigging techniques.</li> <li>• Knowledge of and ability to obtain required licenses and authorization.</li> <li>• Ability to operate equipment safely in accordance with manufactures specifications.</li> <li>• Knowledge of development and implementation of a lift plan including staffing and technical requirements.</li> <li>• Knowledge of personal protective equipment and safety laws and regulations.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies with team, completes tasks, actively participates in team activities and volunteers for special tasks.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries. managing human resources</li> <li>• Performs basic computations and measurements, performs measurements and predicts arithmetic results.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Demonstrates honesty and trustworthiness, accepts responsibility for own behavior and recommends ethical course of action.</li> </ul>

**Cluster: Mechanics**

**Critical Work Function: D. Install Equipment**

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>D1.</b> <b>Participate on the installation, customization or upgrade team</b></p>	<ul style="list-style-type: none"> <li>• Communications regarding the make-up of the team are made to appropriate personnel effectively and in a timely manner.</li> <li>• Moving and removal of equipment is performed safely and in accordance with all applicable laws and regulations.</li> <li>• Plan of action is accurately followed.</li> <li>• Lockout tagout is performed at the beginning of the project and removed upon completion.</li> <li>• Moving and removal of equipment is completed to specifications and in a timely manner.</li> <li>• Input is given to modify the plan of action as required during installation, customization or upgrade.</li> <li>• Vendors are appropriately involved.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of safety regulations, requirements and policies regarding equipment.</li> <li>• Ability to implement and follow a plan of action.</li> <li>• Knowledge of the personnel and skills of team members and the personnel requirements of the job.</li> <li>• Ability to modify the plans of action as needed.</li> <li>• Ability to understand and follow vendors' equipment requirements and recommendations.</li> <li>• Knowledge of lock out tag out concepts and procedures.</li> <li>• Knowledge of equipment moving and removal procedures.</li> <li>• Knowledge of vendor, equipment and system terminology.</li> </ul>	<ul style="list-style-type: none"> <li>• Responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understand own impact on others.</li> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Understands the requirements of the task and technological results.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Communicates appropriate verbal/non-verbal messages, actively participates in discussion and present complex ideas and information.</li> <li>• Listens attentively and Confirms information and Interprets communication.</li> <li>• Identifies with team, completes tasks, actively participates in team activities and volunteers for special tasks.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>D2.</b> <b>Move or remove equipment</b>	<ul style="list-style-type: none"> <li>• Communications regarding the make-up of the team are made to appropriate personnel effectively and in a timely manner</li> <li>• Moving and removal of equipment is performed safely and in accordance with all applicable laws and regulations.</li> <li>• Plan of action is followed</li> <li>• Lockout tagout is performed at the beginning of the project and removed upon completion</li> <li>• Moving and removal of equipment is completed to specification and in a timely manner.</li> <li>• Input is given to modify the plan of action as required as required during moving and removal of equipment.</li> <li>• Vendors are appropriately involved.</li> <li>• As-builts diagrams are properly updated to reflect the move or removal of equipment.</li> <li>• P&amp;ID's (Piping and Instrument Diagrams) are accurately updated to reflect current status.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of safety regulations, requirements and policies regarding equipment.</li> <li>• Ability to implement and follow a plan of action.</li> <li>• Knowledge of the personnel and skills of team members and the personnel requirements of the job.</li> <li>• Ability to modify the plans of action as needed.</li> <li>• Ability to understand and follow vendors' equipment requirements and recommendations.</li> <li>• Knowledge of lock out tag out concepts and procedures.</li> <li>• Knowledge of equipment moving and removal procedures.</li> <li>• Knowledge of vendor, equipment and system terminology.</li> <li>• Ability to create and understand as-built diagrams and blueprints.</li> <li>• Ability to understand and update piping &amp; instrument diagrams to reflect current status.</li> </ul>	<ul style="list-style-type: none"> <li>• Listens attentively and Confirms information and Interprets communication.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Performs routine recordkeeping.</li> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>D3.</b> <b><i>Test to ensure proper function after installation, customization, move or upgrade</i></b></p>	<ul style="list-style-type: none"> <li>• Prior to starting the test, communications are made to appropriate parties regarding the test.</li> <li>• Testing is performed in accordance with company and industry protocols and procedures.</li> <li>• Moving and removal of equipment is performed safely and in accordance with all applicable laws and regulations.</li> <li>• Test results are properly documented and submitted.</li> <li>• Return to service notification is completed.</li> <li>• Lockout tagout is performed when required.</li> <li>• Test equipment is checked and calibrated and used properly.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of testing procedures and parameters.</li> <li>• Ability to perform testing in accordance with company policy and procedures.</li> <li>• Knowledge and application of relevant safety policies and procedures.</li> <li>• Knowledge of equipment moving and removal procedures.</li> <li>• Knowledge of how to interpret, apply and document test results to validate repair or installation.</li> <li>• Knowledge of notification procedures for return to service.</li> <li>• Knowledge of submittal procedures for test results</li> <li>• Ability to input test results manually and electronically.</li> <li>• Knowledge of test equipment calibration and use.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Follows specified maintenance and identifies, troubleshoots and corrects failures.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle</li> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Selects appropriate categories for information and interprets information.</li> <li>• Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</li> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>D4. Document installation</b>	<ul style="list-style-type: none"> <li>• As-builts and piping and instrumentation diagrams are properly updated to reflect the installation.</li> <li>• Documentation is performed according to company and department policies and procedures.</li> <li>• Documents and appropriate files are input into database, filed or distributed to correct parties.</li> <li>• Documentation is accurate, legible and complete and is completed in a timely manner.</li> <li>• Documentation is understandable and succinct.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of updating procedures for as-builts and piping and instrumentation diagrams.</li> <li>• Knowledge of documentation policies and procedures.</li> <li>• Ability to input relevant and accurate data into manual and electronic system.</li> <li>• Knowledge of how documentation and procedures affect critical operations and timelines.</li> <li>• Ability to report findings and make recommendations based on documented history and findings.</li> <li>• Ability to use correct terminology.</li> <li>• Ability to write clearly and concisely.</li> </ul>	<ul style="list-style-type: none"> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Identifies relevant details, facts, specifications; follows set of instructions</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries.</li> <li>• Draws upon experiences and prior knowledge; Interprets and applies new knowledge and experience.\</li> <li>• Understands computer operation, locates and retrieves information and uses integrated/multiple software.</li> </ul>

**Cluster: Mechanics**

**Critical Work Function: E. Communicate with Co-Workers to Promote Safety and Productivity**

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>E1.</b> <i>Prepare maintenance and repair logs</i></p>	<ul style="list-style-type: none"> <li>• Status reports are clearly communicated from shift to shift.</li> <li>• Documentation is accessible to all appropriate parties.</li> <li>• Documentation is performed according to company and department policies and procedures.</li> <li>• Documents and appropriate files are input into database, filed or distributed to correct parties.</li> <li>• Documentation is accurate, legible and complete and is completed in a timely manner.</li> <li>• Documentation is understandable and succinct, and in a technical format.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of equipment, system and maintenance terminology.</li> <li>• Knowledge of status reports.</li> <li>• Knowledge of documentation policies procedures.</li> <li>• Ability to use internal company computer maintenance management system, such Maximo.</li> </ul>	<ul style="list-style-type: none"> <li>• Communicates appropriate verbal/non-verbal messages, actively participates in discussion and present complex ideas and information.</li> <li>• Listens attentively and Confirms information and Interprets communication.</li> <li>• Records information accurately, completes forms and writes simple documents.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle</li> <li>• Understands computer operation, locates and retrieves information and uses integrated/multiple software.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries.</li> </ul>

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>E2.</b> <i>Participate in meetings and problem solving groups</i></p>	<ul style="list-style-type: none"> <li>• Meetings are attended with active participation and with adequate preparation to be well informed about the meeting topic.</li> <li>• Information is accurately given and received.</li> <li>• Questions are answered in a courteous and respectful manner.</li> <li>• Issues are accurately and thoroughly discussed and solutions are defined.</li> <li>• Communication is respectfully performed without discrimination.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of industry, plant, company, equipment, safety, regulatory, maintenance, repair and personnel terminology.</li> <li>• Knowledge of the power generation system.</li> <li>• Knowledge of plant equipment.</li> <li>• Knowledge of the roles and responsibilities of company personnel and departments.</li> </ul>	<ul style="list-style-type: none"> <li>• Adheres to standards, demonstrates commitment to excellence and leads by example.</li> <li>• Recognizes differences, understands the legal aspects of discrimination, respects the rights of others and encourages individuality.</li> <li>• Demonstrates creative thinking process while problem solving.</li> <li>• Identifies with team, completes tasks, actively participates in team activities and volunteers for special tasks.</li> <li>• Recognizes accuracy of information, interprets information and prepares basic summaries.</li> <li>• Maintains self control, accepts constructive criticism, sets well defined/realistic goals and demonstrates commitment to self improvement.</li> <li>• Understands negotiations process, identifies conflicts and demonstrates composure.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>E3.</b> <b>Communicate safety and job-specific needs</b></p>	<ul style="list-style-type: none"> <li>• Communication is sufficient to ensure that safety issues are understood and safety practices used.</li> <li>• The high priority nature of safety is communicated.</li> <li>• On-the-job issues and concerns are discussed and quickly resolved.</li> <li>• Communication demonstrates knowledge of customer and business needs.</li> <li>• Communication is clear and relevant to the situation.</li> <li>• Communication is made in a timely and accurate manner to the correct parties.</li> <li>• Communications are tracked and documented, as appropriate.</li> <li>• As situations arise, communication priorities are shifted to meet changing business and safety priorities.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of the criticality of safety in the workplace.</li> <li>• Knowledge of industry, plant, company, equipment, safety, regulatory, maintenance, repair and personnel terminology.</li> <li>• Knowledge of customer and business needs.</li> <li>• Knowledge of resource requirements for jobs such as number of people, lengths of time and budgets.</li> <li>• Knowledge of the roles and responsibilities of company personnel and departments.</li> </ul>	<ul style="list-style-type: none"> <li>• Communicates appropriate verbal/non-verbal messages, actively participates in discussion and present complex ideas and information.</li> <li>• Translates blueprints, drawings, diagrams, applies appropriate principles to situation and utilizes previous training/experience to predict outcomes.</li> <li>• Responds appropriately to others, takes active interest in and willingly helps others and modifies behavior to environment.</li> <li>• Identifies relevant details, facts, specifications; follows set of instructions</li> <li>• Selects appropriate categories for information and interprets information.</li> <li>• Responds assertively, defends own viewpoints, accepts constructive criticism and responsibility for own behavior and understand own impact on others.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>E4.</b> <b><i>Suggest ways to prevent future equipment malfunction or improve equipment performance</i></b></p>	<ul style="list-style-type: none"> <li>• Ongoing preventive maintenance and services are communicated to appropriate people in a timely manner.</li> <li>• Suggestions are made to adjust maintenance scheduling or maintenance plan on evidence from the last preventive maintenance for the equipment.</li> <li>• Communication is clear and relevant to the situation.</li> <li>• Communication is made in a timely and accurate manner to the correct parties.</li> <li>• Suggestions are made in writing or verbal suggestions are followed up in writing.</li> <li>• Suggestions take internal and external customer needs into account.</li> <li>• Equipment repair and maintenance history is consulted where possible.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of ongoing maintenance and services.</li> <li>• Knowledge of scheduling and maintenance plans and challenges.</li> <li>• Knowledge of internal and external customer needs.</li> <li>• Knowledge of equipment and repair histories.</li> <li>• Knowledge of terminology.</li> <li>• Knowledge of industry, plant, company, equipment, safety, regulatory, maintenance, repair and personnel terminology.</li> <li>• Knowledge of the roles and responsibilities of company personnel and departments.</li> <li>• Knowledge of how maintenance procedures affect critical operations and timelines.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies needed systemic improvements and suggests system modifications/improvements.</li> <li>• Understands computer operation, locates and retrieves information and uses integrated/multiple software.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Recognizes differences, understands the legal aspects of discrimination, respects the rights of others and encourages individuality.</li> <li>• Follows specified maintenance and identifies, troubleshoots and corrects failures.</li> </ul>

**Cluster: Mechanics**

**Critical Work Function: F. Fabricate parts, pieces, systems, specialty devices and tools**

KEY ACTIVITY	<b>Performance Indicators</b> How do we know when the task is performed well?	<b>Technical Knowledge</b> Skills, Abilities, Tools	<b>Employability Skills</b> SCANS Skills and Foundational Abilities
<p><b>F1.</b> <b>Build structures</b></p>	<ul style="list-style-type: none"> <li>• Structures are built to specification and design, and meet safety laws and regulations.</li> <li>• Structures are built within budget where applicable.</li> <li>• Work is performed safely, and personal protective equipment is worn in accordance with safety policies and all applicable laws and regulations.</li> <li>• Structures are functional and aesthetically pleasing where possible.</li> <li>• Proper tools and materials are used correctly.</li> <li>• Structures are Inspected upon completion approvals are obtained.</li> <li>• Documentation is completed accurately and submitted according to procedure, as required.</li> <li>• Certifications are obtained and maintained where required.</li> <li>• Where applicable, specifications are written in accordance with applicable codes, laws, and safety requirements.</li> <li>• Measurements are accurate.</li> <li>• Quantity estimates are accurate.</li> <li>• Proper terminology is used.</li> </ul>	<ul style="list-style-type: none"> <li>• Knowledge of structures such as cribbing, walkways, scaffold, temporary work platforms, roofs/tents/shelters</li> <li>• Ability to use tools such as hand tools, electric tools, power tools, pneumatic tools, measuring tools, shears, brake presses, drill presses, and band saws.</li> <li>• Ability to read blueprints and schematics and knowledge of codes.</li> <li>• Knowledge of layout techniques and procedures.</li> <li>• Knowledge of ground preparation procedures.</li> <li>• Knowledge of safety laws &amp; regulations, OSHA, WISHA, and personal protective equipment and how to use it.</li> <li>• Knowledge of building materials such as lumber, steel, hardware, aluminum, fasteners, fiberglass, and composites.</li> <li>• Ability to measure accurately.</li> <li>• Ability to recognize types, shapes, and sizes of materials.</li> <li>• Ability to estimate quantities.</li> <li>• Knowledge of inspection and approval requirements and procedures.</li> <li>• Knowledge of documentation requirements and procedures.</li> <li>• Knowledge of certification requirements.</li> <li>• Ability to write specifications.</li> <li>• Knowledge of structure, construction, tool and equipment terminology.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates skill and dexterity in using the hands.</li> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data. skills</li> <li>• Recognizes differences, understands the legal aspects of discrimination, respects the rights of others and encourages individuality.</li> <li>• Identifies relevant details, facts, specifications; follows set of instructions.</li> <li>• Demonstrates creative thinking process while problem solving.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>F2.</b> <b>Perform</b> <b>carpentry and</b> <b>foundation work</b>	<ul style="list-style-type: none"> <li>• Carpentry projects and foundations are built to specification and design, and meets safety laws and regulations.</li> <li>• Carpentry projects and foundations are built within budget where applicable.</li> <li>• Work is performed safely, and personal protective equipment is work in accordance with safety policies and all applicable laws and regulations.</li> <li>• Carpentry and foundations are functional and aesthetically pleasing where possible.</li> <li>• Proper tools and materials are used correctly.</li> <li>• Carpentry and foundations are inspected upon completion and approvals are obtained.</li> <li>• Documentation is completed accurately and submitted according to procedure, as required.</li> <li>• Where applicable, specifications are written in accordance with applicable codes, laws, and safety requirements.</li> <li>• Measurements are accurate.</li> <li>• Quantity estimates are accurate.</li> <li>• Proper terminology is used.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to identify and use hand tools and power tools (electric, pneumatic, battery operated), and measuring tools.</li> <li>• Knowledge of layout techniques and procedures.</li> <li>• Knowledge of ground preparation procedures.</li> <li>• Ability to read blueprints and schematics and knowledge of codes.</li> <li>• Knowledge of safety laws &amp; regulations, OSHA, WISHA, and personal protective equipment and how to use it.</li> <li>• Knowledge of materials such as lumber, steel, hardware, fasteners, and concrete.</li> <li>• Knowledge of framing, rebar, forms</li> <li>• Ability to measure accurately.</li> <li>• Ability to recognize types, shapes, and sizes of materials.</li> <li>• Ability to estimate quantities</li> <li>• Knowledge of inspection and approval requirements and procedures.</li> <li>• Knowledge of documentation requirements and procedures.</li> <li>• Knowledge of certification requirements.</li> <li>• Ability to write specifications.</li> <li>• Knowledge of standard building practices</li> <li>• Knowledge of structure, construction, tool and equipment terminology</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrates skill and dexterity in using the hands.</li> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data. skills</li> <li>• Responds to customer needs and demonstrates sensitivity to customer concerns and interests.</li> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Selects and obtains information relevant to the task and identifies the need for information.</li> <li>• Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</li> <li>• Starts on time, efficiently manages time, prioritizes daily tasks, and monitors/adjusts task sequence.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>F3.</b> <b>Perform plumbing</b>	<ul style="list-style-type: none"> <li>• Plumbing projects are built to specification and design, and meets safety laws and regulations</li> <li>• Plumbing projects are built within budget where applicable</li> <li>• Work is performed safely, and personal protective equipment is work in accordance with safety policies and all applicable laws and regulations.</li> <li>• Plumbing projects are functional and aesthetically pleasing where possible.</li> <li>• Proper tools and materials are used correctly</li> <li>• Plumbing is inspected upon completion and approvals are obtained.</li> <li>• Documentation is completed accurately and submitted according to procedure, as required</li> <li>• Certifications are obtained and maintained where required</li> <li>• Where applicable, specifications are written in accordance with applicable codes, laws, and safety requirements.</li> <li>• Measurements are accurate</li> <li>• Quantity estimates are accurate</li> <li>• Proper terminology is used.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to identify and use hand tools and power tools (electric, pneumatic, battery operated), measuring tools and machine tools machine tools, (lathes, drill presses, milling machines, bench and surface grinders, dividing heads).</li> <li>• Knowledge of layout techniques and procedures.</li> <li>• Ability to read blueprints and schematics and knowledge of national plumbing codes and local codes.</li> <li>• Knowledge of ground preparation.</li> <li>• Knowledge of safety laws &amp; regulations OSHA, WISHA, and personal protective equipment and how to use it.</li> <li>• Knowledge of materials such as lumber, hardware and fasteners.</li> <li>• Knowledge of framing.</li> <li>• Ability to measure accurately.</li> <li>• Ability to recognize types, shapes, and sizes of materials.</li> <li>• Ability to measure accurately.</li> <li>• Ability to estimate quantities.</li> <li>• Knowledge of standard building practices.</li> <li>• Knowledge of system design and requirements and structural design</li> <li>• Ability to estimate quantities.</li> <li>• Knowledge of inspection and approval requirements and procedures.</li> <li>• Knowledge of documentation requirements and procedures.</li> <li>• Knowledge of certification requirements.</li> <li>• Ability to write specifications.</li> <li>• Knowledge of standard building practices.</li> <li>• Knowledge of structure, construction, tool and equipment terminology</li> </ul>	<ul style="list-style-type: none"> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data. skills</li> <li>• Demonstrates skill and dexterity in using the hands.</li> <li>• Selects and obtains information relevant to the task and identifies the need for information.</li> <li>• Identifies the problem, analyzes possible causes/reasons, generates/evaluates solutions and devises/implement plan of action.</li> <li>• Uses materials in a safe and efficient manner and acquires and distributes supplies and equipment.</li> <li>• Uses logic to draw conclusions and analyzes logic/rule/principle</li> <li>• Performs routine recordkeeping.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<p><b>F4.</b> <b>Perform welding</b></p>	<ul style="list-style-type: none"> <li>• Welding is performed to specification and design, and meets safety laws and regulations</li> <li>• Welding projects are completed within budget where applicable</li> <li>• Work is performed safely, and personal protective equipment is work in accordance with safety policies and all applicable laws and regulations.</li> <li>• Welding projects are functional and aesthetically pleasing where possible.</li> <li>• Proper tools and materials are used correctly</li> <li>• Welding is inspected upon completion and approvals are obtained.</li> <li>• Documentation is completed accurately and submitted according to procedure, as required.</li> <li>• Where applicable, specifications are written in accordance with applicable codes, laws, and safety requirements.</li> <li>• Measurements are accurate</li> <li>• Quantity estimates are accurate</li> <li>• General certifications and specific certifications to the applicable procedure are obtained and maintained, where required.</li> <li>• Weld procedure is certified in accordance with national standards where applicable.</li> <li>• Proper gas and filler materials are used</li> <li>• Gas bottles are stored and shipped correctly.</li> <li>• Proper terminology is used.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to identify and use hand tools and power tools (electric, pneumatic, battery operated), measuring tools and machine tools machine tools, (lathes, drill presses, milling machines, bench and surface grinders, dividing heads).</li> <li>• Ability to identify and use equipment such as oxygen acetylene torches, arc welding machines and gas welding machines.</li> <li>• Knowledge of welding processes and associated equipment such as SMAW, GMAW, and TIG.</li> <li>• Knowledge of layout techniques and procedures.</li> <li>• Knowledge of welding symbols.</li> <li>• Knowledge of surface preparation.</li> <li>• Ability to read blueprints and schematics.</li> <li>• Knowledge of codes.</li> <li>• Knowledge of safety laws &amp; regulations and company policies and procedures for each welding process including torch safety, compressed gas bottle safety, transport safety.</li> <li>• Knowledge of personal protective equipment and how to use it.</li> <li>• Knowledge of basic metallurgy.</li> <li>• Knowledge of materials such as hardware, fasteners, and gas and filler material such as filler rod.</li> <li>• Knowledge of structural design.</li> <li>• Ability to measure accurately.</li> <li>• Ability to recognize types, shapes, and sizes of materials.</li> <li>• Ability to estimate quantities and write specs.</li> <li>• Knowledge of inspection and approval requirements and procedures.</li> <li>• Knowledge of documentation requirements and procedures.</li> <li>• Knowledge of certification requirements.</li> <li>• Knowledge of standard building practices.</li> <li>• Knowledge of storage and shipping of gas bottles.</li> <li>• Knowledge of structure, construction, tool and equipment terminology.</li> </ul>	<ul style="list-style-type: none"> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data. skills</li> <li>• Demonstrates skill and dexterity in using the hands.</li> <li>• Identifies relevant details, facts, specifications; follows set of instructions</li> <li>• Follows procedures and pays attention to details, follows up on assigned tasks, works with minimal supervision and demonstrates initiative.</li> <li>• Understands computer operation, locates and retrieves information and uses integrated/multiple software.</li> <li>• Understands decision making process, analyzes situation/information and considers risks/implications.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> </ul>

KEY ACTIVITY	<i>Performance Indicators</i> How do we know when the task is performed well?	<i>Technical Knowledge</i> Skills, Abilities, Tools	<i>Employability Skills</i> SCANS Skills and Foundational Abilities
<b>F5.</b> <b>Perform machining</b>	<ul style="list-style-type: none"> <li>• Machining is performed to specification and design, and meets safety laws and regulations.</li> <li>• Machining projects are completed within budget where applicable.</li> <li>• Machining is performed safely and personal protective equipment is utilized properly.</li> <li>• Machining projects are functional and aesthetically pleasing where possible.</li> <li>• Proper tools and materials are used correctly.</li> <li>• Machining projects are inspected and tested upon completion and approvals are obtained as required.</li> <li>• Documentation is completed accurately and submitted according to procedure, as required and, where applicable, existing plant documents are updated (as built).</li> <li>• Proper rigging is utilized correctly.</li> <li>• Quantity estimates are accurate.</li> <li>• Measurements are accurate.</li> <li>• Proper terminology is used.</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to identify and use hand tools and power tools (electric, pneumatic, battery operated), measuring tools and machine tools machine tools, (lathes, drill presses, milling machines, bench and surface grinders, dividing heads).</li> <li>• Knowledge of precision layout techniques and procedures.</li> <li>• Ability to read blueprints and schematics.</li> <li>• Knowledge of safety laws &amp; regulations OSHA, WISHA, and personal protective equipment and how to use it.</li> <li>• Knowledge of materials such as hardware, lubricants, cutting fluids and fasteners.</li> <li>• Knowledge of structural design.</li> <li>• Ability to measure accurately.</li> <li>• Knowledge of metallurgy.</li> <li>• Ability to recognize types, shapes, and sizes of materials.</li> <li>• Ability to estimate quantities.</li> <li>• Knowledge of inspection and approval requirements and procedures.</li> <li>• Knowledge of documentation requirements and procedures.</li> <li>• Knowledge of certification requirements.</li> <li>• Ability to write specifications.</li> <li>• Knowledge of standard building practices</li> <li>• Knowledge of rigging, and equipment (slings and chokers, shackles, eye bolts, chain falls, hand line, and come alongs).</li> <li>• Knowledge of cutting tool geometry.</li> <li>• Knowledge of speeds and feeds for lathes.</li> <li>• Knowledge of structure, construction, tool and equipment terminology.</li> </ul>	<ul style="list-style-type: none"> <li>• Utilizes mathematical formulas and processes, summarizes and translates mathematical data. skills,</li> <li>• Demonstrates skill and dexterity in using the hands.</li> <li>• Understands technology applications and manipulates technology for desired results.</li> <li>• Performs basic computations and measurements, performs measurements and predicts arithmetic results.</li> <li>• Understands the requirements of the task and technological results.</li> <li>• Draws upon experiences and prior knowledge; Interprets and applies new knowledge and experience.</li> </ul>

# **INTEGRATION**

**Assessment and Certification: A Vital Connection**

**Assessment Strategies**

**Assessment Design**

## Assessment and Certification: A Vital Connection:

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Skill standards, while useful on their own, are just one part of a much larger equation. Skill standards establish the standard of competent performance, but they do not tell a person whether he or she has succeeded in meeting that standard.

For this reason, developing skill standards does not end with their publication. Washington State is also working to develop voluntary assessments and certifications which will make it possible for students, workers and any interested persons to determine their strengths and weaknesses based on the standards, and to earn certification showing that they can perform work competently as established by the skill standards.

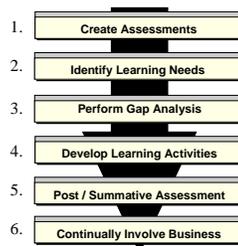
In today's fast-moving technological economy, the necessity for assessments and certification is crucial. The demand for both technical and employability skills is escalating as work becomes more complex. The workforce is more mobile, with workers moving freely between jobs and industries. This job mobility requires that workers must be able to communicate their qualifications to potential employers. As technology changes, workers must keep up with technological change through continuous learning and worker retraining, and must be able to prove they have kept pace. All of these factors mean more training and education for individuals, and the ability to show evidence that this training translates to performance on the job.

Voluntary assessments and certifications based on skill standards will help us address all these needs because of the guiding principles upon which skill standards are based, and because of the stakeholders—employers, labor, educators, workers, students, and government—whose needs skill standards are designed to meet.

**Please Note:** *To ensure the use of standards and their related assessments and certifications do not contradict U.S. employment law, employers will need to conduct an internal validation of the standards before using the skill standards to make hiring and promotion decisions. The purpose of this validation is to ensure that the knowledge, skills, and performance described by the standards are needed for competent performance in an employer's organization. The need to validate the standards internally is a key requirement of U.S. employment law, which seeks to protect individuals from discrimination in hiring and promotion.*

A step toward a statewide system of assessments and certifications is the development of assessments which measure an individual's ability to perform work competently as defined by the skill standards. Once these assessments are developed, curriculum can be reviewed to determine that all necessary topics and practicums sufficiently cover the items in the assessment. Once any gaps are identified, learning activities and content adjustments can be made, and post/summative assessments can be administered. Finally, it is critical that industry be involved every step of the way, and that standards are continuously reviewed and updated. The diagram below provides a summary of this process.

### Integrating Skill Standards



## Assessment Strategies

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Upon completion of the development of skill standards, performance assessment can be created to assess the criteria identified. Sample assessments and standards may be distributed to instructors and curriculum developers who will be educated on the skill standards elements.

Assessments based on the skill standards may include pre-and post-evaluations of the student to measure skill progression and to track the success rate of obtaining certification, where applicable.

Within a skill standards or competency-based system, assessment is the generation and collection of evidence of performance which can be matched to specified explicit standards that reflect expectations of performance in the workplace. There are two main forms of evidence:

- Evidence of actual performance
- Evidence of underpinning knowledge, skills and abilities

The types of evidence may vary and will include:

- Direct evidence (products and items produced by the performer)
- Indirect evidence (supporting evidence and information about the performer)

Evidence can be collected in a wide variety of educational or business settings. To a large extent, the range of opportunities available for demonstration will determine the most appropriate setting. Often it is difficult to actually perform the task in the authentic work setting. In this case, evidence generated during an educational course or an in-house training session can be collected by individuals and added to their overall portfolios.

By requesting that the student or trainee produce tangible results in the form of take-away products (videos, tapes, paper, and electronic products), the participant will have created real evidence which can be shown to human resource personnel, hiring managers, supervisors or assessors. When assessing these products, the trained assessor will seek:

- Validity
- Currency
- Authenticity
- Sufficiency

Therefore, when designing a skill standards-based assessment for an educational course or training session, the assessment process and results will meet four criteria:

**Validity:** The assessment instrument/process clearly relates to the relevant standards.

**Currency:** The assessment instrument/process calls for a demonstration of the current standards in the industry.

**Authenticity:** The individual being assessed produces the assessment results; it is their own work. Team activities will be useful to demonstrate the skills and abilities to work effectively with others, not necessarily the total end results. The individual can, if possible, identify his or her part of the team project to demonstrate evidence of his or her own results.

**Sufficiency:** Enough evidence is collected to match the key task and the performance criteria included in the skill standards.

When designing/revising the curriculum for power generation, students will be assisted in generating high-quality evidence of performance or of underpinning skills, knowledge and abilities which will help them to be successfully assessed as fully competent.

Adapted from the *Skill Standards Volume 2: Assessment*, 1999, Washington State Board for Community and Technical Colleges, and *Designing Competency-Based Training*, Shirley Fletcher, 1991, Pfiffer & Company, p. 86-88.

### Assessment Design

Type of Authentic Assessment	Description of Authentic Assessment Strategies
<b>Project</b>	<ul style="list-style-type: none"> <li>Hands-on demonstration of knowledge, skills, and attitudes that reveals a student's ability to plan, organize, and create a product or an event.</li> </ul>
	<ul style="list-style-type: none"> <li>Documentation of process of development from initial steps to final presentation.</li> </ul>
<b>Portfolio</b>	<ul style="list-style-type: none"> <li>Collection of pieces of evidence of a student's knowledge, skills, and attitudes.</li> </ul>
	<ul style="list-style-type: none"> <li>Showcase of best work, work-in-progress.</li> </ul>
	<ul style="list-style-type: none"> <li>Record of student's progress over time.</li> </ul>
	<ul style="list-style-type: none"> <li>Content selection by student in collaboration with the teacher.</li> </ul>
	<ul style="list-style-type: none"> <li>Centerpiece for parent conferences.</li> </ul>
<b>On-Demand Demonstrations</b>	<ul style="list-style-type: none"> <li>Hands-on performance by a student, which illustrates levels of knowledge, skills, and attitudes.</li> </ul>
	<ul style="list-style-type: none"> <li>Typically involve a "real life" problem or situation to solve.</li> </ul>
	<ul style="list-style-type: none"> <li>Focus on the application of knowledge and skills learned in one situation as it connects to a new and different one.</li> </ul>
<b>Case Studies</b>	<ul style="list-style-type: none"> <li>Analysis of events and individuals in light of established criteria.</li> </ul>
	<ul style="list-style-type: none"> <li>Synthesis of evidence to support generalizations based on individual cases.</li> </ul>
<b>Paper/Pencil Tests</b>	<ul style="list-style-type: none"> <li>Multiple-choice, essay, true-false questions that rely on extended responses to further clarify a student's understanding of the knowledge being assessed.</li> </ul>
	<ul style="list-style-type: none"> <li>Graphic representations that reveal a student's understanding of connections among ideas.</li> </ul>
<b>Structured Observation</b>	<ul style="list-style-type: none"> <li>Observation of events, groups, and individuals that focuses on the salient traits of the skill or attitude being observed.</li> </ul>
<b>Scenarios</b>	<ul style="list-style-type: none"> <li>A problematic or challenging situation presented in the context of a career-technical perspective.</li> </ul>
	<ul style="list-style-type: none"> <li>Study required to analyze or evaluate a situation.</li> </ul>
	<ul style="list-style-type: none"> <li>Apply relevant knowledge or skills.</li> </ul>
	<ul style="list-style-type: none"> <li>Prepare and justify a reasonable solution</li> </ul>
<b>Critical Incident</b>	<ul style="list-style-type: none"> <li>An interview where the assessee is asked to describe past experiences which demonstrate skill standards.</li> </ul>

From: Center for Occupational Research and Development, November 1996, and the forthcoming *Skill Standards Volume 2: Assessment*, 1999, Washington State Board for Community and Technical Colleges.

# **APPENDICES**

**References**

**Ordering Information**



## References

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National Skill Standards Board (2000). Built to Work.

Manufacturing Skill Standards Council (2001). MSSC Skill Standards, A Blueprint for Workforce Excellence.

Washington State Board for Community and Technical Colleges, (1999). Manufacturing Skill Standards.

Washington State Board for Community and Technical Colleges , (Reprinted June, 1999). Skill Standards Guidebook Volumes I and II.

Washington State Board for Community and Technical Colleges ( 2002). Transportation Skill Standards.

### For more information -- Web references:

<http://www.energycentraljobs.com/>

<http://www.nwppa.org/web/jobs/jobindex.shtml>

<http://www.westernenergy.org/>

<http://energyjobsearch.com/>

<http://www.power-plant-jobs.com/jobs/index.php?sh+7992&f=1&s=0>

## Order Form

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For additional copies of *Power Generation Skill Standards*, please detach or photocopy this order form and return it to:

Barbara Hins-Turner  
Executive Director  
Center of Excellence for Energy Technology  
Centralia College  
600 W Locust  
Centralia, WA 98531-4099

Phone: 360-736-9391, extension 477  
bhins-turner@centralia.edu

Payment can be made by check, money order, VISA, MasterCard, or purchase order. Checks or money orders should be made payable to Centralia College.

For residents or organizations in the State of Washington, please sales tax.

## Order Form

	Quantity	Cost
<i>Power Generation Skill Standards @ \$20.00 each</i>	_____	_____
Washington State Sales Tax @ (State of Washington only)		_____
Shipping & Handling: <i>Please add \$3.50 for shipping and handling a single order, \$2.00 for each additional item per shipment.</i>		_____
	Total	_____
Name _____		
Address _____		
City _____ State _____ Zip _____		
<input type="checkbox"/> Check or money order enclosed <input type="checkbox"/> VISA <input type="checkbox"/> MasterCard <input type="checkbox"/> Purchase Order		
Card Number _____	Exp. Date _____	
PO # _____		
Signature _____		