

TITLE: **APPRENTICE MECHANIC-RIGGER TRAINING PROGRAM OF INSTRUCTION**

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**References**

1. Training Program for the Apprentice Mechanic-Rigger in Nuclear Power Plants, 3/1/89 Edition
2. M/M Initial Training Program of Instruction
3. TQ1.ID4, Non-Accredited training Records
4. TQ1.ID3, Non-Accredited Training and Qualification Program Management
5. TQ2.DC6, Maintenance Training Program
6. Division Master Apprenticeship Agreement, Rev. 7.02

**Remarks**

1. Assumed entry level skills and knowledge – The Apprentice Mechanic-Rigger Training Program is an entry level program and assumes little or no maintenance experience from Apprentice candidates. Candidates will meet the following:
  - Applicable union bidding specifications as dictated by the Division Master Apprenticeship Agreement
  - Satisfactory completion of the Arithmetic Computation Test (ACT) as dictated by the Division Master Apprenticeship Agreement
  - Satisfactory completion of discipline Aptitude Test at the discretion of plant Supervision
  - Completion of one year as a Plant Utility Worker
2. Evaluation of students will be conducted per TQ1.ID3. The frequency of evaluations will be the end of each course/lesson.

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APPROVED BY:	_____ UNION BUSINESS MANAGER, IBEW	DATE:	_____

**Remarks; continued,**

3. Welding instruction presented by this Apprentice Program, both academic and OJT, is for instructional purposes only. Weld certification is administered by and the jurisdiction of individual facilities.
4. Mobile Crane instruction presented by this Apprentice Program, both academic and OJT, is for instructional purposes only. Mobile Crane certification is administered by National Commission for the Certification of Crane Operators (NCCCO).
5. Review and Approval is accomplished through the Joint Apprenticeship Training Committee, see letter of agreement LA-06-44-PGE.

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## **SECTION I - Introduction**

### **A. Introduction**

Upon selection of the Mechanic-Rigger Apprenticeship the candidate has embarked in an occupation that may well become a life long vocation. The management of Pacific Gas and Electric is committed in its endeavor of guiding and assisting each Apprentice candidate through the Apprentice Training Program. The objective is satisfactory completion of both the "On-the-Job" (OJT) training phase and the related "technical training" of the chosen craft. It is intended that each Apprentice become familiar with how the Apprentice Training Program is organized and how to optimize comprehension and retention of the learning material presented in each training phase.

The Apprentice program is comprised of 30 months of classroom, laboratory, and OJT. An additional 6 month period will be utilized for continued, additional or make-up qualification necessary to complete the program.

Each Apprentice will be exposed to challenges and opportunities, which, if accepted enthusiastically, will result in successful completion of the Apprentice Program and the attainment of Journeyman level status.

The rapid expansion of the nuclear power generation and the increasing complexity of power plant equipment during the last few decades have necessitated the selection of personnel with specific qualifications and job potential. Through cooperative efforts, a great deal of select training material has been assembled. This material has been carefully chosen to give sound training in the discipline of rigging and power plant mechanical maintenance.

This training program will provide the Apprentice candidate with the means to associate theories with the practices of the Mechanical-Rigger craft. Once the training is mastered the candidate will be able to plan work and solve problems relating to his/her job. The academic portion of this training program is enhanced by progressive experiences of OJT. This is essential for the successful advancement to a higher level of skill.

There is no simple way to acquire the related information and skills of any trade. Considerable study and diligent work are required to master the extensive amount of technical knowledge and practical skill that is part of every modern craft. Apprentice-training program has been designed to make the acquisition of this knowledge as meaningful as possible. The material will be covered systematically with frequent checks on progress and on the thoroughness of learning. It is the Apprentice's responsibility to gain the maximum knowledge possible during the Apprenticeship training.

**B. Job progression and Bidding Procedure**

Within a chosen field, normal lines of progression have been established and agreed to by both Company and Union. These lines of progression are shown in Exhibit VI, B of the Company-Union Agreement. Your foreman can show them to you if you desire to review them. Generally the line of progression for the various maintenance classifications in ascending order is Helper, Apprentice, Journeyman and Foreman.

The procedures related to the job bidding and promotions are beyond the scope of this section. They can be found in Section 205 of the Company-Union Agreement.

## **SECTION II – Program Overview**

### **A. Academic Training**

The academic phase of the Apprentice Training Program is designed to provide sufficient technical knowledge to solve problems encountered as a Journeyman. Academic instruction places emphasis on “theory”, principal of operation, and construction. Academic instruction works in conjunction with performance-based training such as OJT, laboratory, or simulator. Academic instruction is tested by quizzes, tests, and exams that become part of the Apprentice’s training record.

Tests and exams will be administered at the end of each lesson or course, respectively, in accordance with TQ2.DC6, Maintenance Training Program.

Self-study is usually performed in the training building where instructors are available for assistance. Self-study hours will be documented on Attachment 14, Master Assignment Chart in the location specified. The Apprentice is expected to meet or exceed the hours specified.

### **B. On-the-Job Training (OJT)**

OJT is performance-based training designed to provide instruction in job-related skills and knowledge in a work environment. The “OJT” phase of the Apprentice Training Program is designed to allow the Apprentice to work side-by-side with Journeyman level personnel to provide practical training with hands-on applications to prepare for Journeyman responsibilities. It is preferred that OJT be conducted by task qualified Journeyman level personnel. It is, however, recognized that in-plant OJT may not always be available or feasible. Therefore, portions of OJT may be conducted in a laboratory or simulator setting by line and other than line personnel, providing they are task qualified in the task to be trained.

The OJT hours shown in Section V.B, Apprentice Mechanic-Rigger Program Schedule, are adequate to complete the program in the allotted time.

Scheduling - OJT is divided into 13 categories (e.g., pumps, valves, etc.) with minimum hourly OJT requirements given. (See Section IV). The foreman is responsible for assigning the Apprentice to plant work. Utilizing the Master Assignment Chart (Attachment 14), the foreman will be capable of resource loading the schedule for the required Apprentice OJT training hours when ever practical.

### C. Program Management

It is the intent of the Apprentice Training Program and PG&E management that rather than completing this Apprentice program in its entirety and then entering into the M/M Initial Training Program, the Apprentice candidate will complete selected portions of the Apprentice program and be allowed to enter into the applicable qualification portions of the M/M Initial Training Program. It is intended that the Apprentice finish the Apprentice Training Program with some or all of his/her fundamental and basic qualifications as listed in the M/M Initial Training Program of Instruction. Supervision of the Apprentice Training Program is the responsibility of the maintenance foreman. The maintenance foreman is responsible for assigning the Apprentice to plant work, review of training records, and remedial study plans. The foreman is assisted, as necessary, by other plant personnel such as Journeyman and training department instructors.

### D. Progress Evaluation

Evaluation of successful progress through the Mechanic-Rigger Apprentice Program consists of two criteria. The first is academic achievement evaluated by quizzes, tests, and exams. The second is hourly OJT requirements as stated in Section IV of this document. Periodic tests and reviews will be held for the purpose of evaluating overall progress and determining success within the program. If academic progress becomes unsatisfactory, below the minimum level of 70%, the foreman/instructor will review performance and recommend steps for remediation. It is recognized that it may not be possible to attain the scheduled OJT hours due to plant evolutions or training availability in a particular area. Should the Apprentice fail to complete the scheduled hours, they may be made up at a later date. Satisfactory completion of the Apprentice Program requires completing the total OJT hours as shown in Section V.B, General Program Schedule.

After a failure of a test or exam, line supervision will be notified, and the Apprentice shall be offered remediation and allowed to retake the test. Two additional tests shall be allowed at line supervision discretion. Academic failure will be addressed per Section F of the Company-Union agreement.

The above shall also apply to hourly requirements of OJT given in conjunction with academic training. Records of progress will be kept and reviewed as part of the evaluation process.

If an Apprentice does not maintain an acceptable OJT and academic work level, notice shall be given to the Union's Business Representative or their designee. Progress to the next higher wage step, or demotion, shall be in accordance with Paragraphs F3, 4, 5, and 6 of the Master Apprenticeship Agreement. An Apprentice shall not be held back from the next higher wage step because the necessary academic training was not provided prior to one of these steps.

### E. Apprentice Responsibility

It is the Apprentice's responsibility to maintain a grade average above the minimum level of 70%, satisfy OJT hourly requirements, and obtain plant signatures during OJT to remain in the program. If the need for assistance arises, it is the Apprentice's responsibility to discuss these matters with plant supervision.



### SECTION III - Guidelines

#### A. Goals of the Apprentice Mechanic-Rigger Program

The need for trained and fully qualified employees to accomplish their duties in a manner consistent with the Company's Standards of Construction, Safety, and Performance has resulted in this program, which coordinates OJT and related academic training.

The systematic acquisition of knowledge and skills offers the employee in training the vehicle to attain self-confidence, assuredness, satisfaction in his/her job, and to learn the correct and safe method of performing the Company's work.

#### B. Training

During the 36 months of the Apprenticeship, the Apprentice will be offered job training divided into six time periods, which coincide with the wage steps of the classification. To ensure that uniform and safe practices will be followed during training, assignment of duties and work procedures shall be provided in each of the wage steps as outlined here and in Section IV and V. The amounts of time as indicated in these sections are believed to be sufficient for the Apprentice to develop proficiency.

The program Map in Section V also specifies those training periods in which the Apprentice shall receive specified classroom training.

The amount of OJT training as specified in Section IV, shall apply, to the extent that, such duties are performed by Journeymen where the Apprentice is headquartered. In the event a duty is not performed by the journeymen at the Apprentice's headquarters, and is therefore not available in the training program, it shall be noted in the Apprentice's work record. Progression through the Apprenticeship, or to Journeyman, or to higher classification shall not be deterred for this reason. If such a duty later becomes applicable, the Apprentice (or Journeyman if classification has since changed) shall receive the training, as may be required, to attain the expected Journeyman proficiency. If, after a reasonable opportunity, proficiency is not attained, bids for progression to higher classification may be subject to the provisions of Section 205.11 of the Agreement.

#### C. General Guidelines

It is intended that assignment of the specified hours of OJT (Section IV) for each period of the Apprenticeship will be made to the Apprentice as early in the period as is practical.

Hours shown in Section IV exclude any travel time needed to reach the place where training is to be given; however, such hours include time needed to prepare tools and equipment.

Except where otherwise specified, Apprentices shall be trained by assignment to work with qualified journeymen. Progressive work experience in all phases of work should be provided throughout the first five periods of the Apprenticeship. Assignments during the last or sixth period will be made for the purpose of rounding out the Apprentice's experience.

Upon entering each new wage step and period of training, the work assignments in the period shall be such that the Apprentice will gain the basic knowledge and confidence on the equipment and the procedures being used. More complex assignments shall be made progressively as the Apprentice gains knowledge and capability.

As an Apprentice, work may be assigned without direct supervision only after instruction on the required duties and/or work procedures; after such work has been performed under direct supervision; and after the capability of performing such work safely has been demonstrated. At DCCP, only task-qualified personnel will perform work independently.

Except in emergency circumstances, an Apprentice shall not be temporarily assigned to the classification of Sub-foreman. If assigned to such classification, the Apprentice shall not be given the responsibility for duties beyond their current step of training.

At the end of the first six-months, and at the end of each succeeding six-month interval, progress will be examined to determine that the Standards of Achievement for current status in the program have been met and to determine whether the apprentice is qualified to advance to the next step in the program in accordance with SECTION VII – Progress Documentation Procedures and Attachment 14, Master Assignment Chart.

#### D. Guidelines for Training Periods

During the training periods, the Apprentice shall learn the use and care of tools and equipment and will gain knowledge of a Journeyman Mechanic-Rigger's work by participating in such work. The Apprentice will become familiar with the various Clearance Procedures, General Orders and Instructions applicable to the work that they perform.

The academics will be provided as outlined in Section IV and in accordance with the program map and schedule of Section V.

The OJT training portion of the Apprentice Program has been planned, both in the subject material covered and the amount of training given, to provide the basic knowledge of the Mechanic-Rigger's duties. A Minimum number of training hours has been established for each phase of the OJT training as shown on the Master Assignment Chart in Attachment 14.

At the end of the second six months and at the end of each of the next three six month intervals, the Apprentice will be required to satisfactorily complete a project to demonstrate rigging ability. These demonstration tests will be based on the length of time in the program and the training received.

## SECTION IV - Outline of Subject Matter

### A. Academic Training

Academic training will consist of 12 courses. The instructional settings, facility, and duration for these courses are outlined in the paragraphs that follow. Course content is described in Section IV.C. Specific details, such as lesson titles and numbers, are covered in Attachments 1 through 12.

Academic Course Content	Training Hours
Mechanic/Rigger Fundamentals	
Math	80
Basic Science	70
Power Plant Fundamentals	80
Basic Tools and Equipment	128
Mechanical Drawing & Print Reading	40
Piping and Piping Components	147
Bearings and Lubrication	40
Mechanic/Rigger Basic Qualification	
Rigging Fundamentals	105
Heavy Equipment and Cranes Operation	163
Valve Fundamentals	140
Pumps and Rotating Equipment	205
Welding	40
<b>Total</b>	<b>1228</b>

## B. On-The-Job Training

The OJT portion of this Apprentice Program has been carefully designed, both in the duty area covered and the amount of time. For each phase of the OJT, a minimum number of training hours have been established and is shown on Attachment 14. The total hours are as follows:

Duty Area	Training Hours
Pumps	250
Valves	300
Bearings and Lubrication	100
Fans and Dampers	200
Air Compressors	75
Turbine Generator	150
Overhead Cranes and Hoists	250
Mobile Cranes	50
Rigging	500
Forklift	75
Piping	250
Tools and Shop Equipment	250
Staging	200
Welding	50
Portable Tools	100
<b>Total</b>	<b>2800</b>

Each duty area is divided into individual items or components (see Attachment 13 – Weekly OJT Hours). The Apprentice shall strive to complete the On-the-Job Training for each of the items or components. Goal hours of OJT are listed for each duty area for each six month period on Attachment 14 – Master Assignment Progress Chart. The listed hours serve to guide the apprentice in achieving the required Total OJT hours.

## C. Mechanic/Rigger Fundamentals Overview

### 1. Mathematics

This course provides instruction in whole number and fraction equation solving, simplifying arithmetic expressions, unit analysis and conversion, converting quantities with a calculator, significant figures, powers of ten and scientific notation problem solving, exponential expression problem solving, square, cube and fractional exponent problem solving, basic algebraic equations with one unknown problem solving, define trigonometric functions, calculate variables in area, volume and circumference, rectangular and logarithmic coordinate system graph plotting and information from strip and circular charts and monograms.

Mathematics consists of classroom lecture in the various topical areas above. See the lesson objectives and student text book for detail content. The material of the course is covered during 80 hours of classroom instruction during the first six months in the program at the Diablo Canyon Training Center.

## 2. Mechanic/Rigger Basic Science

This course provides instruction in the following topics:

Physics: provides instruction in defining terms, energy conversions from one form to another, the six basic simple machines and Newton's laws of motion and gravity.

Electrical Science: provides instruction in structure of the atom, the six principle methods of generating electricity, common electrical properties of materials, definition of electrical terms, relationship between magnetism and electricity, the three requirements for producing an induced voltage, advantages and disadvantages of alternating current and the basic elements of electrical safety.

Heat Transfer and Fluid Flow: provides instruction in identifying terms, describes the four elements of the heat cycle and plant component for each, modes of heat transfer and examples of each, relationship between pressure, temperature and specific volume for sub-cooled, saturated, and superheated fluids, effects of plant components on fluid parameters, causes and effects of water hammer, operating characteristics of centrifugal and positive displacement pumps, and the causes and effects of cavitation.

Fundamentals of Hydraulics and Pneumatics: provides instruction in the process of transmitting force and energy through solids, liquids and gases, effects on air when compressed and allowed to expand, Pascal's Law, operation of simple fluid power cylinder, gauge pressure scales and applications, inefficiencies found in basic pneumatic system, defining basic terms and concepts related to hydraulics, how hydraulic energy is transmitted through a system, relationship between resistance and pressure in a hydraulic system, effects of heat, pressure differential, velocity and flow rate.

Basic Chemistry: provides instruction in definition of terms, the periodic table, the components of atomic symbols, properties and states of matter, differentiate between acids, bases and salts, relating concentration of  $H^+$  in a liquid to pH, the pH scale, two forms of corrosion and factors that promote corrosion, impurities in plant water systems, primary methods of water chemistry control, purposes for controlling reactor coolant chemistry, effects that plant components and systems can have on secondary water chemistry, and types of sampling methods used at DCP.

Basic Atomic and Nuclear Physics: provides instruction in structure and components of the atom, units for atomic structure and particle nomenclature, the radioactive decay process, nuclear interactions such as charged particles, photons and neutrons, the nuclear fission process, reactivity control in a nuclear reactor, and types of reactors used for power generation.

Properties of Nuclear Plant Materials: provides instruction in description of three basic metal crystal structures, simple stresses which may affect materials, basic properties of metals, metal failure mechanisms, properties of metals found in nuclear plant components, and the effects of corrosion on metals and corrosion controls, thermal stress, and radiation effects on metal.

Basic Science consists of classroom lectures in various areas of instruction. See individual lessons for content as listed in Attachment 2. The course consists of 7 lessons. The material of the course is covered during 70 hours of classroom instruction during the first six months in the program at the Diablo Canyon Training Center.

### 3. Power Plant Fundamentals

This course provides instruction in:

Reactor and Refueling Systems: provides instruction in the purpose of Reactor Vessel & Internals, core components, Spent Fuel Pool Cooling (SFP) system, and Fuel Handling system to include basic diagrams, purpose and location of major components, importance to plant safety, interrelationships between them and other systems, Technical Specification LCOs and ECGs, purpose of Integral Fuel Burnable Absorbers, and system flow paths, and fuel handling tools and components.

Primary Systems: provides instruction in the purpose of the Reactor Coolant System (RCS), Reactor Coolant Pumps (RCPs), the Steam Generators (S/Gs), Containment Structure System, and Containment Spray System to include basic block diagrams, identifying major components, functions and locations, process flow paths, importance to plant safety and/or radioactive containment and relationship with other plant components, and the physical connections and/or cause effect relationships between the RCS and containment.

Steam Systems: provides instruction in the purpose of the Main Steam (MS) System, Moisture Separator Reheaters (MSRs), Main Turbine System, EH Oil Supply System to include basic block diagrams, identifying major components, functions and locations, process flow paths, importance to plant safety and relationship with other plant systems. It also discusses Main Turbine – Generator LO System, turbine supervisory instrumentation, and Steam Dump System importance to radioactivity containment.

Feed Systems: provides instruction in the purpose of the Condensate System (CND), Main Feedwater System (FW), Auxiliary Feedwater Water (AFW) System, Condenser and Condenser Air Removal System, and Circulating Water System (CWS) to include basic block diagrams, identifying major components, functions and locations, process flow paths, importance to plant safety and relationship with other plant systems.

Safety Systems: provides instruction in the purpose of the Chemical and Volume Control System (CVCS), Reactor Makeup Water System, Residual Heat Removal (RHR) System, Emergency Core Cooling System (ECCS), Component Cooling Water (CCW) System, and Auxiliary Salt Water (ASW) System to include purpose, basic block diagrams, identifying major components, functions and locations, process flow paths, and importance to plant safety and radioactive containment, relationship with other plant systems and the physical connections and/or cause effect relationships between the Fire Water System and the Centrifugal Charging Pumps (CCPs).

Ventilation and Control Systems: provides instruction in Auxiliary Building Ventilation System, Control Room Ventilation System, Fuel Handling Building Ventilation System, Rod Control System, and Main Feedwater Control System to include purpose, basic block diagrams, identifying major components, functions and locations, process flow paths, Control Room Ventilation System alignments, and importance to plant safety and radioactive containment, relationship with other plant systems.

Electrical Systems: provides instruction in the Plant Electrical System, Main Generator and related equipment, and the DG System to include purpose, basic block diagrams, identifying major components, functions and locations, process flow paths, Control Room Ventilation System alignments, and importance to plant safety and radioactive containment, relationship with other plant systems.

Plant Protective Systems: provides instruction in Reactor Protections System, Eagle 21 and Solid State Protection Systems, Nuclear Instrumentation Systems, Incore Instrument Systems, DC Power System, and Instrument AC System to include purpose, basic block diagrams, identifying major components, functions and locations, process flow paths, importance to plant safety and radioactive containment, and relationship with other plant systems. .

Miscellaneous Systems: provides instruction in Liquid Radwaste Systems, Gaseous Radwaste System (GRS), Service Cooling Water (SWC) System, Fire Detection System, Cardox System and Fire Water System. Areas covered include purpose of system, block diagram, the importance to plant safety and/or radioactive containment, basic interrelationship between the system and other systems, location of major components, and specific area/and or components of each system are discussed.



Power Plant Fundamentals consists of classroom lecture in various areas of instruction. See individual lessons for content as listed in Attachment 3. The course consists of 9 lessons. The material of the course is covered during 80 hours of classroom instruction during the first six months in the program at the Diablo Canyon Training Center.

#### 4. Basic Tools and Shop Equipment

Provide instruction in hand tools and hand tool safety, precision measuring tools, portable power tools, layout and drill press operations, horizontal band saw, vertical band saw, abrasive wheel saw, hydro-blaster, bead blaster, hydraulic press, basic carpentry, screw threads, tapers, mechanical fasteners, Bolting and torquing, gears and gearbox fundamentals, site specific gears and gearboxes, mechanical power transmission.

Basic Equipment and Tools consists of classroom lectures and lab exercises in various areas of instruction. See individual lessons for content as listed in Attachment 4. The course consists of 12 lessons. The material of the course is covered during 128 hours of classroom and laboratory instruction during the first six months in the program at the Diablo Canyon Training Center.

#### 5. Mechanical Drawing, & Print Reading

This course provides instruction in reading technical drawings, multi-view drawings, dimensions and tolerances, auxiliary views and revolutions, sectional views and conventions, fasteners, working drawings, pictorial drawings, pictorial and technical illustrations, welding drafting, surface developments & illustrations, cams & gears, and print reading.

Provides instruction on plant drawings and prints; including piping schematics, operational valve identification drawings, isometric drawings, piping specification mechanical design drawings, and plant location drawings.

Mechanical Drawing and Print Reading consists of classroom lectures and exercises in various areas of instruction. See individual lessons for content as listed in Attachment 5. The course consists of 2 lessons. The material of the course is covered during 40 hours of classroom instruction during the first six months in the program at the Diablo Canyon

#### 6. Piping and Piping Components Fundamentals

This course provides instruction in basic piping systems maintenance; including piping, pipe fittings, pipe flanges, pipe threading, tubing, tubing fittings, plate stock, round stock, square stock, structural steel, pipe hangers, snubber inspection, hanger and snubber drawings, heat exchangers, condensers, steam traps, filters, strainers, and gaskets.

Piping and Piping Components consists of classroom lecture and lab exercises in various area of instruction. See individual lessons for content as listed in Attachment 6. The course consists of 9 lessons. The material of the course is covered during 147 hours of classroom and Laboratory instruction during the first six months in the program at the Diablo Canyon

#### 7. Bearing and Lubrication Fundamentals

This course provides instruction in basic bearing types, bearing use, axial support, radial support, thrust, bearing replacement, bearing maintenance, bearing lubrication systems, lubrication types and uses.

Bearing and Lubrication Fundamentals consists of classroom lecture and lab exercises in various area of instruction. See individual lessons for content as listed in Attachment 7. The course consists of 2 lessons. The material of the course is covered during 40 hours of classroom instruction during the second six months in the program at the Diablo Canyon Training Center.

### D. Mechanic/Rigger Basic Qualifications Overview

#### 8. Rigging Fundamentals

This course provides instruction in rigging principles, ropes, chains, slings, rigging hardware, beam clamps, plate clamps, hoists, come-a-longs, rigging inspections, wire rope, rigging procedures, scaffolding, jacks, rollers, and skids.

Rigging consists of classroom lecture and lab exercises in various areas of instruction. See individual lessons for content as listed in Attachment 8. The course consists of 5 lessons. The material of the course is covered during 105 hours of classroom and Laboratory instruction during the second six months in the program at the Diablo Canyon

#### 9. Heavy Equipment and Crane Operation

Provides instruction on plant crane procedures, crane inspections, shop cranes and service hoists, Turbine Building Crane Operation, Intake Structure Crane Operation, Fuel Handling Building Crane Operation, Polar Crane Operation, Rad-waste Storage Building Crane Operation, Mobile Crane & Boom Truck Operation, and Fork Lift Operation.

Heavy Equipment and Cranes Operation course consists of classroom lecture and lab exercises in various area of instruction. See individual lessons for content as listed in Attachment 9. The course consists of 11 lessons. The material of the course is covered during 163 hours of classroom and Laboratory instruction during the second six months in the program at the Diablo Canyon.

### 10. Valve Fundamentals

This course provides instruction in valve basics and maintenance of diaphragm valves, globe valves, flow control valves, gate valves, check valves, ball valves, plug valves, and butterfly valves. This course also includes lessons on valve stem packing, pneumatic valve actuator maintenance, and safety & relief valve replacement & testing.

Valve Fundamentals consists of classroom lecture and lab exercises in various area of instruction. See individual lessons for content as listed in Attachment 10. The course consists of 7 lessons. The material of the course is covered during 140 hours of classroom instruction during the third six months in the program at the Diablo Canyon Training Center.

### 11. Pumps and Rotating Equipment

This course provides instruction in pump fundamentals, pump nomenclature, impeller types, wear rings, Bernoulli's Law, classifications, head pressure, pump lubrication systems, pump packing, mechanical seals, centrifugal pump maintenance, rotary pump maintenance, positive displacement pump maintenance, diaphragm pump maintenance, couplings and shaft alignment, fan maintenance, and piston air compressor maintenance.

Pumps and Rotating Equipment consists of classroom lecture and lab exercises in various area of instruction. See individual lessons for content as listed in Attachment 11. The course consists of 9 lessons. The material of the course is covered during 205 hours of classroom instruction during the third six months in the program at the Diablo Canyon Training Center.

### 12. Welding Fundamentals

This course provides instruction in oxy-acetylene heating/cutting/welding and Shielded Metal Arc Welding (SMAW). It includes welding safety, compressed gas cylinder safety, types of cutting tips, type of cutting flame, plasma arc cutting, straight polarity, reverse polarity, and amperage settings.

Welding consists of classroom lecture and lab exercises in various area of instruction. See the lessons for content as listed in Attachment 12. The course consists of 2 lessons. The material of the course is covered during 40 hours of classroom and laboratory instruction during the fifth six months in the program. The welding does not apply to Diablo Canyon Mechanic/Rigger personnel.

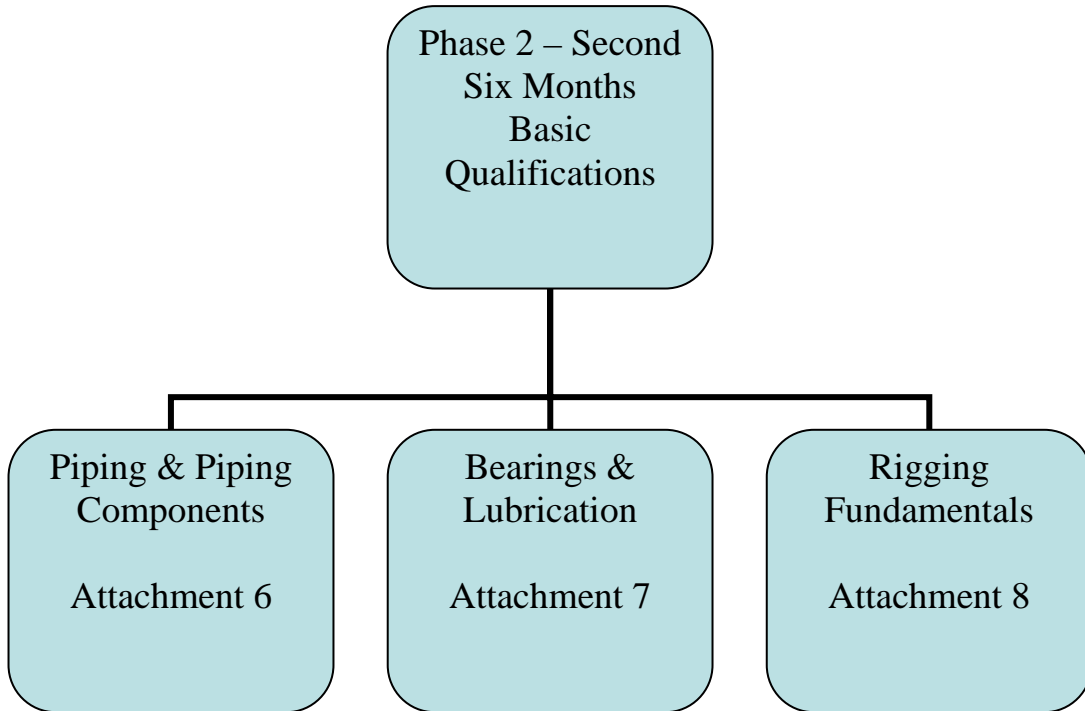
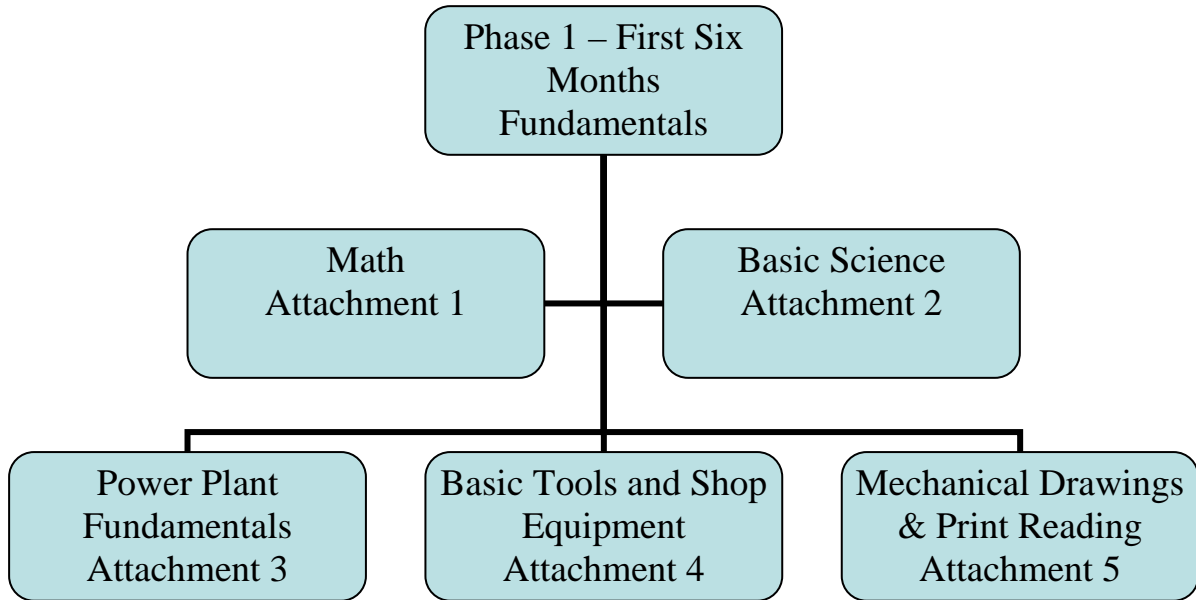
### 13. Rigging Projects for the Mechanic Rigger Program

The following are examples of projects that will be used in the Mechanic Rigger Program for the purpose of allowing the apprentice to demonstrate rigging capabilities. They may be performed in the Maintenance Shops Building.

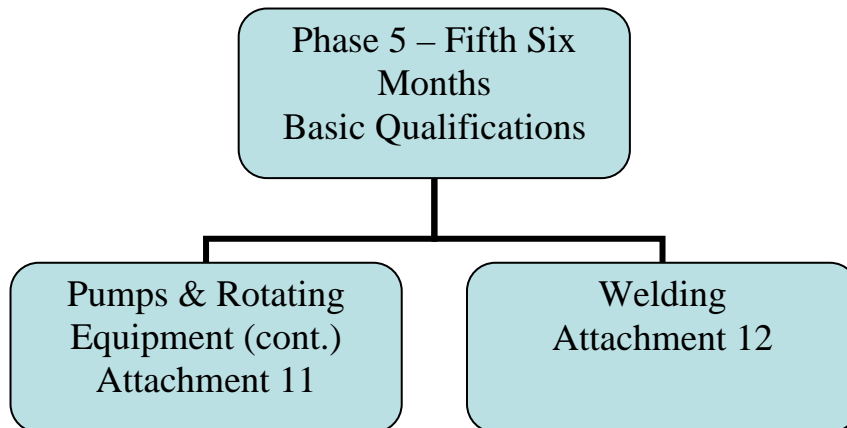
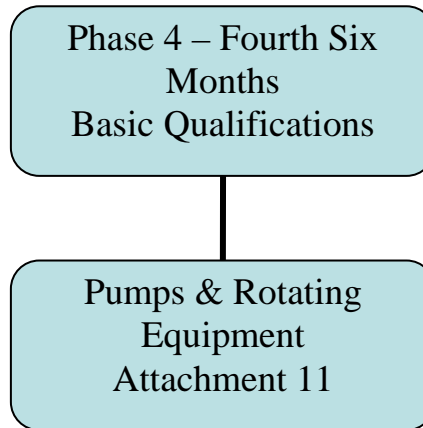
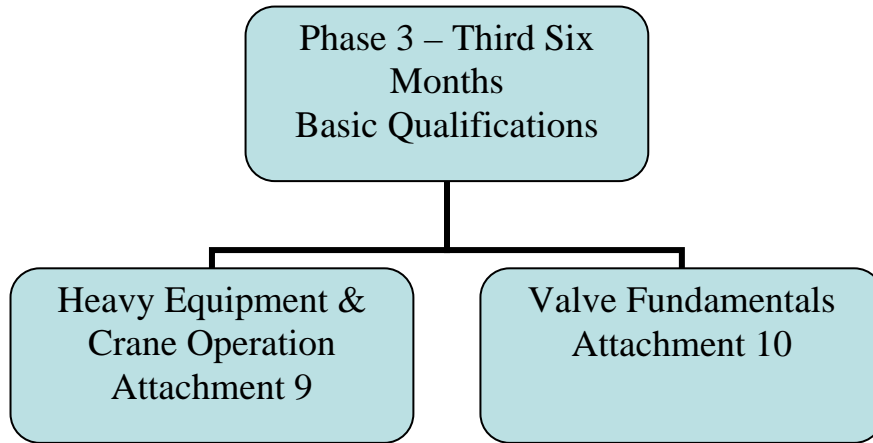
- a. Rig, lift and move a 24" butterfly valve with actuator
- b. Rig, lift and move a skid-mounted 8 stage Pacific pump and motor.
- c. Rig, lift and move an 8 stage Pacific pump, top casing to be remove and flipped over.
- d. Rig, lift and move the Reactor Coolant Pump Seal Mockup.
- e. Rig, lift and move the diesel generator (generator only). This will require the use of a mobile crane

**SECTION V - Apprentice Mechanic-Rigger Program Map**

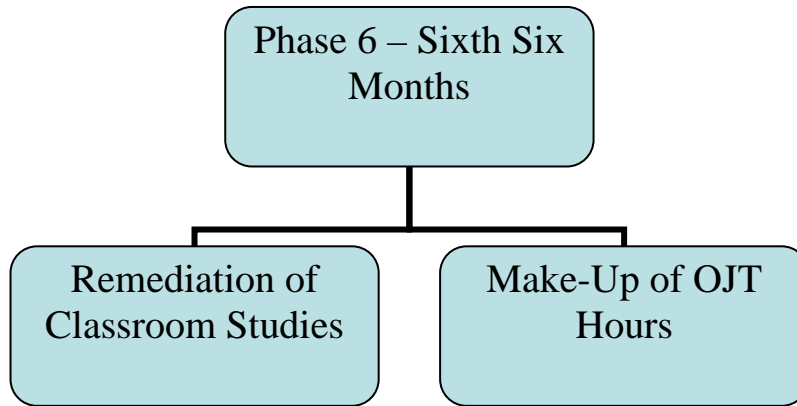
A. Apprentice Mechanic-Rigger Program Map



Apprentice Mechanic-Rigger Program Map (Cont)



Apprentice Mechanic-Rigger Program Map (Cont)



**B. Apprentice Mechanic-Rigger Program Schedule**

Months In Training:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<b>OJT Hours:</b>	560					560					560					560					560									
<b>ACADEMIC TRAINING</b>																														
<b>Mathematics, Basic Sciences, &amp; Power Plant Fundamentals</b>	5.8 Wks																													
<b>Tools &amp; Equip.</b>			3.2 Wks																											
<b>M/R Fundamentals</b>						5.7 Weeks																								
<b>M/R Basic Quals</b>											16.3 Weeks																			



## **SECTION VI - Training Records Management**

Auditable records are required for documentation of training in support of the Mechanic-Rigger Apprentice Program. Training records will be established for each Apprentice candidate for both academic and OJT training provided in accordance with TQ1.ID4, Non-Accredited Training Records.

### **A. Academic Training Courses**

Each academic course taught will be documented with a Training Attendance Record. Training Attendance Record should include: Program/Course and Topic information, date of training, class number, lesson revision number and date, class title, number of class hours, instructor(s) signature(s), program coordinator signature, date student attended, student name student identification, student signature, quiz, test, and/or exam score, as applicable. If a course is made up of multiple lessons (e.g., Basic Sciences, Power Plant Fundamentals, etc.) a Training Attendance Record will be developed for each lesson.

### **B. On-The-Job Training**

Each Apprentice will be issued a Qualification Book upon his/her acceptance into the Apprentice Training Program. The Qualification Book consists of OJT tasks that will be completed and signed off during the 36-month Apprenticeship. Each Apprentice is responsible for obtaining his/her sign-offs by a task qualified Journeyman in the task to be trained. It should be noted that obtaining a sign-off for completed OJT, does not by itself fulfill the hourly requirements stipulated in Section IV of this document. Nor does OJT sign-offs task qualify the Apprentice.

It is recognized that academic and OJT, while vital to the learning process, are not by themselves a stand-alone methodology to completely train the Apprentice in all the skills and knowledge necessary for Journeyman status. This program recognizes the importance of plant work and time-in-grade to complete a well-rounded training program.

Thus, OJT will be documented by the line organization in accordance with the hourly requirements of Section IV, B. of this document. The forms provided in Attachment 13 & 14, will be used to maintain a record of hourly performance in the various subject areas covered by the OJT portion of the Apprentice Training Program. The Journeyman providing the OJT will validate OJT hours completed. As progress through this training is achieved, a Supervisor will review and evaluate performance on each Apprentice.

### C. TPE Evaluation

Task Performance Evaluation (TPE) – is an evaluation of the student's performance of a task under controlled conditions and measured against observable and quantifiable standards. TPE is the evaluation of those skills and knowledge obtained during the classroom and OJT phase of Apprentice training. Task qualification is accomplished by completing the associated Qualification Guide. Task qualification will not be granted until academic training, hourly OJT requirements, and the TPE are successfully completed. TPEs will be documented in accordance with TQ2.ID4, Training Program Implementation.

**SECTION VII – Progress Documentation Procedures****A. Weekly On-The-Job Training Hours**

Attachment 13 “Weekly OJT Hours Form” consists of a form for recording daily OJT hours and a list of the duty areas and the components/items in each duty area that have OJT hour requirements.

The required hours for each 6-month period are shown on Attachment 14, On-The-Job Training. The Apprentice should meet or exceed these times for each duty area.

OJT hours in the specified duty area components/items shown on Attachment 13 will be documented as follows:

The Apprentice will document the Duty Area/Component and the OJT hours performed on Attachment 13 for all OJT. The Journeyman who is assigned to work with the Apprentice will initial in the block immediately below the hours marked to indicate that the time spent was acceptable. See example below.

**Portion of Attachment 13, Daily OJT Hours**

Duty Area		Sun	Mon	Tues	Wed	Thur	Fri	Sat	Weekly Total
<i>Cent. Pumps</i>	Hours	0	7	5	0	0	0	0	
	Init.		GRV	GRV					
<i>Gate Valves</i>	Hours	0	0	0	8	3	0	0	
	Init.				RSB	JWH			
<i>Rigging Loads</i>	Hours	0	0	2	0	5	0	0	
	Init.			GRV		JWH			

At the end of each week, the Apprentice will add the hours in each area and record the total time in the “Total Hours” column. The Apprentice will submit the completed form to his supervisor for review and approval. If the OJT hours are acceptable, then the supervisor will initial the review block and turn the form into the department clerk. See example below:

**Portion of Attachment 13, Daily OJT Hours**

Duty Area		Sun	Mon	Tues	Wed	Thur	Fri	Sat	Weekly Total
<i>Cent. Pumps</i>	Hours	0	7	5	0	0	0	0	12
	Init.		GRV	GRV					
<i>Gate Valves</i>	Hours	0	0	0	8	3	0	0	11
	Init.				RSB	JWH			
<i>Rigging Loads</i>	Hours	0	0	2	0	5	0	0	7
	Init.			GRV		JWH			
Supervisor’s Review of OJT Hours									MRO

B. Total Hours

At the end of each month, the Apprentice (or department clerk) will record the total OJT hours completed on Attachment 14, and shade in the “Time in Program” bar. The Apprentice (or department clerk) will also fill in the self-study hours on Attachment 14 where indicated.

When a six month training phase has been completed, the actual total OJT hours for each Duty Area will be recorded on Attachment 14 and submitted to the General Foreman for review. The “Req. OJT Hours” are the minimum number of OJT hours that must be completed for each Duty Area. The “Actual OJT Hours” should equal or exceed the “Req. OJT Hours.” The General Foreman will review the Actual OJT Hours performed and initial in the “Supervisor Initial” row. He will also review the Academic Training progress and Self Study Hours

(Portion of Attachment 14, Master Assignment Chart)

Month			3				6			9	
Time in Program											
Program Period						1					

		Total							Total					
Pumps	Req. OJT Hours								50					100
	Actual OJT Hours	0	16	30	0	14	0	60	0					
	Supervisor Initials								CSB					
Valves	Req. OJT Hours								60					120
	Actual OJT Hours	20	0	0	29	18	14	81	12					
	Supervisor Initials								CSB					
Bearings & Lubrication	Req. OJT Hours								20					40
	Actual OJT Hours	0	22	0	0	0	12	32						
	Supervisor Initials								CSB					

Following the General Foreman’s review, Attachment 14 and the Master Assignment Progress Chart Review and Comments form (see page 29) will be submitted to the Line Manager for his review and comment at the start of the seventh, thirteenth, nineteenth, twenty-fifth and thirty-first month. The line manager will review the apprentice’s progress, and indicate if the progress has met or has not-met expectations. If the progress has not-met expectations, then a formal remediation plan will be implemented. Following the Line Manager’s review, the Attachment 14 and the Master Assignment Progress Chart Review and Comments form will be submitted to the Plant Manager for review. The Plant Manager will forward the forms to the Division Personnel Department for their review and comment. The Attachment 14 and Master Assignment Progress Chart Review and Comments form will be returned to the plant prior to the end of the month. These forms will be filed in the Apprentice’s training folder.

**MASTER ASSIGNMENT PROGRESS CHART REVIEW AND COMMENTS**

Apprentice Name: \_\_\_\_\_ Start Date \_\_\_\_\_

FIRST PERIOD REVIEW

Comment: \_\_\_\_\_

\_\_\_\_\_  
Comment: \_\_\_\_\_ (Signed) Line Manager Date

SECOND PERIOD REVIEW

Comment: \_\_\_\_\_

\_\_\_\_\_  
Comment: \_\_\_\_\_ (Signed) Line Manager Date

\_\_\_\_\_  
(Signed) Personnel Dept. Rep. Date

THIRD PERIOD REVIEW

Comment: \_\_\_\_\_

\_\_\_\_\_  
Comment: \_\_\_\_\_ (Signed) Line Manager Date

\_\_\_\_\_  
(Signed) Personnel Dept. Rep. Date

FOURTH PERIOD REVIEW

Comment: \_\_\_\_\_

\_\_\_\_\_  
Comment: \_\_\_\_\_ (Signed) Line Manager Date

\_\_\_\_\_  
(Signed) Personnel Dept. Rep. Date

FIFTH PERIOD REVIEW

Comment: \_\_\_\_\_

\_\_\_\_\_  
Comment: \_\_\_\_\_ (Signed) Line Manager Date

\_\_\_\_\_  
(Signed) Personnel Dept. Rep. Date

**Attachment 1 – Mathematics**COURSE: **Math**

# LESSONS: 1

Lesson Text: Mathematics for Technical and Vocational Students, Boyce, Margolis, and Slade, 10<sup>th</sup> Edition

Topic (Qualification Guide) Title				
Basic Sciences				
<b>Mathematics – TBS01</b>				
PIMS I.D.#	Lesson Title	Set*	Hrs.	Max
TBS01	Mathematics	C	80	15
Math total classroom training hours			80	

**Normal sequence of lessons is as listed above.****Set\*** - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 2 – M/R Basic Science**COURSE: **Basic Science Course Outline**

# LESSONS: 7

Lesson Text: (see Lesson Guides/Student Handouts)

<b>Topic (Qualification Guide) Title</b>				
Math and Basic Sciences				
<b>PIMS I.D.#</b>	<b>Lesson Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MBS0100	Physics	C	10	10
MBS0200	Electrical Science	C	10	10
MBS0300	Properties of Nuclear Plant Material	C	10	10
MBS0400	Basic Atomic and Nuclear Physics	C	10	10
MBS0500	Heat transfer and Fluid Flow	C	10	10
MBS0600	Fundamentals of Hydraulics and Pneumatics	C	10	10
MBS0700	Basic Chemistry	C	10	10
Basic Sciences total classroom training hours			70	

**Normal sequence of lessons is as listed above.****Set\*** - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 3 – M/R Power Plant Fundamentals**COURSE: **Power Plant Fundamentals Course Outline**

# LESSONS: 9

Lesson Text: (see Lesson Guides/Student Handouts)

<b>Topic (Qualification Guide) Title</b>				
Power Plant Fundamentals				
<b>PIMS I.D.#</b>	<b>Lesson Title</b>	<b>Set*</b>	<b>Hrs</b>	<b>Max</b>
MPS1	Reactor and Refueling System	C	10	6
MPS2	Primary systems	C	10	6
MPS3	Steam Systems	C	10	6
MPS4	Feed Systems	C	10	6
MPS5	Safety Systems	C	10	6
MPS6	Ventilation and Control Systems	C	5	6
MPS7	Electrical Systems	C	10	6
MPS8	Plant Protective Systems	C	10	6
MPS9	Miscellaneous Systems	C	5	6
Power Plant Fundamentals total classroom training hours			80	

**Normal sequence of lessons is as listed above.****Set\*** - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT



## Attachment 4 – Basic Tools and Shop Equipment

COURSE: **Basic Tools and Shop Equipment Course Outline**

# LESSONS: 12

Lesson Text: (see Lesson Guides/Student Handouts)

Topic (Qualification Guide) Title				
Basic Tools and Shop Equipment				
PIMS I.D.#	Lesson Title	Set*	Hrs	Max
MM0700	Precision Measuring Tools	C + L	20	6
MM0701	Hand Tools	C + L	10	6
MM0702	Power Tools	C + L	10	6
MM0703	Layout and Drill Press Operations	C + L	4	6
MM0704	Metal Cutting, Horizontal Hacksaw, Vertical Band Saw, Abrasive Wheel Saw	C + L	4	6
MM0705	Hydro-Blaster	C + L	4	6
MM0706	Mechanical Fasteners	C + L	8	6
MM0600	Bolting Practices and Torquing	C + L	10	6
MM0707	Mechanical Power Transmission	C + L	20	6
MM2801	Gear Fundamentals	C	10	8
MM2810	Gears and GearBoxes	C + L	20	8
MM0708	Basic Carpentry	C	8	6
Basic Tools and Shop Equipment total classroom training hours			128	

Normal sequence of lessons is as listed above.

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

### JPMs for Basic Tools and Shop Equipment

Topic Title				
Measuring Tools				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM0700J	Measuring Tools JPM	L	4	N/A
Mechanical Power Transmission				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM0707J	Belt and Sheave Maintenance JPM	L	2	N/A
Mechanical Fasteners and Bolting				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM0600J	Torquing JPM	L	2	N/A

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 5 – Mechanical Drawing & Print Reading**COURSE: **Mechanical Drawing and Print Reading Course Outline**

# LESSONS: 2

Lesson Text: Blueprint Reading Course by Technicomp, Inc. 1992  
(see Lesson Guide/Student Handout)

<b>Topic (Qualification Guide) Title</b>				
Mechanical Drawing and Print Reading				
<b>PIMS I.D.#</b>	<b>Lesson Title</b>	<b>Set*</b>	<b>Hrs</b>	<b>Max</b>
MM0715	Blueprint Reading	C	20	6
MM0300	Plant Drawings and Prints	C	20	6
Mechanical Drawing and Print Reading total classroom training hours			40	

Normal sequence of lessons is as listed above.

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**JPMs for Print Reading**

<b>Topic Title</b>				
Print Reading				
<b>PIMS I.D.#</b>	<b>JPM Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MM0300J	Clearance JPM	L	2	N/A

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

## Attachment 6 – Piping and Piping Components

COURSE: **Piping and Piping Components Fundamentals Course Outline**

# LESSONS: 9

Lesson Text: (see Lesson Guide/Student Handout)

Topic (Qualification Guide) Title				
Piping and Piping Components				
PIMS I.D.#	Lesson Title	Set*	Hrs	Max
MM2120	Piping Systems Maintenance	C	30	6
MM0709	Rigid Pipe Machine	C + L	8	6
MM0712	Plate, Round Stock, Square Stock, Structural Steel	C	4	6
MM1171	Snubber and Hanger Maintenance	C + L	30	6
MM0930	Heat Exchanger Tube Repair	C + L	30	6
MM2130	Installation and Removal of Anchors	C + L	10	6
MM2140	Removal and Re-Installation of Pipe Supports	C + L	15	6
MM0710	Steam Traps,	C	10	6
MM0711	Filters and Strainers	C	10	6
Piping and Piping Components Fundamentals total classroom training hours			147	

Normal sequence of lessons is as listed above.

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

### JPMs for Piping and Piping Components Fundamentals

Topic (Qualification Guide) Title				
Piping Systems Maintenance (Prerequisites: MM0300J & MM0600J)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM2120J	Piping Maintenance JPM	L	4	N/A
Installation and Removal of Anchors (Prerequisite: MM0600J)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM2130J	Installation and Removal of Anchors JPM	L	4	N/A
Remove and Re-install Pipe Supports (Prerequisite: MM2130Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM2140J	Removal and Re-installation of Pipe Supports JPM	L	4	N/A

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 7 – Bearings & Lubrication**COURSE: **Bearing and Lubrication Fundamentals Course Outline**

# LESSONS: 2

Lesson Text: (see Lesson Guide/Student Handout)

<b>Topic (Qualification Guide) Title</b>				
Bearing and Lubrication Fundamentals				
PIMS I.D.#	Lesson Title	Set*	Hrs.	Max
MM0500	Basic Lubrication Principles	C	10	6
MM2700	Bearing Maintenance	C + L	30	6
Bearing and Lubrication fundamentals total classroom training hours			40	

Normal sequence of lessons is as listed above.

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**JPMs for Lubrication and Bearings**

<b>Topic (Qualification Guide) Title</b>				
Lubrication				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM0500J	Lubrication JPM	L	1	N/A
Bearings – MM2700Q Bearing Maintenance (Prerequisite: MM0100Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM2700J	Bearing Maintenance JPM	L	3	N/A

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 8 – Rigging**COURSE: **Rigging Fundamentals Course Outline**

# LESSONS: 5

Lesson Text: (see Lesson Guide/Student Handout)

<b>Topic (Qualification Guide) Title</b>				
Rigging Fundamentals				
PIMS I.D.#	Lesson Title	Set*	Hrs.	Max
MG0801	Rigging Fundamentals	C + L	30	6
MG0820	Rigging Setup and Dismantling	C + L	6	6
MG0880	Hoist and Come-a-Long Inspection	C + L	8	6
MG0850	Scaffolding	C + L	60	6
FSSLADD	Ladder Safety	CBT	1	6
Rigging fundamentals total classroom training hours			105	

Normal sequence of lessons is as listed above.

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**JPMs for Rigging**

<b>Topic (Qualification Guide) Title</b>				
Basic Rigging (Light Loads) – MGC0801Q (Prerequisite: MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0801J	Rigging Fundamentals JPM	L	3	N/A
Advanced Rigging (Heavy Loads) – MGC0800Q (Prerequisite: MS0091 & MG0801)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0820J	Set Up & Dismantle Rigging JPM **	L	6	N/A
Scaffolding – MG0850Q (Prerequisites: MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0850J	Basic Scaffold Erection JPM	L	6	N/A

\*\* - MG0820J will be scheduled during the fifth six month phase of the program.

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 9 – Heavy Equipment and Cranes**COURSE: **Heavy Equipment and Crane Operation Course Outline**

# LESSONS: 11

Lesson Text: (see Lesson Guide/Student Handout)

<b>Topic (Qualification Guide) Title</b>				
Heavy Equipment and Cranes Operation				
<b>PIMS I.D.#</b>	<b>Lesson Title</b>	<b>Set*</b>	<b>Hrs</b>	<b>Max</b>
MG0826	Introduction to Plant Cranes & Procedures	C	5	6
MG0876	Quarterly & Annual Crane Inspections	C	10	6
MG0886	Shop Crane and Service Hoist Operation	C + L	30	6
MG0885	Service Hoist Operation	C + L	20	6
MG0831	Turbine Building Crane Operation	C + L	6	6
MG0841	Intake Structure Crane Operation	C + L	6	6
MG0851	Fuel Handling Building Crane Operation	C + L	6	6
MG0861	Polar Crane Operation	C + L	10	6
MG0887	Rad-waste Storage Building Crane	C + L	30	6
MG0835	Mobile Crane & Boom Truck Operation	C	30	6
MG0844	Forklift Operation	C + L	10	6
Heavy Equipment and Cranes Operation total classroom training hours			163	

**Normal sequence of lessons is as listed above.****Set\*** - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

## Attachment 9 – Heavy Equipment and Cranes (cont.)

## JPMs for Heavy Equipment and Crane Operation

Topic (Qualification Guide) Title				
Crane Hand Signals				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0826J	Crane Hand Signals JPM (or)	L/P	½	N/A
Turbine Building Cranes - MG0831Q (Prerequisites: FCO100, MG0826J, and MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0831J	Turbine Building Crane Operation JPM	P	1	N/A
Intake Structure Crane - MG0841Q (Prerequisites: FCO100, MG0826J, and MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0841J	Intake Structure Crane Operation JPM	P	1	N/A
Fuel Handling Bldg. Crane – MG0851Q (Prerequisites: FCO100, MG0826J, and MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0851J	Fuel Handling Building Crane Operation JPM	P	1	N/A
Polar Crane – MG0861Q (Prerequisites: FCO100, MG0826J, and MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0861J	Polar Crane Operation JPM	P	1	N/A
Radwaste Storage Bldg. Crane - MG0887Q (Prerequisites: FCO100, MG0826J, and MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0887J	Radwaste Storage Bldg. Overhead Crane Operation JPM	P	1	N/A
Mobile Crane Familiarizations (Prerequisites: FCO100, MG0826J, and MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0835CTB	Lorain “LRT220E” Mobile Crane Operation & Safety	P	5	N/A
MG0835DTB	Grove “RT630B” Mobile Crane Operation	P	5	N/A
MG0835FTB	Terex TR335 Mobile Crane Operation	P	5	N/A
MG0835HTB	Grove “RT530E” Mobile Crane Operation	P	5	N/A
MG0835ITB	Terex RT230-1 Mobile Crane Operation	P	5	N/A
Forklifts – MG0844Q (Prerequisite: MS0091)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MG0844J	Forklift Operation JPM	P	5	N/A

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 10 - Valves**

COURSE: **Valve Fundamentals Course Outline**

# LESSONS: 7

Lesson Text: (see Lesson Guide/Student Handout)

Topic (Qualification Guide) Title				
Valve Fundamentals				
PIMS I.D.#	Lesson Title	Set*	Hrs.	Max
MM1201	Valve Basics	C	20	6
MM1202	Valve Stem Packing	C + L	10	6
MM1210	Gate/Check Valve Maintenance	C + L	20	6
MM1230	Globe and Flow Control Valves	C + L	20	6
MM1236	Ball, Plug, and Butterfly Valve Maintenance	C + L	20	6
MM1295	Pneumatic Operated Valve Operator Maintenance	C + L	30	6
MM1270	Safety & Relief Valve Replacement & Testing	C + L	20	6
Valve fundamentals total classroom training hours			140	

**Normal sequence of lessons is as listed above.**

**Set\*** - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT



**Attachment 10 – Valves (Cont)****JPMs for Valves**

Topic (Qualification Guide) Title				
Valve Basics - MM1201Q (Prerequisite: MM2120Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM1201J	Valve Basics JPM	L	3	N/A
Valve Stem Packing -MM1202Q (Prerequisite: MM1201Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM1202J	Valve Stem Packing JPM	L	2	N/A
Gate and Check Valve - MM1210Q (Prerequisites: MM1201Q & MM1202Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM1210J	Gate & Check Valve Maintenance JPM	L	4	N/A
Globe & Flow Control Valves - MM1230Q (Prerequisites: MM1201Q & MM1202Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM1230J	Globe/Flow Control Valve Maintenance JPM	L	2	N/A
Ball, Plug, & Butterfly Valves - MM1236Q (Prerequisites: MM1201Q & MM1202Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM1236J	Ball, Plug, & Butterfly Valve Maintenance JPM	L	3	N/A
Pneumatic Operated Valve Operators - MM1295Q (Prerequisite: MM1201Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM1295J	POV Operator Maintenance JPM	L	4	N/A
Replace Safety/Relief Valves - MMC1270Q (Prerequisites: MM1201Q)				
PIMS I.D.#	JPM Title	Set*	Hrs.	Max
MM1270J	Safety Valve Testing and Replacement JPM	L	4	N/A

### Attachment 11 - Pumps

COURSE: **Pumps & Rotating Equipment Course Outline**

# LESSONS: 9

Lesson Text: see Lesson Guide/Student Handout)

Topic (Qualification Guide) Title				
Pumps & Rotating Equipment				
PIMS I.D.#	Lesson Title	Set*	Hrs	Max
MM0720	Pump Fundamentals	C + L	20	6
MM1456	Pump Shaft Seals	C + L	30	6
MM1470	Centrifugal Pump Maintenance	C + L	30	6
MM1460	Rotary Pump Maintenance	C + L	20	6
MM1465A	Positive Displacement Pump Maintenance	C + L	10	6
MM1465B	Diaphragm Pump Maintenance	C + L	20	6
MM1430	Couplings and Shaft Alignment	C + L	40	6
MM1300	Fan Maintenance	C + L	15	6
MM1500	Air Compressor Maintenance	C + L	20	6
Pump fundamentals total classroom training hours			205	

**Normal sequence of lessons is as listed above.**

**Set\*** - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 11 – Pumps (Cont)****JPMs for Pumps**

<b>Topic (Qualification Guide) Title</b>				
Mechanical Seals – MM1456Q (Prerequisite: MM0200Q)				
<b>PIMS I.D.#</b>	<b>JPM Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MM1456J	Replace Mechanical Seal - JPM	L	5	N/A
Centrifugal Pumps - MM1470Q (Prerequisite: MM0200Q)				
<b>PIMS I.D.#</b>	<b>JPM Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MM1470J	Centrifugal Pump Inspect & Repair JPM	L	6	N/A
Diaphragm Pumps - MM1465BQ (Prerequisite: MM0200Q)				
<b>PIMS I.D.#</b>	<b>JPM Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MM1465BJ	Inspect and Repair Diaphragm Pumps JPM	L	5	N/A
Couplings & Shaft Alignment - MM1430Q (Prerequisite: MM0200Q)				
<b>PIMS I.D.#</b>	<b>JPM Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MM1430J	Shaft Alignment JPM	L	5	N/A
Fan Maintenance - MM1310Q (Prerequisite: MM0200Q)				
<b>PIMS I.D.#</b>	<b>JPM Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MM1310J	Fan Maintenance - JPM	L	1	N/A
Air Compressor Maintenance - MM1500Q (Prerequisite: MM0200Q)				
<b>PIMS I.D.#</b>	<b>JPM Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MM1502J	Piston Air Compressor Maintenance - JPM	L	8	N/A

Set\* - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 12 - Welding**COURSE: **Welding Fundamentals Course Outline**

# LESSONS: 2

Lesson Text:

<b>Topic (Qualification Guide) Title</b>				
Welding Fundamentals				
<b>PIMS I.D.#</b>	<b>Lesson Title</b>	<b>Set*</b>	<b>Hrs.</b>	<b>Max</b>
MTB0816	Oxy-Acetylene Heating, Cutting, and Welding	C + L	25	6
	SMAW Welding	C + L	15	6
Welding fundamentals total classroom training hours			40	

**Normal sequence of lessons is as listed above.****Set\*** - Settings are: C = Classroom, L = Lab or Lab OJT, P = in Plant OJT

**Attachment 13 – Weekly OJT Hours Record Form**

Note: Use Blue or Black ink only to record daily OJT hours on this form. Fill in the Duty Area with the appropriate component/item from the Program’s Required OJT (see list on next page). The journeyman will initial the hours recorded to indicate that they provided the OJT in the specific duty area listed (i.e. pumps, valves, etc.). The apprentice will ensure the hours are submitted weekly for the foreman’s review. Once the hours have been validated by the foreman, route this form to the department clerk for updating Attachment 14. The clerk will forward the completed forms to the training coordinator for filling in the apprentice’s training records.

Apprentice’s Name \_\_\_\_\_ User I.D. \_\_\_\_\_

Week beginning on Sunday \_\_\_\_\_ Plant \_\_\_\_\_

Duty Area	Sun	Mon	Tues	Wed	Thur	Fri	Sat	Weekly Total
Hours Init.								
Hours Init.								
Hours Init.								
Hours Init.								
Hours Init.								
Hours Init.								
Hours Init.								
Hours Init.								
Hours Init.								
Supervisor’s Review of OJT Hours								

Foreman’s Initials

Print Journeyman’s Name	Initials	Print Journeyman’s Name	Initials

(attach additional sheets as necessary)

**Attachment 13 – Weekly OJT Hours Record Form****OJT Hours by Duty Area and 6 month period**

Recommended hrs per 6 mo. period	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	Required Total	
<b>Pumps</b>	50	50	50	50	50	250	
Centrifugal Pumps	50	Screw Pumps		20	Couplings and Alignment		30
Diaphragm Pumps	40	Vane Pumps		20	Pump Packing		25
Gear Pumps	20	Lobe Pumps		20	Mechanical Seals		25
<b>Valves</b>	60	60	60	60	60	300	
Globe Valves	30	Gate Valves		30	Butterfly Valves		30
Ball Valves	15	Diaphragm Valves		30	Check Valves		30
Control Valves	30	Safety & Relief Valves		30	Plug Valves		15
Pneumatic Valve Operators	30	Valve Packing		30			
<b>Bearings and Lubrication</b>	20	20	20	20	20	100	
Rolling Contact Bearings	25	Plain Sliding Surface Bearings		25	Thrust Bearings		25
Lubrication	25						
<b>Fans and Dampers</b>	40	40	40	40	40	200	
Fans	100	Dampers		50	Belts and Sheaves		50
<b>Air Compressors</b>	15	15	15	15	15	75	
Air Compressor Overhaul	45	Air Compressor PMs		30			
<b>Turbine Generator</b>	30	30	30	30	30	150	
Turbine Maintenance	50	Generator Maintenance		50	Turbine Auxiliaries		50
<b>Overhead Cranes and Hoists</b>	50	50	50	50	50	250	
Turbine Bldg. Crane Oper.	40	Intake Crane Oper.		40	Fuel Handling Bldg. Crane Oper.		40
Polar Crane Oper.	20	Shop Cranes		40	Rad-Waste Stor. Bldg. Crane Oper.		40
Special Service Hoists	30						
<b>Mobile Cranes</b>	10	10	10	10	10	50	
Lorain LRT 220 Mbl. Crane	10	Grove RT630B Mbl. Crane		10	Terex RT335 Mbl. Crane		10
Grove RT530E Mbl. Crane	10	Terex RT230-1 Mbl. Crane		10			
<b>Rigging</b>	100	100	100	100	100	500	
Rigging Loads	350	Calculating Weights		100	Using Hand signals		50
<b>Forklift</b>	15	15	15	15	15	75	
Oper. Forklift ≤ 5000 lbs cap.	35	Oper. Forklift ≥ 5000 lbs cap.		20	Inspect Forklift		20

**Attachment 13 – Weekly OJT Hours Record Form****OJT Hours by Duty Area and 6 month period; continued,**

Recommended hrs per 6 mo. period	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	Required Total	
Piping	50	50	50	50	50	250	
Tubing & Tubing Fittings	50	Piping & Pipe Fittings		100	Hydrostatic Testing		20
Pipe Hangers	50	Pipe Snubbers		30			
Tools and Shop Equipment	50	50	50	50	50	250	
Hand Tools	20	Precision Measuring Tools		20	Layout and Drill Press		30
Horizontal Band Saw	20	Vertical Band Saw		20	Abrasive Wheel Saw		10
Hydro-Blasters	20	Bead Blaster		20	Hydraulic/Arbor Press		20
Basic Carpentry	20	Jacks / Porta-Power/Pullers		20	Iron Worker (Piranha)		20
Bearing Heater	10						
Staging/Scaffolding	40	40	40	40	40	200	
Erect Scaffolding	120	Dismantle Scaffolding		80			
Welding	10	10	10	10	10	50	
Oxy-Acetylene Heating & Cutting		15	Oxy-Acetylene Welding		15		
Shielded Metal Arc Welding (Stick)		10	Plasma Arc Cutting		10		
Portable Tools	20	20	20	20	20	100	
Valve Grinders (Lars-Lap)	20	Hydraulic Torque Wrenches		20	Pneumatic Torque Wrenches		20
Portable Power Saws	20	Misc. Portable Power Tools		20			

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*End of Attachment 13 Weekly OJT Hours Record Form*

### Attachment 14 – Master Assignment Progress Chart

Name \_\_\_\_\_ USER ID \_\_\_\_\_

Plant \_\_\_\_\_ Starting Date \_\_\_\_\_

month	3	6	9	12	18	24	30	36						
Time in Program														
Program Period	1		2			3			4		5		6	

		Total			Total			Total			Total			Total		
Pumps	Req. OJT Hours	50			100			150			200			250		
	Actual OJT Hours															
	Supervisor Initials															
Valves	Req. OJT Hours	60			120			180			240			300		
	Actual OJT Hours															
	Supervisor Initials															
Bearings & Lubrication	Req. OJT Hours	20			40			60			80			100		
	Actual OJT Hours															
	Supervisor Initials															
Fans and Dampers	Req. OJT Hours	40			80			120			160			200		
	Actual OJT Hours															
	Supervisor Initials															
Air Compressor	Req. OJT Hours	15			30			45			60			75		
	Actual OJT Hours															
	Supervisor Initials															
Turbine Generator	Req. OJT Hours	30			60			90			120			150		
	Actual OJT Hours															
	Supervisor Initials															
Overhead Cranes and Hoists	Req. OJT Hours	50			100			150			200			250		
	Actual OJT Hours															
	Supervisor Initials															
Mobile Cranes	Req. OJT Hours	10			20			30			40			50		
	Actual OJT Hours															
	Supervisor Initials															
Rigging	Req. OJT Hours	100			200			300			400			500		
	Actual OJT Hours															
	Supervisor Initials															
Forklift	Req. OJT Hours	15			30			45			60			75		
	Actual OJT Hours															
	Supervisor Initials															
Piping	Req. OJT Hours	50			100			150			200			250		
	Actual OJT Hours															
	Supervisor Initials															



### Attachment 14 – Master Assignment Chart (Cont)

		Total	Total	Total	Total	Total
Tools & Shop Equipment	Req. OJT Hours	50	100	150	200	250
	Actual OJT Hours					
	Supervisor Initials					
Staging	Req. OJT Hours	40	80	120	160	200
	Actual OJT Hours					
	Supervisor Initials					
Welding	Req. OJT Hours	10	20	30	40	50
	Actual OJT Hours					
	Supervisor Initials					
Portable Tools	Req. OJT Hours	20	40	60	80	100
	Actual OJT Hours					
	Supervisor Initials					
Self Study Hours	Self Study Hrs	120	240	360	480	600
	Act. Self Study Hrs					
	Supervisor Initials					

#### Progress Reviews

Phase 1 Review	Met Expectations ___	Did Not Meet Expectations ___	_____	_____
		Remediation tracking # _____	Line Manager	Date
Phase 2 Review	Met Expectations ___	Did Not Meet Expectations ___	_____	_____
		Remediation tracking # _____	Line Manager	Date
Phase 3 Review	Met Expectations ___	Did Not Meet Expectations ___	_____	_____
		Remediation tracking # _____	Line Manager	Date
Phase 4 Review	Met Expectations ___	Did Not Meet Expectations ___	_____	_____
		Remediation tracking # _____	Line Manager	Date
Phase 5 Review	Met Expectations ___	Did Not Meet Expectations ___	_____	_____
		Remediation tracking # _____	Line Manager	Date
Phase 6 Final Review	Met Expectations ___	Did Not Meet Expectations ___	_____	_____
		Remediation tracking # _____	Line Manager	Date

### Academic Training

	Phase 1						Phase 2						Phase 3						Phase 4						Phase 5						Phase 6					
Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Math	█																																			
Basic Sciences		█																																		
Power Plant Fundamentals			█																																	
Basic Tools & Shop Equipment				█																																
Mechanical Drawings & Print Reading					█																															
Piping & Piping Components							█																													
Bearing and Lubrication										█																										
Rigging Fundamentals											█																									
Heavy Equipment & Crane Operation													█																							
Valve Fundamentals																█																				
Pumps and Rotating Equipment																			█																	
Welding																													█							
Remedial Training																															█					

End of Mechanic-Rigger Program of Instruction