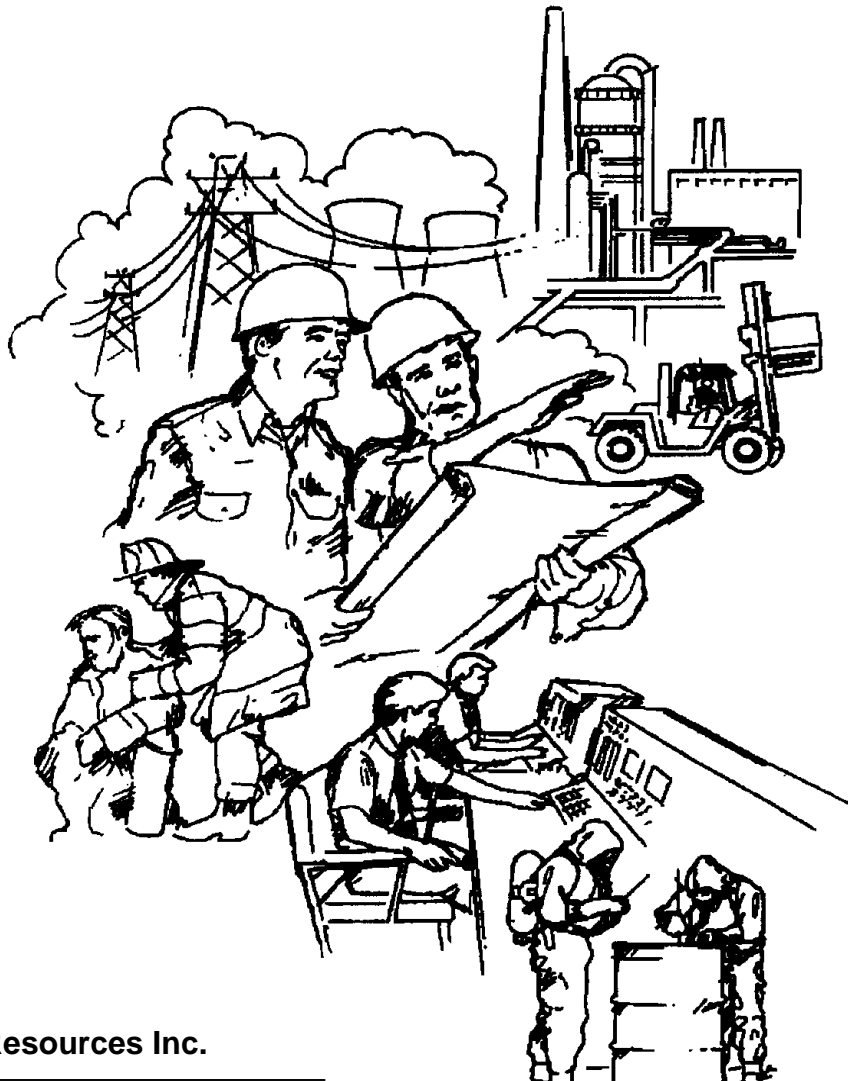


# POWER PLANT OPERATOR TRAINING AND CERTIFICATION PROGRAM



## **Industrial Resources Inc.**

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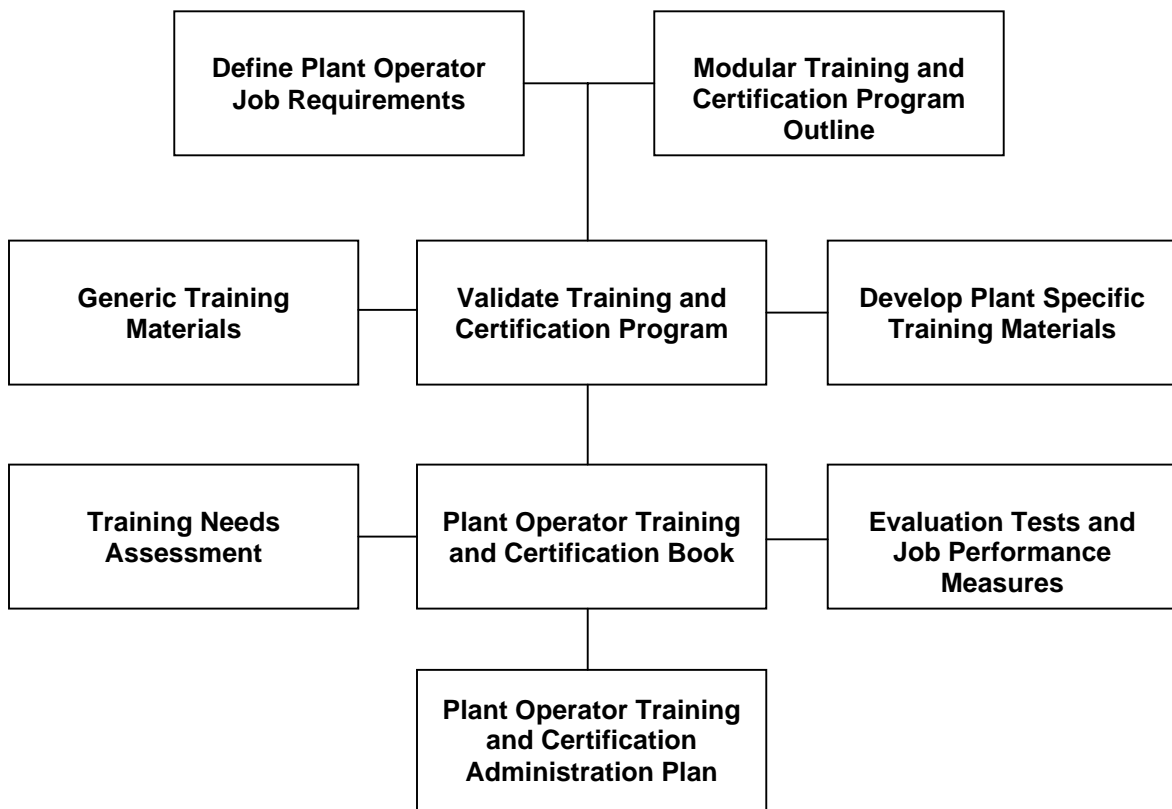
The Industrial Resources, Inc. (IRI) Power Plant Operator Training and Certification Program is designed to be used to train and certify your plant operators. It is an integrated training and evaluation system that utilizes currently available training materials wherever possible. It provides a comprehensive, validated method, for evaluating and training plant personnel to ensure they are competent to operate and maintain your facilities in a safe, effective and efficient manner. The program includes the following:

- Validated Power Plant Operator Training and Certification Program
- Evaluation Tests and Job Performance Measures (JPMs)
- Plant Operator Training Needs Assessments
- Individual Plant Operator Training and Certification Books
- Plant Operator Training and Certification Administration Plan
- Plant Specific Training Materials

The Power Plant Operator Training and Certification Program can be structured as a self-paced program so that plant operators through individual study, classroom and on-the-job training can gain the knowledge, skills and abilities necessary to meet certification requirements. It is also designed to allow for Maintenance cross training and evaluation, allowing operations personnel to perform, or to skillfully assist, in the performance of maintenance tasks.

Regulatory Compliance Training designed to meet the training requirements of various government agencies such as OSHA, DOT and EPA is included in the program.

The program can be implemented at your plant using a step-by-step process as illustrated below:



## Define Plant Operator Job Requirements

The first step in setting up the program is to define the operator job requirements at your plant. Extensive lists of job requirements for power plant operators are available from many sources. In addition, you may have already developed job lists as a result of conducting a Job/Task Analysis. These lists of job requirements must be combined and/or modified to fit your specific plant operations. This process involves reviewing your plant technical documents, interviewing current plant operators and observing your plant operation. Training materials and records are also reviewed with the objective of developing a training and certification program that will utilize available resources as much as possible.

## Modular Training and Certification Program Outline

After the job requirements for your plant operators have been defined, they are arranged in modules with similar skills grouped together. The modules are sequenced in accordance with your plant operator's job progression and include provisions for Evaluation Tests and Job Performance Measures (JPMs) to evaluate performance. A typical modular training and certification program is shown in Appendix (1).

The example shown in Appendix (1) is structured to include three Plant Operator job levels, Level 1 being equivalent to a Shift Supervisor. Evaluation and required training for each job level, is divided into training modules, tests and job performance measures. Training and certification is sequenced to progress from basic information for new employees, to more plant specific training for more experienced employees.

Although for your plant the job progression may be different, the general progression of the training and evaluation in the example is as follows:

### General orientation training for new employees

This level includes sections on administrative policies and procedures (New Hire Orientation), basic power plant technology and Regulatory Compliance Training (OSHA, EPA, DOT). Both classroom and on-the-job training methods are used. On-the-job training for this level consists of having trainees locate and identify plant equipment, walkdown plant systems, locate emergency equipment and perform supervised exercises.

### Higher level technical training

This training is very specific to the job classifications. It includes systems operation and training that is needed to perform individual job requirements. This will include the utilization of existing plant training materials where applicable. In classes such as the power principles training, classroom as well as on-the-job training in system operation and emergency procedures will be implemented.

### Advanced Training

This level continues the employee's training on both the senior technician level and as a supervisor. This level will include advanced operator training, classroom as well as on-the-job training in system operation and emergency procedures, training on new equipment, cross training, refresher training and training in supervisory, management and administrative skills. Also included is training designed to meet the new EPA operator certification requirements.

Each module in the outline has a written topic outline that corresponds to the job duties, training objectives and evaluation items associated with it.

After IRI prepares the Modular Training and Certification Outline for your plant it is submitted to plant management for review and approval. This ensures that management goals and objectives are included in the program.

### **Validate the Plant Operator Training and Certification Program**

There are a variety of requirements (laws and EEOC guidelines) that apply to the use of evaluation tests and performance measures such as those provided as part of the training and certification program.

To ensure that the program requirements are valid for your plant operators a validation study will be conducted. The validation study process involves preparing job survey questionnaires that are cross referenced to each module's job training and certification requirements, surveying a representative sample of plant operators to collect data and then analyzing that data to determine the validity of each item. A computer based analysis program is used to perform the analysis. This data is carefully documented and used as a cross-reference for all training and evaluation requirements.

A final Validation Report that documents the validation process and the results are provided.

### **Generic Training Programs**

IRI will provide a detailed outline of each generic training module to be included in the program. Generic training programs are those programs that provide general training on safety and power plant theory or operation. In most cases you will probably already have these programs. They may be in videotape, CD-ROM or Web Based format as provided by commercial vendors or written programs that you have purchased or developed yourselves. IRI will utilize the programs that you already have wherever possible and provide you a list of any other programs that are needed.

### **Plant Specific Training Program Materials**

Development of plant specific training program materials for use in the Plant Operator Training and Certification Program is essential to provide safe and efficient operation of the plant. Plant Specific training materials are developed for each training module. Up to 40 Plant Specific Training Modules are included for each plant.

The complete training package for each module includes the following:

- System Descriptions
- System Operating Procedures
- Job Performance Measure
- Multiple Choice Test Questions

System Descriptions will contain the following sections:

- System Function
- System Flow Path
- Basic System Descriptions and Parameters
- Major Component Details and Specifications
- System Operation

System Operating Procedures will contain the following sections:

- Purpose of Procedure
- Precautions, Limitations and Set-points
- Procedure
- System Startup
- Normal Operation
- System Shutdown
- Valve Listing for Normal Operation

Plant Unit Integrated Operating Procedures and Alarm Response Tables are also provided and have related test items and job performance measures.

### **Evaluation Tests and Job Performance Measures (JPMs).**

Multiple choice and fill in the blank evaluation tests (a minimum of 1000 individual items in a test bank will be needed) for use in evaluating both general and specific knowledge relating to plant operation, safety and regulatory requirements.

At least one JPM per module will be developed. The purpose of the JPMs is to provide a standard for the supervisor or evaluator to measure the operator's capability of performing a specific job requirement in an on-the-job situation. The JPMs measure specifically the individual's ability to combine job knowledge, skill and ability into a practical hands-on performance demonstration of job capability.

Typical examples of Evaluation Tests and Job Performance Measures (JPMs) are contained in Appendix (2).

### **Plant Operator Training and Certification Book**

This book details the procedure by which the operator can either be certified or advance within their existing job classification to the next job classification level. Complete instructions for accomplishing this are contained in the book.

Training Progress Monitoring Cards (TPMCs) that are contained in the book are used to document and guide individual employee training and certification efforts. Example pages of the Plant Operator Training and Certification Book including a typical Training Progress Monitoring Card are contained in Appendix (2).

### **Training Needs Assessment Test**

To ensure that the training provided in conjunction with the Plant Operator Training and Certification Program is cost effective, a Training Needs Assessment Test is conducted to identify those areas where training is required. The Training Needs Assessment Test items are also cross-referenced to the requirements listed in the Plant Operator Training and Certification Book. The Training Needs Assessment Test is normally administered to all Plant Operators at the plant.

After the tests are graded and the results analyzed, a graphic report is prepared that illustrates the results. This is then used to define those areas where operator training is needed and a training schedule is developed based on training needs, available materials and plant specific priorities.

## Plant Operator Training and Certification Program Administration Plan

An administration plan must be developed to assist you in implementation of the program. The purpose of the plan is to establish a process that ensures all operators have the knowledge and skills to successfully perform their jobs and that the evaluation process for certification is uniform. For this process to work the requirements for individual self study, classroom and on-the-job and training and evaluation must be understood. The Administration Plan includes the following:

1. Specific instructions for each individual operator on program requirements. This includes information about the availability of training materials and time requirements for completing the training and certification. Evaluation methods are detailed and a list of individuals qualified to perform evaluations is included.
2. Standards for classroom training and evaluation to be conducted by training instructor(s). Classroom training is to be supported by lesson plans, audiovisual training materials and uses written evaluations that are part of the training program. Prepared commercial training programs are used wherever possible. New programs, as needed, are identified.
3. On-the-job training and evaluation must be designed to ensure that the knowledge that is learned both in the classroom and on-the-job can be applied to perform actual job duties. The validated Job Performance Measures (JPMs) will be used to perform on-the-job training and evaluation. On-the-Job training and evaluation is normally conducted by the supervisor or other designated experts.
4. Current and new operators are screened to determine what their training and certification requirements are. Current operators may be “grandfathered” and some requirements wavered if they have already demonstrated that they are competent in those areas. New operators (who may also be experienced at other plants) are screened when initially hired to determine what training and certification requirements are applicable.
5. Each Operator is provided an Operator Training and Certification Book that contains an individualized Training Progress Monitoring Card (TPMC). The TPMC is used to monitor an individual’s progress through the completion of required training and certification at all job levels.

The training and certification plan will specify what materials are needed to support each training and certification module. In some cases generic training programs that you already own will be specified. Other plant specific training materials will also need to be developed to fully support the training and certification as a individualized self-study program.

## Appendix (1) Typical Modular Outline

### Basic Power Plant Training

		Electrical Systems and Equipment  036	Plant Protection  037	Gas Turbines and Diesels  038		
Fuels and Combustion  029	Boilers  030	Water Treatment  031	Turbines  032	Environ- mental Protection  033	Instrum- ation and Control  034	Power Generation  035
Plant Science  022	Plant Cycle  023	Plant Auxiliaries  024	Plant Systems  025	Basic Electricity  026	Plant Instrumentation  027	Basic Water Chemistry  028
Laboratory Safety Training  015	SCBA Training  016	Respiratory Protection Training  017	Scaffold User Training  018	Power Plant Operation  019	Mathematic Principles  020	Mathematic Applications  021
Chlorine Training  008	Ammonia Training  009	Hazwoper Training  010	Confined Spaces Training  011	Lock-out/ Tag-out Training  012	Overhead Crane Training  013	Mobile Crane Training  014
New Hire Orientation  001	CPR and First Aid  002	Bloodborne Pathogens  003	Hazard Comm.  004	Forklift Training  005	Fire Extinguisher Training  006	Flammables And Combustion  007

### Plant Operator Advanced Training

Controllable Losses – Boiler 076	Factors Affecting Turbine Efficiency 077	Controllable Losses – Turbine 078	Balance of Plant Operation 079	Power Plant Controls 080	Case Studies I 081	Case Studies II 082
Protective Relays Systems 069	Unit Integrated Operations 070	Alarm Response 071	Emergency Operating Procedures 072	Fundamentals of Plant Efficiency I 073	Fundamentals of Plant Efficiency II 074	Factors Affecting Efficiency 075

### Plant Operator Plant Specific Training

Boiler Water Sample Analysis 067	Emissions Monitoring System 068
-------------------------------------	------------------------------------

Excitation Systems 060	125 Volt DC Electrical Systems 061	AC Electrical System 062	Data Acquisition System 063	Combustion Control System 064	Electro-Hydraulic Control System 065	Switchyard System 066
Main. Reheat & Auxiliary Steam Systems 053	Turbine Lube Oil System 054	Turbine Steam Seal System 055	Turbine System 056	Extraction Steam and Heater Drains Systems 057	Generator Auxiliary Systems 058	Generator Systems 059
Feedwater System 046	Steam Generator System 048	Combustion Air and Flue Gas System 048	Boiler Fuel System 049	Ash Handling System 050	Precipitator System 051	Flue Gas Desulf. System 052
Service Water System 039	Circulating Water Systems 040	Fire Protection System 041	Cooling Water System 042	Demineralized Water System 043	Compressed Air System 044	Condensate System 045

# Plant Operator

## Training Module Requirements

**(Typical - Not a complete Module listing)**

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### Notes

*Materials include Video Tapes and Workbooks, Student Text, Lesson Plans and Job Performance Measures.*

*The list below provides requirements for Plant Operator Training on each of the training modules available in the Plant Operator Training Program*

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### Module 1: New Hire Orientation

**Materials:** *Steam Plant Safety Rules Book • Safety Procedures Manual*

**Requirements:**

Attend Entry Level New Hire Orientation Safety Training.  
Knowledge of the Organization.  
Knowledge of the layout of the Power Plant  
Knowledge of Personal Protective Equipment  
Knowledge of Steam Plant Policies and Procedures  
Demonstrate the application of proper safety procedures as directed, to ensure personnel and equipment safety.

### Module 2: CPR and First Aid

**Materials:** *OSHA Standard 29 CFR 1910.151 • Red Cross CPR and First Aid Handbook Resusci-Annie • Gauze • Splinting Materials • Airway • Surgical Gloves • Germicidal Wipes*

**Requirements:**

Attend CPR and First Aid Entry Level Safety Training.  
Knowledge of First Responder Treatment of Sprains and Muscle Pulls.  
Knowledge of First Responder Treatment of Lacerations and Bleeding.  
Knowledge of First Responder Treatment of Broken Bones.  
Ability to perform Adult Cardiopulmonary Resuscitation.  
Ability to utilize the EMS System.  
Demonstrate the application of proper CPR and First Aid safety procedures as directed, to ensure personnel and equipment safety.

### Module 4: Hazard Communication

**Materials:** *OSHA Standard 29 CFR 1910.1200 • Hazard Communication Videotape and Workbook • Testing Materials*

**Requirements:**

Attend Hazard Communication Entry Level Safety Training.  
Knowledge of Chemical Hazards.  
Knowledge of site Hazardous Chemicals.  
Ability to minimize exposure to Hazardous Chemicals, using PPE.  
Knowledge of Spills and Clean-up procedures.  
Demonstrate the application of proper Hazard Communication safety procedures as directed, to ensure personnel and equipment safety.  
Demonstrate knowledge and application of proper Hazard Communication safety procedures, which pertain to personal safety and equipment protection.  
Knowledge of Agency Notification/Reporting Requirements (HAZCOM).

**Module 5: Forklift Training**

**Materials:** OSHA Standard 29 CFR 1910.178 • Forklift Videotape and Workbook • Testing Materials • Forklift • Forklift Inspection Sheet • Pallets, Cones and Barricades • Testing Materials

**Requirements:**

Attend Forklift Entry Level Safety Training.  
Knowledge of Forklift Safety Policy.  
Ability to Inspect a Forklift prior to operation.  
Knowledge of Forklift Operation Procedures.  
Knowledge of Forklift routine maintenance and record keeping.  
Demonstrate the application of proper Forklift safety procedures as directed, to ensure personnel and equipment safety.

**Module 6: Fire Extinguisher Training**

**Materials:** OSHA Standard 29 CFR 1910.157 • Extinguisher Training Videotape and Workbook • Handheld Extinguishers (various classes) • Extinguisher Inspection Sheet • #2 Diesel in Oil Pan • Torch • Testing Materials

**Requirements:**

Attend Fire Extinguisher Entry Level Safety Training.  
Knowledge of the Fire Tetrahedron.  
Knowledge of the Classes of Fires.  
Knowledge of Fire Extinguisher Types.  
Ability to Checkout an Extinguisher.  
Demonstrate proper use of an Extinguisher.  
Demonstrates the application of proper Fire Extinguisher safety procedures as directed, to ensure personnel and equipment safety.

**Module 10: Hazwoper Training**

**Materials:** OSHA Standard 29 CFR 1910.120 • Hazwoper Videotape and Workbook • Operating Procedures • Emergency Procedures • MSDS Sheet • Process Safety Management Plan • Certification Test

**Requirements:**

Attend Hazwoper Entry Level Safety Training.  
Knowledge of Hazardous Waste (Identification).  
Knowledge of Container Labeling.  
Knowledge of Placards.  
Ability to Contain a Hazardous Waste Spill.  
Ability to perform a Hazardous Waste Evaluation.  
Demonstrate the application of proper Hazwoper safety procedures as directed, to ensure personnel and equipment safety.  
Demonstrate knowledge and application of proper Hazwoper safety procedures, which pertain to personal safety and equipment protection, related to auxiliary equipment.

**Module 40: Circulating Water System**

**Materials:** *Circulating Water System Student Text • P & IDs • Plant Procedures • System Drawings • Logic Diagrams • Job Performance Measure*

**Requirements:**

Knowledge of Basic Circulating Water System Description.  
Knowledge of Circulating Water System Flow Path.  
Knowledge of Circulating Water System Parameters  
Knowledge of Circulating Water System Major Components.  
Knowledge of Circulating Water System Operation.  
Knowledge of Alarms and Trips for Circulating Water System.  
Demonstrate the basic knowledge of Circulating Water System equipment operating procedures, principally related to placing auxiliary equipment and systems in and out of service.  
Demonstrate the skill and knowledge for Circulating Water System required to monitor Unit equipment, recognize and react to abnormal operation and record equipment history.  
Demonstrate knowledge and application of Circulating Water System safety procedures, which pertain to personal safety and equipment protection, related to auxiliary equipment.

**Module 42: Cooling Water System**

**Materials:** *Cooling Water System Student Text • P & IDs • Plant Procedures • System Drawings • Logic Diagrams • Job Performance Measure*

**Requirements:**

Knowledge of Cooling Water System Function.  
Knowledge of Basic Cooling Water System Description.  
Knowledge of Cooling Water System Flow Path.  
Knowledge of Cooling Water System Parameters.  
Knowledge of Cooling Water System Major Components.  
Knowledge of Cooling Water System Operation.  
Knowledge of Alarms and Trips for Cooling Water System.  
Demonstrate the basic knowledge of Cooling Water System equipment operating procedures, principally related to placing auxiliary equipment and systems in and out of service.  
Demonstrate the skill and knowledge for Cooling Water System required to monitor Unit equipment, recognize and react to abnormal operation and record equipment history.  
Demonstrate the knowledge and skills required to operate Cooling Water Systems and various heat exchangers associated with the auxiliary equipment.  
Demonstrate knowledge and application of Cooling Water System safety procedures, which pertain to personal safety and equipment protection, related to auxiliary equipment.

**Module 64: Combustion Control System**

**Materials:** *Combustion Control System Student Text • P & IDs • Logic Diagrams • Plant Procedures • System Drawings • Logic Diagrams • Job Performance Measures*

**Requirements:**

Knowledge of Combustion Control System Function.  
Knowledge of Basic Combustion Control System Description.  
Knowledge of Basic Combustion Control System Flow Path.  
Knowledge of Basic Combustion Control System Parameters.  
Knowledge of Basic Combustion Control System Major Components.  
Knowledge of Basic Combustion Control System Operation.  
Knowledge of Basic Combustion Control System Alarms and Trips.  
Demonstrate a thorough knowledge of Combustion Control System operating procedures in order to start-up, shutdown and respond appropriately to Unit upsets, with minimal supervisory assistance.  
Demonstrate knowledge and skills for Combustion Control System required to operate Unit controls and equipment, in a manner, which maintains Unit reliability, availability, and efficiency goals.  
Demonstrate the skills and knowledge of boiler operation and all related equipment, to respond appropriately during Unit transitions, as required by the power marketing group.  
Demonstrate in-depth knowledge of Combustion Control System units operating procedures and resource material, and provide leadership for team members, during Unit's start-ups, shutdowns, upsets and/or load transitions.

**Module 65: Electro-Hydraulic Control System**

**Materials:** *Electro-Hydraulic Control System Student Text • P & IDs • Logic Diagrams • Plant Procedures • System Drawings • Job Performance Measures*

**Requirements:**

Knowledge of Electro-Hydraulic Control System Function.  
Knowledge of Basic Electro-Hydraulic Control System Description.  
Knowledge of Electro-Hydraulic Control System Flow Path.  
Knowledge of Electro-Hydraulic Control System Parameters.  
Knowledge of Electro-Hydraulic Control System Major Components.  
Knowledge of Electro-Hydraulic Control System Operation.  
Knowledge of Alarms and Trips for the Electro-Hydraulic Control System.  
Demonstrate a thorough knowledge of Electro-Hydraulic Control System operating procedures in order to start-up, shut-down and respond appropriately to Unit upsets, with minimal supervisory experience.  
Demonstrate knowledge and skills for Electro-Hydraulic Control System required to operate Unit controls and equipment, in a manner that maintains Unit reliability, availability, and efficiency goals.  
Demonstrate in-depth knowledge required to operate the turbine/generator controls and related equipment, during normal and abnormal Unit conditions.  
Demonstrate in-depth knowledge of Electro-Hydraulic Control System Unit's operating procedures and resource material, and provide leadership for team members, during Unit's start-ups, shut-downs, upsets and/or load transitions.

**Module 68: Emissions Monitoring System**

**Materials:** *Emissions Monitoring System Training System Description Procedure • P & IDs • Plant Procedures • System Drawings • Logic Diagrams • Job Performance Measures*

**Requirements:**

Knowledge of Emissions Monitoring System Function.  
Knowledge of Emissions Monitoring System Basic System Description.  
Knowledge of Emissions Monitoring System Flow Path.  
Knowledge of Emissions Monitoring System Parameters.  
Knowledge of Emissions Monitoring System Major Components.  
Knowledge of Emissions Monitoring System Operation.  
Knowledge of Alarms and Trips for the Emissions Monitoring System.  
Demonstrate knowledge and application of Emissions Monitoring System safety procedures that pertain to personal safety and equipment protection.  
Demonstrates knowledge and skills required to operate all boiler air/flue gas equipment and systems.  
Demonstrates a thorough knowledge of environmental control systems, required to operate, advise and assist team members in minimizing the number of violations.  
Demonstrates the skills and knowledge to direct operation of environmental control systems and react appropriately to minimize violations.

**Module 69: Protective Relays System**

**Materials:** *Protective Relays System Student Text • P & IDs • Electrical Drawings • Plant Procedures • System Drawings • Logic Diagrams • Job Performance Measures*

**Requirements:**

Knowledge of Protective Relays System Function.  
Knowledge of Basic Protective Relays System Description.  
Knowledge of Protective Relays System Flow Path.  
Knowledge of Protective Relays System Parameters.  
Knowledge of Protective Relays System Major Components.  
Knowledge of Protective Relays System Operation.  
Knowledge of Alarms and Trips for the Protective Relays System.  
Demonstrate a thorough knowledge of Protective Relays System operating procedures in order to  
start-up, shutdown and respond appropriately to Unit upsets, with minimal supervisory experience.  
Demonstrates the skills and knowledge required to operate generator/exciter controls and electrical  
switching, including the operation of electrical protective devices.

**Module 70: Unit Integrated Operation**

**Materials:** *Unit Integrated Operation Procedure/Student Text • P and IDs • Logic Diagrams • Plant Procedures • System Drawings • Job Performance Measures*

**Requirements:**

Knowledge of Precautions, Limitations and Setpoints for Unit Integrated Operation.  
Ability to perform Complete Unit Start-up.

Ability to perform troubleshooting of Unit Integrated Operation Systems/components during Normal Operation.

Ability to perform complete Unit Shut-down.

Ability to perform all Unit System Valve Line-ups.

Demonstrate a thorough knowledge of Unit Integrated Operation operating procedures in order to start-up, shutdown and respond appropriately to Unit upsets, with minimal supervisory experience.

Demonstrate the skills required to operate all combustion control and data acquisition systems, during all Unit conditions, including start-ups, shutdowns and upsets, with minimal supervisory experience.

Demonstrate the skills and knowledge required to operate the turbine/generator controls, and related equipment, during normal and abnormal Unit conditions.

**Module 71: Alarm Response**

**Materials:** *Alarm Response Student Text • P & IDs • Plant Procedures • System Drawings • Logic Diagrams • Job Performance Measures*

**Requirements:**

Knowledge of the Hierarchy of Alarms.

Ability to Identify Systems/Equipment in Alarm/Alarm Status.

Ability to interpret and print an Alarm List.

Ability to appropriately respond to Alarms.

Demonstrates a thorough knowledge of Alarm Response operating procedures in order to start-up, shutdown and respond appropriately to Unit upsets, with minimal supervisory assistance.

**Module 72: Emergency Operating Procedures**

**Materials:** *Emergency Operating Procedures • P & IDs • Plant Procedures • System Drawings • Logic Diagrams • Job Performance Measures*

**Requirements:**

Ability to respond appropriately to the loss of a Condensate Pump.

Ability to respond appropriately to the loss of a Feedwater Pump.

Ability to respond appropriately to the loss of a Fan Pair.

Ability to respond appropriately to Drum Level Hi/Lo.

Ability to respond appropriately to Turbine High Vibration.

Ability to respond appropriately to Turbine Differential Expansion.

Ability to respond appropriately to Turbine Thrust.

Demonstrate a thorough knowledge of emergency operating procedures in order to start-up, shut-down and respond appropriately to Unit upsets, with minimal supervisory assistance.

Demonstrates the skills and knowledge required to operate the turbine/generator controls, and related equipment, during normal and abnormal Unit conditions.

## Appendix (2) Typical Training Documents

# Power Plant Operator Training and Certification Book

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## Typical Power Plant Operator Training Book

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### Preface

This Plant Operator Training Program was developed and validated by a select group of workers and supervisors from your plant. Thus, the requirements for training conforms to the standards set by the plant.

The broad purpose of the Plant Operator Training and Certification Program is to train Plant Operators throughout the company. The skills listed in each module of training cover all phases of Plant Operator work. The modules are intended to replace any training or certification program now in place.

This particular program “Plant Operator Training Program” lists the core skills that any Plant Operator must have to effectively perform his or her job functions. As participants learn new material, they are expected to demonstrate their competence on a continuing basis. That is, participants are expected to carry previously learned skills with them to the next level. This approach is in contrast to some training programs, which require participants to demonstrate competence only at the current level, while ignoring skills learned at previous levels.

If properly used, the Plant Operator Training and Certification Program will help supervisors train their employees on the job and will form the basis of evaluation. The skills listed for each module form the basis for the content of the training classes.

An added benefit of the modular approach is that employees will be able to review each module’s skill requirements and know what is expected of them. This will help employees prepare themselves for each step in their progression.

Ultimately, the Plant Operator Training and Certification Program will help you attain our goal of having **“well-trained employees who can progress with the company.”**

## **PLANT OPERATOR TRAINING REQUIREMENTS**

The program is organized such that the training progression into levels allows flexibility. The complete program may take between six and eighteen months to complete depending on each individual's training requirements. Regardless of how much time trainees spend on each module they must demonstrate the ability to perform the listed skills and must show that they meet the knowledge requirements.

The Plant Operator Training Program is not designed to be a job description. The skills listed in the program outline minimum technical requirements for each module. Since these are minimum requirements for a particular module, a given employee may be able and qualified to perform a job beyond his or her classification. The employee may perform the specific job at the supervisor's discretion. The supervisor determines whether or not a trainee is qualified to do a job beyond his or her classification.

Plant Operators are sometimes required to do their jobs without assistance. Employees being trained, as part of this program, also may have to work by themselves at times. Nevertheless, it is very important that the skills and knowledge outlined in this program be performed under direct supervision, with supervisors becoming involved in the growth of trainees.

Keys to successful skill-building during training include:

- Involved supervision
- On-the-job explanation of how to work
- Focused skill-building in the various types of work

Some modules require trainees to learn especially important parts of the "Safety Rules Book". The selection of these modules is not intended to limit or dictate the sequence of the employee's Safety Procedures Manual. However, the selected modules and procedures must be learned as employee's progress through this program.

Study materials for this certification program include the following:

- Safety Rules Book
- Plant Operator Training Book (this book)
- Training material (received during classroom instruction)
- Self-study training materials such as system descriptions and operating procedures
- Videotapes and CD-ROMs
- P&ID Drawings, Logic Diagrams, Valves List and other plant reference material

## **PLANT OPERATOR TRAINING BOOK INSTRUCTIONS**

The Plant Operator Training Program uses self-study, classroom training and on-the-job training. Employees are required to demonstrate actual work proficiency before they can be certified as qualified.

All items in the Plant Operator Training Book require the employee to take an action or give a response. Each item requires some preparatory work, such as reading, studying, observation, or practical experience. Employees should be encouraged to ask questions if they are unsure about any items.

The requirements have been designed to measure knowledge and evaluate skills. Each employee must take the initiative to request training or help in learning a skill. The supervisor is responsible for observing the employee's safety habits, work procedures, and completion time. As the trainee demonstrates skills, the supervisor or another qualified trainer should initial and date the space next to the skill demonstrated (see Job Performance Measure sheets).

The supervisor or trainer must consider safety habits when judging whether or not to approve a skills demonstration. An unsafe act may invalidate an otherwise approved performance. Remember that safety is a crucial part of any Plant Operator's work and of every task performed.

Skill demonstrations must be approved by an employee's supervisor or someone designated by a supervisor, such as a trainer in a school. The company Safety Procedures Manual and company-approved standards and procedures must be used to determine the quality of a demonstration. In some cases, the supervisor may use a team to approve a demonstration.

Supervisors or delegated authorities must date and initial or sign all approvals on the Plant Operator Training Progress Monitoring Card. Since the TPMC will become a part of the employee's permanent record, supervisors must keep the document secure during the training period, to protect confidentiality.

Employees, supervisors, and trainers can use the comments section and the white space in the margin of each page for any notes or remarks.

The skills listed in this book must be performed in their order of appearance unless authorized by the Training Manager or Supervisor. The order in which the employee performs the demonstration of these skills depends on each employee's experience and preparation. It also depends on the employee's current work schedule.

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**Typical Power Plant Operator  
Training Book**

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**Plant Operator Training Progress Monitoring Card**

**Note: Modules 2-18 are Plant Operator Mandatory OSHA Safety Training.**

**Employee's Name (print):** \_\_\_\_\_

**Work Location:** \_\_\_\_\_

**Supervisor's Name (print):** \_\_\_\_\_

<b>Module #</b>	<b>Module Title</b>	<b>Date Completed</b>	<b>Initials</b>
001	New Hire Orientation		
002	CPR and First Aid		
003	Bloodborne Pathogens		
004	Hazard Communication		
005	Forklift Training		
006	Fire Extinguisher Training		
007	Flammables and Combustibles		
008	Chlorine Training		
009	Ammonia Training		
010	Hazwoper Training		
011	Confined Spaces Training		
012	Lock-out/Tag-out		
013	Overhead Crane Training		
014	Mobile Crane Training		
015	Laboratory Safety		
016	SCBA Training		
017	Respiratory Protection		
018	Scaffold User Training		

**Typical Power Plant Operator  
Training Book**

<b>Module #</b>	<b>Module Title</b>	<b>Date Completed</b>	<b>Initials</b>
019	Power Plant Operation		
020	Mathematics Principles		
021	Mathematics Applications		
022	Plant Science		
023	Plant Cycle		
024	Plant Auxiliaries		
025	Plant Systems		
026	Basic Electricity		
027	Plant Instrumentation		
028	Basic Water Chemistry		
029	Fuels and Combustion		
030	Boilers		
031	Water Treatment		
032	Turbines		
033	Environmental Protection		
034	Instrumentation and Control		
035	Power Generation		
036	Electrical Systems and Equipment		
037	Plant Protection		
038	Gas Turbines and Diesels		
039	Service Water System		
040	Circulating Water System		
041	Fire Protection System		
042	Closed Cooling Water System		
043	Demineralized Water System		
044	Compressed Air System		
045	Condensate System		
046	Feedwater System		

**Typical Power Plant Operator  
Training Book**

<b>Module #</b>	<b>Module Title</b>	<b>Date Completed</b>	<b>Initials</b>
047	Steam Generator System		
048	Combustion Air and Flue Gas System		
049	Boiler Fuel System		
050	Ash Handling Systems		
051	Precipitator System		
052	Flue Gas Desulfurization System		
053	Main, Reheat and Auxiliary Steam Systems		
054	Turbine Lube Oil System		
055	Turbine Steam Seal System		
056	Turbine System		
057	Extraction Steam and Heater Drains System		
058	Generator Auxiliaries System		
059	Generator System		
060	Excitation System		
061	125 Volt DC Electrical System		
062	AC Electrical System		
063	Data Acquisition System		
064	Combustion Control System		
065	Electro-Hydraulic Control System		
066	Switchyard System		
067	Boiler Water Sample Analysis		
068	Emissions Monitoring System		
069	Protective Relays System		
070	Unit Integrated Operating Procedure		
071	Alarm Response		
072	Emergency Operating Procedures		
073	Fundamentals of Plant Efficiency I		

**Typical Power Plant Operator  
Training Book**

<b>Module #</b>	<b>Module Title</b>	<b>Date Completed</b>	<b>Initials</b>
074	Fundamentals of Plant Efficiency II		
075	Factors Affecting Boiler Efficiency		
076	Controllable Losses - Boiler		
077	Factors Affecting Turbine Cycle Efficiency		
078	Controllable Losses - Turbine		
079	Balance of Plant Operation		
080	Power Plant Controls		
081	Case Studies I		
082	Case Studies II		

**Comments**

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I certify that \_\_\_\_\_ has performed the above duties as evaluated.

\_\_\_\_\_  
Supervisor's Signature                      Please print name                      Date

\_\_\_\_\_  
Employee's Signature                      Please print name                      Date

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**Typical Power Plant Operator  
Assessment Test Items and Job Performance Measure**

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**TYPICAL PLANT OPERATOR ASSESSMENT TEST ITEMS**

1. (MOD061) If a vacuum breaker on a Raw Water System discharge pipe fails to operate properly, the pipe may burst due to the high-pressure condition.
  - a. True
  - b. False
  
2. (MOD062) Before starting circulating water pump, the discharge valve must be
  - A. Completely open
  - B. Halfway open
  - C. Completely closed
  - D. None of the above
  
3. (MOD063) What should be done if pump packing liquid leak-off temperature is increasing?
  - A. Tighten gland. If temperature continues to rise, report the condition to the supervisor
  - B. Loosen gland. If temperature continues to rise, report the condition to the supervisor
  - C. Adjust temperature of liquid supply
  - D. Stop pump and report condition to supervisor
  
4. (MOD064) \_\_\_\_\_ if exposed to temperatures of 50 degrees or below, will solidify.
  - A. Ammonia
  - B. Sulfuric acid
  - C. Caustic soda
  - D. Hydrazine
  
5. (MOD065) Moisture can be blown down from station airlines by opening high point vents.
  - A. True
  - B. False
  
6. (MOD065) A Station Air Compressor cycles on and off based on the demand signal generated from a flow switch.
  - A. True
  - B. False

{PRIVATE }

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**Typical Power Plant Operator  
Assessment Test Items and Job Performance Measure**

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**Plant Operator**

**CS13-3-JPM**

Performance Measure: Feedwater System Unit 3

Name:

All Parts Satisfactorily Completed:

\_\_\_\_\_  
(Examiner's signature)

\_\_\_\_\_  
(Date)

Supervisors Comments:

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References:

- Training Module (CS13-3)

Materials Needed:

- Pencil
- System Description – Unit 3 Feedwater System (CS13-3-SD)
- System Operating Procedure – Unit 3 Feedwater System (CS13-3-SOP)
- Associated Operator Route Check List

Safety/Environmental:

- Wear hard hats, safety glasses, safety toe shoe, and ear plugs as required.
- Discuss safety and environmental hazards associated with operating the system.
- Discuss any unusual operating conditions associated with the system.

Note: Always observe all plant safety precautions in accordance with Plant Safety and Health procedures, the Power Supply Safety and Operating Rules Handbook or Accident Prevention Manual, and all Federal, State and/or Local OSHA Standards.

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**Typical Power Plant Operator  
Assessment Test Items and Job Performance Measure**

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**Part A: Location of System Components**

Conduct a walk through of the plant, locate, identify and describe the operational function of the components.

1. Unit 3 Deaerator
2. Boiler Feed Pump 3-1
3. Boiler Feed Pump 3-2
4. Boiler Feed Pump Hydraulic Control Package
5. HP Feedwater Heater 3-5
6. HP Feedwater Heater 3-6
7. AC oil pumps
8. DC oil pump
9. Kaydon Oil Conditioner

Satisfactorily Completed \_\_\_\_\_

**Part B: Location of Valves**

Conduct a walk through of the plant, locate, identify and describe the operational function of the valves.

1. BFP Inlet MOVs (41 and 42)
2. BFP Outlet MOV'S (9 and 10)
3. BFP Drains
4. BFP Recirculation Valves (FCV-14 and -15)
5. BFP Warm-Up Valves
6. Cross-Connect to Unit 3 Condensate System Valves
7. Supply to HP Injection Pumps
8. Supply to Main Steam Desuperheater
9. Three-Way HP Heater Inlet Valve
10. HP Heater Outlet Valve (Gear-Driven)
11. Feedwater Stop Valve (MOV-11)
12. Startup Feedwater Control Valve (FCV-18)
13. Economizer Inlet Valves

Satisfactorily Completed \_\_\_\_\_

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**Typical Power Plant Operator  
Assessment Test Items and Job Performance Measure**

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**Part C: Location of Local Control Panels and Breakers**

Conduct a walk through of the plant, locate, identify and describe the operational function of the local control panels and breakers.

1. BFP 3-1 Control Panel
2. BFP 3-2 Control Panel
3. BFP Control Panels in Control Room
4. HPU Control Panel
5. Kaydon Oil Conditioner Control Panel
6. MOV Breakers

Satisfactorily Completed \_\_\_\_\_

**Part D: Preparation for Operating the Feedwater System**

Using the following steps, demonstrate how to prepare for operating the Feedwater System. Explain your actions at each step.

1. Visually inspect the Feedwater System for proper valve lineup.
2. Deaerator level is acceptable, near 8.5 feet.
3. Each BFP lined up for operation, with lubrication systems operating.
4. HP Feedwater Heater levels are normal.
5. Startup Feedwater Control Valve FCV-18 lined up for use, Feedwater Block Valve (MOV-11) is closed.
6. Three-Way Valve is lined up to pass Feedwater through the HP Heaters.
7. Both Feedwater Inlet Valves to the Economizer are open.

Satisfactorily Completed \_\_\_\_\_

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**Typical Power Plant Operator  
Assessment Test Items and Job Performance Measure**

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**Part E: Feedwater System Startup**

Perform a start up of the Feedwater System. Explain your actions and observations at each step of the procedure.

1. Seal each BFPT prior to drawing vacuum in the Main Condenser.
2. Before reaching Boiler pressure of 300 psig, verify that the BFP is lined up for use.
3. Open all required steam line drains.
4. When Auxiliary Steam pressure is 70 psig, reset the BFPT trips.
5. Open the BFPT Steam Stop Valve.
6. Roll the first BFPT using the buttons in the Control Room, allowing the automatic controls to raise BFPT speed properly.
7. Verify that the BFPT starts properly, with no excess vibration or noise.
8. Bump open the BFP Discharge Valve.
9. After the BFP is running, close the warm-up line.
10. When Feedwater flow is stable, place the Startup Feedwater Control Valve (FCV-18) in "AUTO".
11. When FCV-18 is about 50 percent open, place the BFP in "AUTO".
12. Verify MOV 11 opens and that flow control shifts from DP mode to FLOW mode as drum pressure increases to 1500 psig and Feedwater flow increases to 450,000 pounds per hour.
13. As load approaches 50 percent, start the second BFP.

Satisfactorily Completed \_\_\_\_\_

**Part F: Feedwater System Unit 3 Inspection**

Conduct a complete system inspection of the Unit 3 Feedwater System. Explain your actions and observations as equipment is inspected.

1. Verify Deaerator and Heater levels are being maintained automatically.
2. Verify proper operation of the BFP lubrication and hydraulic oil units.
3. Verify proper operation of operating BFPs.
4. Verify proper operation of the oil purification system.
5. Check for leaks or any abnormal conditions.

Satisfactorily Completed \_\_\_\_\_

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**Typical Power Plant Operator  
Assessment Test Items and Job Performance Measure**

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**Part G: Feedwater System Shutdown**

Explain your actions and observations at each step of the procedure.

1. If both BFPs operating, reduce both to minimum speed of 3000 rpm.
2. Trip one BFP and shut down the BFPT properly.
3. When ready, trip the second BFP and shut down the BFPT properly.
4. Shut FCV-18 and MOV-11.
5. After vacuum is broken, remove steam seals from both BFPTs.
6. Recirculate oil for at least 4 hours.
7. If the shutdown will be a long one, open the BFPT drains.

Satisfactorily Completed \_\_\_\_\_

**Part H: Personnel and Equipment Safety**

Verify the individual performed all aspects of the JPM using safe operating practices and following Plant safety and environmental procedures.

Satisfactorily Completed \_\_\_\_\_