R2-82-103-PGE

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PACIFIC GAS AND ELECTRIC COMPANY

PG&E — 245 MARKET STREET • SAN FRANCISCO, CALIFORNIA 94106 • (415) 781-4211 • TWX 910-372-6587

September 17, 1982

Local Union No. 1245
International Brotherhood of
Electrical Workers, AFL-CIO
P. O. Box 4790
Walnut Creek, California 94596

Attention: Mr. Jack McNally, Business Manager

Gentlemen:

This letter cancels and supersedes our letter dated August 18, 1982 on the same subject.

The Joint Apprenticeship and Training Committee proposes the adoption of the attached, revised Water Department Training Guidelines for the Water Systems Repairman and Water Serviceman classifications. Company further proposes to delete from Exhibits VI-G and X the classifications of Labor Foreman (0625), Water and Gas Subforeman-Willits (0827), and Water Treatment Plant Operator-Willits (1904); and to amend Exhibit VI-G by inserting the content of the letter agreement dated August 24, 1979, as it relates to filling vacancies in the Water Facilities Maintenanceman classification immediately following that classification's definition and line of progression.

If you are in accord with the foregoing and its attachments and agree thereto, please so indicate in the space provided below and return one executed copy of this letter to Company.

Yours very truly,

PACIFIC GAS AND ELECTRIC COMPANY

By _____
Manager of Industrial Relations

The Union is in accord with the foregoing and its attachments and it agrees thereto as of the date hereof.

LOCAL UNION NO. 1245, INTERNATIONAL
BROTHERHOOD OF ELECTRICAL WORKERS, AFL-CIO

Dec 6, 1982

By _____
Business Manager

(NOTE: SEE RON FITZSIMMONS FOR ATTACHMENTS)

JOB DEFINITIONS AND LINES OF PROGRESSION

DIVISION WATER DEPARTMENT

0840 WATER SERVICE SUBFOREMAN

An employee who is a working foreman in charge of the operation and maintenance of the water treatment plants in his area; supervises the repair, maintenance, and operation of water level recorders, pumping plants, and pressure systems; supervises and performs work related to providing and maintaining water service to the public; and supervises and performs work related to the operation and minor repair of canals, flumes, gates, and other related facilities. He shall have the personal qualifications of leadership and supervisory ability, and the craft qualifications of a Water Treatment Plant Operator (including the appropriate Water Treatment Plant Operator's license) and Water Systems Subforeman, and be familiar with Company's operating standards, safety rules, accounting procedures, and other applicable rules and procedures. He shall maintain a high standard of public relations and personal appearance.

Next Lower Classifications	Same or Higher Classification
1905 Water Treatment Plant Operator	0840 Water Service Subforeman
2190 Water Serviceman	

1905 WATER TREATMENT PLANT OPERATOR

An employee who operates one or more full treatment water plants. He operates all equipment, including pumps, filters, and controls; runs all laboratory control tests, except bacteriological; collects bacteriological samples; maintains plant records; performs minor maintenance duties and keeps buildings, grounds, and equipment in a clean and orderly manner. He is required to have a Waterworks Operator's Certificate, Grade II. Since this work may not require his full-time services, he may also be required to work as a Water Serviceman.

Next Lower Classifications	Same or Higher Classifications
*2070 Water Systems Repairman	*0830 Water Systems Subforeman
*2190 Water Serviceman	*0840 Water Service Subforeman
	1905 Water Treatment Plant Operator

*Applies only to employees who possess valid Waterworks Operator's Certificate, Grade II.

0830 WATER SYSTEMS SUBFOREMAN

An employee who is a working foreman in charge of a crew of two to five men, excluding himself, engaged in construction, maintenance, and repair of canals, tunnels, ditches, flumes, pipelines, services, reservoirs, dams, gates, roads, and other related facilities of the water systems; handles the cleaning of canals, ditches, and other bodies of water. May supervise a crew not to exceed ten employees, excluding

himself, performing unskilled work. He shall have the personal qualifications of leadership and supervisory ability, the qualifications of a Water Systems Repairman, and be familiar with Company's construction and safety standards, accounting procedures, and other applicable rules and procedures.

Next Lower Classifications	Same or Higher Classifications
*1905 Water Treatment Plant Operator	*0830 Water Systems Subforeman
2070 Water Systems Repairman	0840 Water Service Subforeman
*2190 Water Serviceman	

*Provided employee has been a Water Systems Repairman and has successfully completed the Water Systems Repairman Training program.

2190 WATER SERVICEMAN

An employee who has the qualifications of a Water Systems Repairman and performs work related to providing and maintaining service to the public, such as installing and removing meters, handling complaints and adjustments, locating leaks, testing meters in the field, meter reading and collecting; may be required to install services; may be required to operate a chlorination or pumping plant and to perform minor maintenance in such plants.

Next Lower Classification	Same or Higher Classifications
2070 Water Systems Repairman	0830 Water Systems Subforeman
	0840 Water Service Subforeman
	1905 Water Treatment Plant Operator
	2190 Water Serviceman

2070 WATER SYSTEMS REPAIRMAN

An employee who is engaged in the construction, maintenance, and repair of all types of water system structures and related facilities and equipment, including water collection and domestic water systems. He drives trucks and operates mechanical equipment, such as tractor-grader, backhoe, loaders, and all equipment for general hauling, bulldozing, road maintenance, excavating and other similar work. If required, must possess a Class I Driver's License. He must make welds, as required, and have a good working knowledge of safe rigging practices and be proficient in the use of all types of hand and power tools and in the operation of mechanized equipment associated with this work. May be assigned other work of similar nature as the occasion requires. His background of experience and the successful completion of formal training must be such as to qualify him to perform this work with skill and efficiency.

Next Lower Classifications	Same or Higher Classifications
0418 Truck Driver	0830 Water Systems Subforeman
0464 Heavy Truck Driver	0840 Water Service Subforeman
0945 Helper	1905 Water Treatment Plant Operator
1195 Canal Maintenanceman	2070 Water Systems Repairman
2430 Ditch Tender	2190 Water Serviceman
1203 Water Facilities Maintenanceman	
2575 Utilityman (Spring Gap)	

1195 CANAL MAINTENANCEMAN - WESTERN CANAL

An employee who operates, cleans and maintains the canal, gates, roads, buildings, and other structures associated with it. He shall install, maintain, test and remove measuring devices and services; and regulate, check and read the canal flow and diversions to customers. In addition, he may be required to perform other routine duties of a Water Serviceman and be assigned to work on Company's water facilities in the Hydro Development on the Yuba River. Also, he may be assigned duties of a similar nature in other departments during off-season periods.

Next Lower Classifications	Same or Higher Classifications
0418 Truck Driver	0464 Heavy Truck Driver-Western Canal Only
0464 Heavy Truck Driver	0830 Water Systems Subforeman
0945 Helper	0840 Water Service Subforeman
2430 Ditch Tender	1195 Canal Maintenanceman
1203 Water Facilities Maintenanceman	1905 Water Treatment Plant Operator
2575 Utilityman (Spring Gap)	2070 Water Systems Repairman
	2190 Water Serviceman

Hours of Work - Canal Maintenanceman

Company and Union are in accord that a Canal Maintenanceman may be required to work a schedule of workdays other than Monday through Friday or Tuesday through Saturday during the irrigation season.

2430 DITCH TENDER

An employee who cleans and makes minor repairs to canals, flumes, gates and other structures, and patrols and operates sections of a canal as assigned, being responsible for the flow of water therein. In addition, he may be required to perform the duties of a Water Facilities Maintenanceman. He shall install and maintain measuring devices and regulate diversions to customers, and may be required to operate a chlorination plant. In addition, he may be required to perform the routine duties of a Water Serviceman associated with his work as a Ditch Tender.

Next Lower Classification	Same or Higher Classifications
0945 Helper	0418 Truck Driver
	0464 Heavy Truck Driver
	0830 Water Systems Subforeman
	0840 Water Service Subforeman
	1195 Canal Maintenanceman
	1905 Water Treatment Plant Operator
	2070 Water Systems Repairman
	2190 Water Serviceman
	2430 Ditch Tender
	1203 Water Facilities Maintenanceman
	2575 Utilityman (Spring Gap)

Hours of Work - Ditch Tender

Company and Union are in accord that a Ditch Tender may be required to work a schedule of workdays other than Monday through Friday or Tuesday through Saturday.

1203 WATER FACILITIES MAINTENANCEMAN

A resident employee who cleans, patrols, maintains, makes minor repairs to and is responsible for the flow and level of water in canals, flumes, gates, tunnels, syphons, penstocks, gaging stations, reservoirs and their appurtenant facilities and equipment (including in-house clorinator system). Inspects and operates such facilities as assigned. He shall maintain and install measuring devices and regulate diversions to customers. May also be required to operate and provide routine maintenance for chlorination plants and weather stations. In addition, may be required to perform the routine duties of a Water Serviceman associated with his work as a Water Facilities Maintenanceman and work with other hydro maintenance or Water Department employees. May be required to reside adjacent to a facility.

Next Lower Classification	Same or Higher Classifications
0945 Helper	0830 Water Systems Subforeman 0840 Water Service Subforeman 2070 Water Systems Repairman 1195 Canal Maintenanceman 1905 Water Treatment Plant Operator 2190 Water Serviceman 2430 Ditch Tender 1203 Water Facilities Maintenanceman 2575 Utilityman (Spring Gap)

A transfer application from Water Facilities Maintenanceman or a higher classification in the line of progression will be given Priority 1 status under the Job Bidding System. Priority 1 transfer applications receive preference over all other transfers and are treated as a bid under the provisions of Subsections 205.7(a), (b), or (c) as appropriate. Under other circumstances, the Water Facilities Maintenanceman classification will be considered a beginner's classification and filled pursuant to Section 205.5 of the Physical Agreement.

Hours of Work - Water Facilities Maintenanceman

Company and Union are in accord that a Water Facilities Maintenanceman may be required to work a schedule of workdays other than Monday through Friday or Tuesday through Saturday.

0441 HEAVY TRACTOR DRIVER (Incumbent Only)

An employee who operates a tractor for general hauling, bulldozing, road maintenance and other similar work; may be required to drive a truck or operate other mechanical equipment and perform other crew or driving work as required.

0464 HEAVY TRUCK DRIVER (Incumbent Only)

An employee who drives a heavy truck transporting men, supplies and equipment; loads and unloads the truck; performs necessary paper work in connection therewith; assists other employees in the performance of their work and may be assigned to operate material handling equipment.

A heavy truck is defined as:

1. a truck-tractor coupled with one or more trailers, or

2. a three-axle truck, or

3. any combination of truck and trailers exceeding 50 feet in length.

Two-wheel pole or pipe dollies without any part of the weight of the dolly resting upon the towing vehicle are not considered trailers for purposes of the above.

0418 TRUCK DRIVER

An employee who drives a truck (other than a pickup truck) transporting men, supplies, and equipment; loads and unloads the truck; performs necessary paper work in connection therewith; assists other employees in the performance of their work and may be assigned to operate material handling equipment.

Next Lower Classifications	Same or Higher Classifications
0945 Helper	0416 Truck Driver
2430 Ditch Tender	0417 Truck Driver
1203 Water Facilities Maintenanceman	0418 Truck Driver
2575 Utilityman (Spring Gap)	0419 Truck Driver
	0462 Heavy Truck Driver
	0463 Heavy Truck Driver
	0464 Heavy Truck Driver
	0465 Heavy Truck Driver
	0830 Water Systems Subforeman
	0840 Water Service Subforeman
	1195 Canal Maintenanceman
	1905 Water Treatment Plant Operator
	2070 Water Systems Repairman
	2190 Water Serviceman

0425 LIGHT TRUCK DRIVER (Temporary Assignment Only)

An employee who drives a station wagon or pickup truck transporting men, supplies, and equipment; loads and unloads the truck; performs necessary paper work in connection therewith; assists employees in the performance of their work in the department to which he is assigned.

0425 LIGHT TRUCK DRIVER (Temporary Assignment Only) (Continued)

Next Lower Classifications

0945 Helper
2430 Ditch Tender
1203 Water Facilities Maintenanceman

Same or Higher Classifications

0945 HELPER

An employee whose principal duties consist of semiskilled work while assisting a higher classified employee; and, in addition, does such work as digging holes or ditches, clearing rights of way and handling tools and materials. When receiving the top rate of pay of his classification, he may be required to operate a boat on waterways for breaking ice. In addition, may be required to perform appropriate camp duties, including the hauling of camp materials and garbage, janitor work, gardening and helping in the boardinghouse.

Beginner's Classification.

0247 FIELD CLERK

An employee whose background and experience is such that he has a comprehensive knowledge of the operation and procedures of a general foreman's or foreman's office in the Water Department, and who performs the clerical work and assists in the administrative work of such office. This work includes such duties as coordinating various functions to facilitate the completion of jobs; assigning jobs to crews; receiving and dispatching customers' complaints; preparing reports; processing timecards, work orders, and GMs for the crews or for accounting purposes; and maintaining office files and records. His duties may require that he work in the office, in a camp, or in the field.

Next Lower Classifications

0265 Routine Hydro Clerk
*2852 Clerk C
*2737 Clerk-Machine Operator C
*2856 Clerk-Steno C
*2872 Clerk-Typist C

Same or Higher Classifications

0263 Senior Hydro Clerk
0264 First Hydro Clerk
*2723 Clerk A
*2789 Clerk B
*2730 Supervising Clerk B
*2762 Clerk-Steno A
*2796 Clerk-Steno B
*2766 Clerk-Typist A
*2812 Clerk-Typist B

*In Division Electric and Water Departments.

1036 METEOROLOGICAL INSTRUMENTMAN

An employee who, without direct supervision, is engaged in the installation, operation, and maintenance of equipment associated with the cloud seeding, precipitation, surface wind, temperature, and upper air sounding systems. He routinely performs duties, such as installation and removal of silver iodide generator equipment and precipitation gauges; services and makes repairs to the equipment as required; adjusts and calibrates gauges and recorders; changes charts; and maintains records. During storm periods, operates the upper air sounding system, reducing data and submitting to the weather office. He is responsible for maintaining adequate supplies to operate the project and may be called on from time to time to perform special studies in the field, such as collecting snow replica slides.

In addition, he may be required to perform other duties of a Water Systems Repairman and be assigned to work on Company's water facilities in the hydro development in the area to which assigned.

Next Lower Classification	Same or Higher Classification
1037 Assistant Meteorological Instrumentman	1036 Meteorological Instrumentman

1037 ASSISTANT METEOROLOGICAL INSTRUMENTMAN

An employee who is engaged in performing a Meteorological Instrumentman's work as an assistant to or under the direction of a Meteorological Instrumentman. Without direct supervision, in the field, operates, adjusts, cleans, zeros and checks meteorological instruments for proper operation, and installs and calibrates rain gauges. In the shop, performs routine maintenance on these instruments without direct supervision.

Next Lower Classifications	Same or Higher Classifications
0418 Truck Driver	1036 Meteorological Instrumentman
0464 Heavy Truck Driver	0830 Water Systems Subforeman
0945 Helper	0840 Water Service Subforeman
1195 Canal Maintenanceman	1905 Water Treatment Plant Operator
2430 Ditch Tender	2070 Water Systems Repairman
1203 Water Facilities Maintenanceman	2190 Water Serviceman

2575 Utilityman (Spring Gap)

An employee who performs the duties of a Water Facilities Maintenanceman and in addition operates the Spring Gap Tram and patrols lines assigned.

Next Lower Classifications	Same or Higher Classifications
1203 Water Facilities Maintenanceman	0830 Water Systems Subforeman
2430 Ditch Tender	0840 Water Service Subforeman
0945 Helper	2070 Water Systems Repairman
	1195 Canal Maintenanceman
	1905 Water Treatment Plant Operator
	2190 Water Serviceman

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

All employees entering the Water Systems Repairman and Water Serviceman classifications must successfully participate in a Training Program for purposes of rate progression and/or promotion.

Entry Tests

To insure that all employees entering the Water Systems Repairman or Water Serviceman classification possess the necessary capabilities to progress, they shall not be entitled to consideration for appointment to one of the above classifications unless they have first received passing scores on the following test:

Arithmetic Computation Test (ACT)

1. The Arithmetic Computation Test has been prepared in four forms for test purposes and one additional form for refresher purposes. When a prospective trainee notifies his Personnel Department that he desires to be tested, he will be furnished a copy of the refresher test and a copy of the same test with the correct procedures and answers indicated. This will enable him to determine what review will be necessary to attain a passing score on the formal test.

2. He shall be allowed a reasonable length of time for such review, and, on the employee's request, the examination date shall be established by his Personnel Department.

3. The minimum passing grade on this test is 75 percent (30 correct out of 40 problems). Credit will be given only for those problems that are answered completely correct.

4. An employee who has failed, on his first attempt, to receive at least the minimum passing score on the ACT will be eligible to be retested on such test in the following manner:

   a. 2nd Testing - Three (3) months, or thereafter, following the date of the first testing.

   b. 3rd Testing - Six (6) months, or thereafter, following the date of the second testing.

   c. 4th Testing - Six (6) months, or thereafter, following the date of the third testing <u>provided</u> that he is able to show satisfactory evidence that he has prepared himself to pass the test.

5. An employee who fails will be advised when he will be eligible for retest. When again eligible, such employee shall request his Personnel Department to be retested, and his retest shall be scheduled within 14 days of his request.

6. Company will not be required to give further consideration to an employee when he has failed for the fourth time to meet the ACT requirement.

7. The above qualification tests may be revised or additional requirements may be established by written agreement between Company and Union. Additional requirements previously established under the provisions of Section 205.11 of the Agreement shall continue to be applicable.

This training consists of instruction designed to be taken in six-month increments. Employees in the classifications of Water Systems Repairman and Water Serviceman will receive instruction specifically tailored to meet the needs of the facilities in the Divisions where the employee is employed.

Employees in the Water Systems Repairman classification shall be given programs of instruction in each of their six months' wage progression periods that are jointly selected from a master list of courses and are administered by the Company both in Division and in central locations. Such selection of courses may vary from Division to Division, but successful completion of the courses within each Division is mandatory for wage step progression.

The Training Program shall be administered as follows:

1. Placement Into the Training Programs

   a. An employee who is the successful bidder on a vacancy in the Water Systems Repairman classification shall be placed at the beginning wage step of such classification. Such employee must satisfactorily complete all required training commensurate with the employee's wage step in the above-listed classification prior to further wage progression.

   b. Employees who, on the effective date of this agreement (August 29, 1979), are currently classified as Water Systems Repairman shall not progress beyond the current two-year wage step until such time as they successfully complete the portions of the Training Program that correspond to the wage step. Upon successfully attaining the standards applicable to the classification, they shall be allowed to progress in their present classification to the top of the wage rate and be considered qualified for promotion if the standards of classifications bid are met.

   Notwithstanding the provisions of the above paragraph, employees at the top rate of pay or at the 18-month wage step, in the above classification, on the effective date of this agreement, shall be allowed to progress to the 30-month step and be required to take the Water Systems Repairman Training Program as soon as the formal program is mutually agreed to. Should an employee at the top rate of pay fail to meet one of the standards, such employee will be returned to the two-year rate of pay. In any case, such employee must satisfactorily participate in the Training Program prior to becoming a valid bidder to a higher classification under the provisions of Subsection 205.7(b).

c. Employees who, on the effective date of this agreement (August 29, 1979), are currently classified as Heavy Tractor Driver or Heavy Truck Driver shall not progress beyond the 24-month wage rate of the Water Systems Repairman classification until such time as they successfully complete the portions of the Training Program that correspond to the wage step. Upon successfully attaining the standards applicable to the classification, they shall be reclassified to Water Systems Repairman and be allowed to progress to the top rate of pay of the Water Systems Repairman classification and be considered qualified for promotion if the standards of classifications bid are met.

d. An employee who on August 29, 1979 was a Water Systems Repairman, Heavy Tractor Driver or Heavy Truck Driver but on October 1, 1982 was a Water Systems Subforeman will be required to complete the academic portion of the Water Systems Repairman Training Program within the time limites provided therein. If such Water Systems Subforeman fails to pass the academic portion of such program in a timely manner, Company will review such Subforeman's performance as a Subforeman. Before demoting such Subforeman to the two year step of Water Systems Repairman, Company shall discuss the performance problem with the Union.

2. Training and Testing of Employees in the Water Systems Repairman Training Program

All employees in the Water Systems Repairman Training Program shall be required to successfully complete the training specified for each wage step in the Program applicable with their classification and to successfully demonstrate acceptable performance in the on-the-job aspects of the Program. Such employees must also pass the appropriate agreed-to wage progression tests and any agreed-upon performance tests if applicable for the involved wage step prior to advancing to the next wage step in the Program.

An employee in the Program who has spent six months at his current wage step and who has successfully completed the specified training for that wage step shall be advanced to the next higher wage step of the progressive wage rate.

An employee who is due to progress to his next higher wage step in the wage progression who fails to meet the established criterion for each specified training for that wage step shall:

a. Be notified of his inadequate performance in writing prior to the date he is scheduled to receive the next higher wage step.

b. A copy of the written notification shall be furnished to the Union's Business Representative.

c. Be held in his present wage step, and

d. Be allowed a maximum of five months, including three retests for each training step, to meet the established criterion for each training step not successfully completed. All specified training must be successfully completed by the end of this five-month period.

e. An employee shall be entitled to take tests, described above, a maximum of four times in accordance with the following schedule:

1) 1st Testing - At any time prior to the date on which the examination requirement must be met as provided above.

2) 2nd Testing - Within one month, following the date of the original test.

3) 3rd Testing - Within two months, following the date of the original test.

4) 4th Testing - Three months, following the date of the third test.

If an employee fails to pass a test a fourth time, Company will not be required to give further consideration for testing such an employee.

An employee will be deemed to have met the test requirement if he attains a grade of 70 percent on any form of a written test for the wage step he is attempting to attain and passes the performance test, if required, for the wage step he is attempting to attain. If such standard is attained, further examinations for progression within the applicable classification will not be required.

f) If, during the above period, the employee meets the established criterion for all specified training, he shall receive the next higher wage rate effective the date all such criteria are met. He will not be eligible for further progression in the wage rate until six months have elapsed since the date he received such wage increase and until he successfully completes the specified training for such wage step.

If an employee fails to pass the established requirements to progress to any other step of the Program, other than above within the allotted time, such employee shall be removed from his present classification and demoted in accordance with the provisions of Section 206.15 of the Physical Agreement.

g) An employee, within one year of demotion from a Water Department Training Program, upon presentation of acceptable evidence that the employee has remedied the deficiencies which caused the demotion; or, if demotion was due to academic failure, that the employee has pursued an outside study program and by completing the required tests meets the established standards for the wage step that the employee left, shall have his application for transfer to a vacancy in the appropriate Water Department Training Program classification considered under the provisions of Title 205. If the employee is transferred, he shall be restored to the Training Program at the wage step the employee left and shall progress, as outlined above, to the next higher wage step six months after re-entering the Program.

3. Application of Program to Title 205 - Job Bidding and Promotion

Since the Program is tailored to meet specific conditions in each Division, employees who have met all of the requirements for a classification in one Division will not necessarily have done so for all Divisions. However, employees who have satisfactorily met all requirements in their present Divisions and classifications may bid to another Division, pursuant to the provisions of Title 205, and may be awarded a job without having taken all of the training required in the Division to which the employee is bidding. However, such an employee must complete any necessary training material in the new Division in a reasonable time but, in any case, not longer than 30 months. This waiver of qualifications applies only to portions of the Training Program that an employee may be missing. An employee who does not satisfactorily pass the necessary training in the new Division shall not be qualified for progression to a higher Water Department classification pursuant to Title 205 of the Physical Agreement. All other requirements pertinent to qualifications shall apply.

4. General

a. Should a grievance arise concerning the administration of any portion of this agreement, it shall be determined by the procedure established under the provisions of Section 102.8 of the Agreement; however,

b. if the grievance pertains to:

1) the fairness of administration or correction of a test required in the Program, or

2) the attainment of a standard or proficiency which does not require a test as such,

the Local Investigating Committee, prior to its decision and as part of its deliberations, may refer such grievance to the Joint Apprenticeship Training Committee for its recommendations.

WATER SYSTEMS REPAIRMAN

TRAINING PROGRAM

TABLE OF CONTENTS

INTRODUCTION

Having enrolled in this training program indicates that you have selected an occupation that might well be a lifelong vocation. To help you reach your goal, the management of Pacific Gas and Electric Company has assembled appropriate training material to guide you, step by step, through the program. The material has been carefully selected to give you sound training in your chosen field.

You will be exposed to many opportunities to increase your store of knowledge both in the "on-the-job" phase of this program and in your academic studies. If this challenge is accepted enthusiastically, you will benefit from this training and rate high in your final appraisal.

Your training period can be defined as the intensified portion of lifelong learning. This time served while learning a trade is designed to develop thought processes and on-the-job experience which can lead to a high proficiency in your chosen occupation.

The phenomenal expansion of the PGandE system and the many technological changes and regulations required for present day operations have necessitated the selection of personnel with definite qualifications and job potential.

From your study and related training, you will learn to associate the principles and the practices of your craft. Once you have mastered the program, you will be able to plan work well and to solve problems relating to your job. You will emerge from the training program by progressive experiences. This is essential if you hope to advance to a higher level of skill and on to supervisory responsibility.

There is no simple way to acquire the related information and skills of any trade. Much study and diligent work are required to master the extensive amount of knowledge and practical skill that is part of any modern craft. This Water Systems Repairman training program has been carefully designed to offer instruction, guidance, and counseling during your training period. You will cover the material systematically with frequent checks on your progress and on the thoroughness of your learning. It is your responsibility to gain the maximum knowledge possible during this training period. Through the process of acquiring this knowledge, you will form learning habits that will be valuable to you as you progress through your working career.

Your success in the training program rests with you and your desire to learn. In the pages that follow, the complete program is presented.

OUTLINE OF WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

OBJECTIVE

The need for trained and fully qualified employees to accomplish the duties specified in the Journeyman, Water Systems Repairman definition in a manner consistent with company's standards, safety, and performance has resulted in this program which coordinates extensive on-the-job and related subject training. The systematic acquisition of knowledge and skill offers the employee in training the vehicle to attain self-confidence and satisfaction in his work, and the correct and safe method of performing company's work.

TRAINING

During the 30 months of the training, you will be offered job training divided into five time periods which coincide with the wage steps of the classification. In order that uniform and safe practices will be followed in the training period, assignment of duties and work procedures shall be provided in each of the wage steps as outlined in these guidelines and the attached schedule. The amounts of time or units of work as indicated in the schedule are believed sufficient to permit you to develop proficiency in such duty or work procedures but should not be considered as inflexible dependent on the demonstrated ability of each individual. The attached schedule also specifies those training periods in which you will receive related subject or class training.

1. On-The-Job Training

The on-the-job phase of the training program is designed to give you practical training that will develop your abilities and prepare you for journeyman responsibilities. This training will include instruction on the construction, operation, and maintenance of the water collection and distribution facilities associated with the Hydro Department. This phase of your training will fully utilize the variety of work offered by the daily assignment of jobs in your area.

The duties and amount of such training, as specified in the schedule, shall apply to the extent that such duties are performed by journeymen where you are headquartered. In the event such duty is not performed by journeyman at his headquarters and therefore not available in the training it shall be noted in your work record. However, progression through the training or to journeyman or higher classification shall not be deterred for this reason.

2. Related Academic Training

As early as possible in the training period, you will be assigned to division-administered specialized training courses. The courses will include Math Review, Rigging, Welding, Equipment Operation, Hand and Portable Power Tools, Carpentry, Flumes, and Construction Practices. These courses are to be completed in 24 months.

GENERAL GUIDELINES

1. It is intended that assignment of the specified hours of training on the job for each period of the training will be made as early in the period as practicable.

2. Hours shown on the schedule 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.

3. Except where otherwise specified, you will be trained by assignment to work with qualified journeymen.

4. Progressive work experience in all phases of construction, maintenance, and repair of all types of water systems structures and related facilities, including domestic water systems, will be provided throughout the first six-month periods of the training in accordance with the attached schedule.

5. Assignments during the last or fifth period will be made for the purpose of rounding out your experience.

6. The use of additional study of outside courses is not provided for by this program. If you are having difficulty in any particular phase of your training, it will be to your advantage to utilize additional study for review and improvement. Outside courses can be used, if you wish, to supplement the program.

7. The supervision of your training program is the primary responsibility of your foreman. Your supervisor will be aided, as may be necessary in your training, by other qualified personnel. Thus, through association with more than one person, you will receive a wider range of view points and experience.

8. Periodic tests and interviews will be held for the purpose of evaluating your overall progress and determining your level within the program. Records of your progress will be kept and reviewed as part of your evaluation. If your progress becomes unsatisfactory, below the minimum level of 70 percent, your supervisor will review your performance with you and recommend steps for improvement which you should follow.

RECORDS OF PROGRESS

The sample forms which follow are the Records of Progress forms that will be used by you and your supervisor to evaluate your progress in the training program. They are shown here for your general information along with a short explanation of how they are used:

1. On-The-Job Training--Records of Progress

   The forms are used to maintain a record of your performance in the various phases covered by the on-the-job portion of the program. As you progress through this training, your supervisor will evaluate your performance on each phase and record the results on the following charts:

   a. Monthly Assignment Charts (74 - 897)

      These charts are maintained as a record of the daily training hours you will accumulate during the different phases of the on-the-job portion of your program. They will be kept inside a loose-leaf notebook cover in a supervised location accessible to you. It will be your responsibility, at the end of each workday, to enter the training hours worked in the appropriate space for each process listed. Your supervisor will review the assignment card, at intervals of not longer than one week, and grade each daily entry for that interval.

   b. Master Assignment Chart (74 - 898)

      The Master Chart is maintained by your supervisor as a summary of your graded monthly training hours. At the end of your training program, the training hours will be totaled and the grades averaged for each process.

2. Academic Training Record of Progress (74 - 899)

   Your progress and performance in the academic courses to be completed will be maintained by your supervisor on this form.

   A final examination will be required for the completion of each academic course. This examination will be given by a representative of the Division Personnel Department and will require a grade of at least 70 percent for passing.

3. Review--Records of Progress

   Your Master Assignment Chart and Academic Records of Progress will be reviewed by the Division Personnel Department at the completion of your training.

GENERAL OUTLINE OF COURSE STUDY

The training will begin with an orientation period consisting of a short introduction to various aspects of the company system, division organization, and facilities of the Hydro Department. This period will provide basic understanding of the Water Systems Repairman Training Program, job duties as well as other related areas including accounting procedures, safety, first aid, fire prevention, union contract, etc.

MATH REVIEW

General review of math including problems involving use of fractions, decimals, ratios, areas and volumes, and geometry relating to construction practices in the Water Departments (TPC text).

RIGGING

The fundamentals of rigging to include use of rope, slings, and calculations for determining weight of objects, size of blocks, and advantage for using levers, etc (TPC text).

WELDING

Welding principles including coverage of basic fundamentals, equipment both gas and electric arc, oxygen cutting, brazing, and soldering, etc (TPC text).

EQUIPMENT OPERATION

Basic instruction and training in the operation of the various types of equipment utilized in the Hydro Departments. To include preoperation inspection and service requirements, operating procedures, company rules and regulations, use of complaint forms, records, etc., study material including manufacturers' instruction manuals, check sheets, etc, to be provided from each respective headquarter as appropriate for the equipment utilized.

HAND TOOLS

Information and practice in using measuring tools, wrenches, pipe fitting, concrete, woodworking, hoisting, and pulling tools. How to use, sharpen, and maintain (TPC text).

PORTABLE POWER TOOLS

Instruction and safe practice using portable electric and air powered drills, hammers, saws, routers, planes, sanders, screwdrivers, wrenches, and grinders (TPC text).

CARPENTRY

Basic information about lumber, selection, and safe use of tools, hardware, and general practices involving construction type carpentry (TPC text).

CONSTRUCTION PRACTICE

Instruction and training in the appropriate skills required in performing work in the Hydro Departments associated with piping, concrete, levelling, and print reading. Instruction for print reading to be provided at each respective headquarters utilizing appropriate drawings for the specific types of structures and facilities maintained in that area or system.

FLUMES

The application and instructions for construction, reconstruction, and maintenance of the various type flumes utilized for water conveyance.

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

SCHEDULE

MASTER ASSIGNMENT
(HOURS)

	On-The-Job Procedures and Duties	Month 0-6	7-12	13-18	19-24	25-30
1.	Accident prevention--safety first		(12)	*		
2.	Job procedures, recordkeeping, accident reports, and WOs and GMs		(24)	*		
3.	Equipment operation, inspection and service			(160)	*	
4.	Levelling			(40)	*	
5.	Care and use of hand and power tools			(120)	*	
6.	Rules and application of rigging associated with water systems facilities			(80)	*	
7.	Use, care, and operation of welding and burning equipment. Perform welding and burning work			(60)	*	
8.	Domestic distribution systems			(40)	*	
9.	Pipe fitting (steel, plastic, fiberglass, and asbestos-cement)			(80)	*	
10.	Rough carpentry			(160)	*	
11.	Concrete work			(80)	*	
12.	Flume construction (wood, concrete, steel, gunite)			(320)	*	
13.	Painting and sealing			(80)	*	
14.	Water regulation and clearance procedures		(40)	*		

*The minimum number of hours of on-the-job training are shown in brackets [ ]. The objective of the training is that full knowledge and proficiency be achieved by the end of the six-month period noted by the *.

	On-The-Job Procedures and Duties	Month 0-6	7-12	13-18	19-24	25-30
15.	Handling of explosives (SC&H Guide)	.....	.....	(24).....	.....*	_____
16.	Weed, brush, and rodent control (SP 490.08-1)	.....	(24).....	.....*	_____	_____
17.	Drawings and instructions, Standard Practices, Bulletins, etc.	...(40)..	*	_____	_____	_____

*The minimum number of hours of on-the-job training are shown in brackets [ ]. The objective of the training is that full knowledge and proficiency be achieved by the end of the six-month period noted by the *.

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

HAND TOOLS

INTRODUCTION

The correct and safe use of hand tools and their care are essential skills for Water Department personnel. Upon completion of this unit, the student will be able to make accurate measurements, identify tools by their correct name, cite the specific purpose and use of each tool, describe their correct operation, and provide the care and maintenance required to keep tools in proper operating condition. The importance of good workmanship is stressed and good safety practices are emphasized to prevent or minimize injury and equipment damage.

STUDY GUIDE

The textbook to be used is Technical Publishing Company's USING HAND TOOLS. Read and study all of the lessons and answer the programmed exercises and self-check quizzes after each lesson.

PERFORMANCE OBJECTIVE

The objective of this unit is to provide the employee with information to help acquire a good working knowledge of the use and operation of each hand tool. The completion of this unit will require about eighteen (18) hours of study time and one (1) hour for the performance test.

HAND TOOLS

Lesson 1: MEASURING TOOLS

Linear and angular measurement; Units of linear measurement; Rules and measuring tapes; Using rules and tapes; Calipers; Slide calipers; Vernier calipers; Micrometer caliper; Using the micrometer; Squares.

Lesson 2: WRENCHES AND SCREWDRIVERS

WRENCHES--Using wrenches; Open-end wrenches; Box-end wrenches; Combination wrenches; Socket wrenches; Socket handles; Socket-head wrenches; Adjustable wrenches; Torque wrenches; Using wrenches safely.

SCREWDRIVERS--Using screwdrivers; Standard screwdrivers; Cross-slot screwdrivers; Spiral ratchet screwdrivers; Offset screwdrivers; Driving a screw; Removing a screw; Restoring a screwdriver blade; Using screwdrivers safely.

Lesson 3: PIPEFITTING TOOLS

Pipe wrenches; Using a pipe wrench; Pipe vises; Cutting pipe; Threading pipe; Reaming pipe; Tapping pipe; Cutting tubing and plastic pipe; Flaring metal tubing; Caring for pipe tools.

Lesson 4: PLUMBING TOOLS

Plumbing codes; Plumbing system; Joining copper pipe; Tube bending; Cutting cast-iron pipe; Joining cast-iron pipe; Assembling plastic pipe; Force-cup plungers; Augers; Line-clearing tools; Sewer tapes; Special wrenches; Measuring pipe.

*Lesson 5: ELECTRICIAN'S TOOLS

The electrician; EMT bender; Correcting knocked-over stubs; Bending rigid conduit; Assembling rigid conduit; Knockout punches; Fish tapes; Pliers; Wire and cable strippers; Special screwdrivers; Test and safety equipment.

Lesson 6: WOODWORKING TOOLS

Handsaws; Crosscut saws; Ripsaws; Special purpose saws; Planes; Scrapers; Drills; Chisels; Levels; Plumb bobs; Hammers and nail sets.

Lesson 7: MASONRY, PLASTERING, AND GLAZING TOOLS

Concrete and mortar; Preparing mortar; Working with bricks and mortar; Tuckpointing; Working with concrete; Edging, jointing, and finishing; Repairing plaster; Repairing wallboard; Cutting glass; Installing glass; Safety on the job.

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*Optional. You will not be tested on material in this lesson, but you may study it on your own time.

Lesson 8: SHEET METALWORKING TOOLS

Sheet metal; Sheet metal gages; Layout tools; Dividers; Punches; Rivets and riveting tools; Metal cutting chisels; Using a chisel; Hammers; Metal cutting snips; Dressing; Notchers; Bench stakes; Forming tools; Hand seamer; Soldering sheet metal safety.

Lesson 9: METALWORKING TOOLS

Vises; Hacksaws; Using hacksaws; Files; File cuts; File specifications; Selecting a file; Using files; Taps; Tap sizes; Using taps; Dies; Thread classes; Using dies; Reamers; Using reamers.

Lesson 10: HOISTING AND PULLING TOOLS

Hoisting with rope; Knots; Wire rope; Slings; Sling angles; Sling hitches; Center of gravity; Sling spreader beams; Block and tackle; Chain fall; Chain load pullers; Machine part pullers; Jaw pullers; Slide hammer pullers; Choosing the proper puller.

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

MATH REVIEW

INTRODUCTION

A working knowledge of mathematics is an important part of the skills which a Water Systems Repairman needs to do his job. Mathematical calculations are frequently used for most construction type jobs to determine required materials and in the assembly process involving use of measurements.

Safe rigging practices require the need to determine weights of objects, calculate the advantage of levers, determine size of pulling blocks and the number of lines needed to support a given load, and the sizes of slings to support the load.

The functions to be covered in this unit will provide all of the math needed by the Water Systems Repairman in his daily work.

STUDY GUIDE

The textbook to be used is Technical Publishing Company's USING MATHEMATICS IN THE PLANT. Read and study all of the lessons as indicated in the index and answer the programmed exercises and self-check quizzes after each lesson.

PERFORMANCE OBJECTIVE

The objective of this unit is for use as a refresher study for use in solving problems involving fractions, decimals, ratios, geometry, areas and volumes as related to Hydro Department work. The completion of this unit will require about ten (10) hours of study time and one (1) hour for the performance test.

MATH REVIEW

Lesson 1: WHOLE NUMBERS

Numbers and numerals; Decimal system; Positive and negative numbers; Addition; Carrying; Multiplication; Subtraction; Borrowing; Division.

Lesson 2: COMMON FRACTIONS

Definition of a fraction; Value of a fraction; Improper fractions; Mixed numbers; Equivalent fractions; Reducing fractions; Common denominators; Lowest common denominator; Adding fractions; Subtracting fractions; Subtracting mixed numbers; Multiplying fractions; Canceling; Dividing fractions.

Lesson 3: DECIMAL FRACTIONS

Decimal form; Rounding off; Adding decimal fractions; Rounding off in addition; Subtracting decimal fractions; Rounding off in subtraction; Decimal fractions in the shop; Multiplying decimal fractions; Rounding off in multiplication; Adding extra zeros; Dividing decimal fractions; Rounding off in division; Changing common fractions to decimal form; Changing mixed numbers to decimal form; Changing decimal fractions to common fractions.

Lesson 4: RATIOS AND PROPORTION

Comparing numbers; Ratios; Expressing ratios; Writing ratios; Units in ratios; Proportion.

*Lesson 5: POWERS AND ROOTS

Repeating multiplication and division; Exponential form; Multiplying in exponential form; Dividing in exponential form; Zero power; Fractions with exponents; Products with exponents; Powers of powers; Powers of sums and differences; Roots; Fractional exponents; Decimal exponents; Negative fractional exponents.

*Lesson 6: CALCULATORS

What a calculator does; Inside a calculator; Internal logic; Basic functions; Special functions; Special purpose calculators.

*Lesson 7: GEOMETRY

Lines and curves; Circles; Angles; Measuring angles; Polygons; Triangles; Quadrilaterals; constructions.

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*Optional. You will not be tested on material in this lesson, but you may study it on your own time if you wish.

*Lesson 8: ALGEBRA

Need for algebra; Symbols; Expressions, and equations; Order of operations; Parentheses; Numbers and variables; Equations; Algebraic laws; Writing equations; Solving equations.

Lesson 9: USING FORMULAS

A real problem; Solving the problem; Length, area, and volume; Solving other problems.

*Lesson 10: TRIGONOMETRY

Properties of triangles; Trig functions; Trig tables; Inverse trig functions; Using trig functions.

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*Optional. You will not be tested on material in this lesson, but you may study it on your own time if you wish.

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

PORTABLE POWER TOOLS

INTRODUCTION

Portable power tools have made it possible to perform many tasks with ease that formerly were time-consuming and laborious.

Many portable power tools are made for the jobs a student or craftsman is expected to perform in their work. Some are electric, and others are air-powered. Either type can perform the same work but the amount done varies with the application.

Most portable electric power tools have universal motors that operate on 120 or 240 volts, ac or dc. The electric tools are designed especially for intermittent work. Pneumatic tools perform better than electrical tools on long, continuous operations.

This unit describes the more common power tools an employee may use. All students should know as much as possible about the different power tools to know which tools are best for each application. This unit describes in detail both electrical and pneumatic tools. It explains how to operate them properly and stresses safety in handling each tool.

STUDY GUIDE

The textbook to be used is Technical Publishing Company's USING PORTABLE POWER TOOLS. Read and study all of the lessons and answer the programmed exercises and self-check quizzes after each lesson.

PERFORMANCE OBJECTIVE

The objective of this unit is to provide the employee with information to help acquire a good working knowledge of safe operation and application of portable power tools. The completion of this unit will require about sixteen (16) hours of study time, and one (1) hour for the performance test.

PORTABLE POWER TOOLS

Lesson 1: ELECTRIC DRILLS

Parts of electric drills; Light-duty drills; Heavy-duty drills; Accessories; Drill sizes; Drill bits; Preparing to drill; Using the electric drill; Electric drill maintenance; Drill safety.

Lesson 2: Electric Hammers

Types of hammers; Operating electric hammers; Bits and chisels; Core bits; Self-drilling anchors; Mechanical safety; Electrical safety; Environmental safety.

Lesson 3: PNEUMATIC DRILLS AND HAMMERS

PNEUMATIC DRILLS--Air power; Types of pneumatic drills; Sizes of pneumatic drills; Bits for pneumatic drills; Preparing to drill; Operating pneumatic drills.

PNEUMATIC HAMMERS--Types of pneumatic hammers; Chipping and scaling; Drilling; Riveting; Tampers; Needle scalers; Diggers; Lubrication and maintenance.

Lesson 4: SCREWDRIVERS, NUTRUNNERS, AND WRENCHES

Screwdrivers and nutrunners; Clutch mechanisms; Power wrenches; Bits and sockets; Operating power screwdrivers and wrenches; Lubricators and moisture separators; Tool safety.

Lesson 5: LINEAR MOTION SAWS

Straight blade power saws; Saber saws; Saber saw blades; Plunge cutting, straight cutting; Cutting metals; Saber saw techniques; Reciprocating saws; Reciprocating saw blades; Band saws.

Lesson 6: CIRCULAR SAWS

Circular saws; Using the circular saw; Circular saw blades; Special saw blades; Crosscutting; Ripping; Angular cutting; Plunge cutting; Notching and grooving; Cutoff wheels; Arbors and arbor adaptors; Circular saw accessories; Safety rules.

PORTABLE POWER TOOLS (cont'd)

*Lesson 7: ROUTERS AND PLANES

ROUTERS--Router characteristics; Collet chucks; Bits; Using a router; Direction of feed; Grooves and dadoes; Rabbet cuts; Decorative trim; Circular cuts; Using templates; Hinge-butt mortising; Jointing.

PLANES--Plane characteristics; Using a plane; Safety.

*Lesson 8: ELECTRIC SANDERS

Belt sanders; Installing a sanding belt; Using the belt sander; Belt sander lubrication; Motor maintenance; Pad sanders; Loading the sander; Using the pad sander; Pad sander maintenance; Disk sanders; Using the disk sander; Disk assembly; Disk sander maintenance; Safety.

Lesson 9: GRINDERS AND SHEARS

GRINDERS--Selecting a grinder; Grinding wheels; Mounting grinding wheels; Using the grinder; Grinder maintenance; Safety.

SHEARS--Selecting shears; Using shears and nibblers.

Lesson 10: TOOL SHARPENING

Reasons for sharpening; Whetstones; Using a bench grinder; Sharpening chisels; Sharpening drill bits; Sharpening screwdrivers; Sharpening pointed tools; Sharpening reamers; Sharpening taps and dies; Other sharpening tools.

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*Optional. You will not be tested on material in this lesson, but you may study it on your own time if you wish.

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

RIGGING

INTRODUCTION

Proper rigging practice plays an important part of everyday work involving Hydro Department facilities. A basic knowledge of mechanical movements, simple machines, and machine systems makes it easier to move heavy objects and handle material during the progress of each job.

Equipment such as hoists and cranes are utilized for many different rigging applications. Ladders, scaffolds, and other devices are used when working at heights above ground or water. Different types of fiber and wire rope are required and used in conjunction with rigging work.

STUDY GUIDE

The textbook to be used is Technical Publishing Company's RIGGING. Read and study all of the lessons and answer the programmed exercises and self-check quizzes after each lesson.

PERFORMANCE OBJECTIVE

The objective of this unit is to better prepare and enable the employee to perform work easier and safer. The completion of this unit will require about ten (10) hours of study time and one (1) hour for the performance test.

RIGGING

Lesson 1: RIGGING FUNDAMENTALS AND MECHANICAL ADVANTAGE

Rigging in maintenance work; Estimating the weight of a load; Finding the center of gravity; Using mechanical advantage; Simple machines for rigging; Machine systems for rigging; Sheaves and reeving; Sling materials; Sling types; Hooks and shackles; Mousing; Typical uses of slings in maintenance work; Safe working loads for slings; Inspecting slings for safety.

Lesson 2: FIBER ROPE AND KNOTS

Rope fiber types; Synthetic fiber ropes; Natural fiber rope forms; Synthetic fiber rope forms; Size designations of rope; Natural fiber rope strength; Synthetic fiber rope strength; Effects of moisture; Elongation; Uncoiling natural fiber rope; Unreeling nylon rope; Whipping rope ends; Proper storage and care of fiber rope; Routine inspections; How to store rope; Splicing fiber rope; Useful knots, bends, and hitches.

Lesson 3: WIRE ROPE AND CHAIN

Types of wire rope; Strength of wire rope; Wire rope care and storage; Unreeling and uncoiling wire rope; Cutting and seizing wire rope; Winding wire rope; Lubricating wire rope; Inspecting wire rope; Wire rope eyes; Wire rope sockets; Splicing wire rope; Sheaves and drums; Hoisting chains and hooks.

Lesson 4: CRANES AND HOISTS

Types of derricks (stationary cranes); Gin pole derricks; Other types of derricks; Jib cranes; Mobile cranes; Locomotive cranes and truck-mounted cranes; Hydraulic booms; Chain hoists; Hooks and fittings for chain hoists; Material hoists or lifts; Winches and capstans; Hoisting signals; Hoisting safety.

Lesson 5: SCAFFOLDS AND LADDERS

Scaffolds; Scaffold planking; Types of scaffolding; Workmen's lift platforms; Guy lines; Anchorages; Rigging accessories; Selecting a ladder; Types of ladders; How to raise a ladder; Inspecting ladders; Life belts and life nets; Scaffold safety; Ladder safety.

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

CARPENTRY

INTRODUCTION

The carpenter and other crafts are closely related in many areas and, in some cases, overlap. It is common practice for some portion of your duties to be carpenter work. While the journeyman carpenter trade includes everything from rough construction through trim and finish work, your particular craft is usually concerned with construction-type carpentry only. This section, therefore, is limited to those carpentry operations that may be performed by your craft.

STUDY GUIDE

The textbook to be used is Technical Publishing Company's INTRODUCTION TO CARPENTRY. Read and study all of the lessons provided and answer the programmed exercises and self-check quizzes after each lesson.

PERFORMANCE OBJECTIVE

The objective of this unit is to provide the employee with information to help acquire a good working knowledge of basic carpentry. The completion of this unit will require about six (6) hours of study time and one (1) hour for the performance test.

CARPENTRY

Lesson 1: LAYOUT AND HAND TOOLS

Introduction; Dressing for carpentry work; Safety accessories and equipment; Layout tools; Straightedge; Marking gage; T-Bevel and protractor; Framing square; Testing a framing square; Chalk box and line; Work-holding vises and clamps; Hand tools; Your toolbox.

Lesson 2: CARPENTER'S POWER TOOLS

Rules for power tool safety; Blades for circular saws; Correct use of a circular saw; The saber saw; Reciprocating saw; The power drill; The power plane; The router; Belt sander; Finishing sander; Specialty tools for carpenters; nailers and tackers; Power actuated fastening tools; The screw gun.

Lesson 3: LUMBER, WOOD PRODUCTS, AND FASTENERS

Hardwood vs. Softwood; Lumber sizes; Lumber grading; Lumber defects; Moisture content; Milling methods; Millwork; Plywood; Plywood grading; Working with plywood; Hardboard; Particleboard; Proper storage of lumber; Standard nails; Special nails; Wood screws.

*Lesson 4: ESTIMATING CARPENTRY COSTS

Units for ordering materials; Reducing waste material; Using waste material; Bill of materials; Preparing a cost estimate; Overhead; Guides for cost estimating; Tips on organizing a task.

*Lesson 5: PLANS, SPECIFICATIONS, AND CODES

Architectural drawings; Presentation drawings; How to read drawings; Dimensions on drawings; Symbols used in drawings; Equipment schedules; A full set of plans; Specifications for construction; Building codes and zoning laws; Building permits; Making your own drawings.

*Optional. You will not be tested on material in this lesson, but you may study it on your own time if you wish.

WATER SYSTEMS REPAIRMAN TRAINING PROGRAM

WELDING PRINCIPLES

INTRODUCTION

Welding requirements of a Water Systems Repairman in the Hydro Department are limited; however, there is need to have a working knowledge of the basic fundamentals of welding and to become familiar with the equipment used for gas and arc welding. The importance of welding is extended mainly to the minor repair of equipment in the field and to fabricate brackets, hangers, stands, frames, etc., as may be needed to facilitate completion of work in progress.

STUDY GUIDE

The lessons used are from the Technical Publishing Company. Five (5) lessons concern the basics of gas and arc welding. One (1) additional lesson covers oxygen cutting to provide a total of six (6) lessons for welding instruction. Read and study all the lessons and answer the programmed exercises and self-check quizzes after each lesson.

PERFORMANCE OBJECTIVE

To become proficient in welding requires a lot of practice and experience. The training afforded by this unit is more for familiarization and will be governed according to the availability of welding equipment at the assigned location. The completion of this unit will require about ten (10) hours of study time, plus up to ten (10) hours for familiarization with available equipment and one (1) hour for the performance test.

WELDING PRINCIPLES

Lesson 1: FUNDAMENTALS OF WELDING

The working of metals; Common maintenance welding processes; Production welding processes; Types of welded joints; Types of welds; Identifying weld parts; Joint design and fitup.

Lesson 2: GAS WELDING EQUIPMENT

The gas welding process; Equipment and accessories; Regulators control gas pressures; Welding hoses; The welding torch and tips; Lighting the torch; Filler rods; Personal protection; Preparing to weld; Adjusting the flame; Making a weld; Shutdown procedures.

Lesson 3: ARC WELDING EQUIPMENT

Comparing gas and arc welding; Welding with electricity; A-C and D-C welding currents; Constant current welding power sources; Constant voltage power supplies; Welding machine ratings; A-C welding machines; D-C welding machines; A-C/D-C welding machines; Welding cables; Electrode Holders; Electrodes for arc welding; Arc welding accessories.

Lesson 4: WELDING TECHNIQUES

Selecting a welding process; Welding positions; Overhead welding; Gas welding procedures; Arc welding procedures--Stick; (MIG welding preparations; MIG welding procedures; TIG welding procedures)*.

*Lesson 5: AVOIDING WELD FAULTS

Proper welding procedures; Common weld faults and problems; Shape and dimensional problems; Internal defects; The effects of heat; Controlling expansion and contraction; Identifying metals.

Lesson 6: OXYGEN CUTTING

The oxygen cutting process; The cutting torch; The cutting tips; Cutting Operation Safety; The Cutting Operation; The cutting bevels, Piercing holes; Cutting rivets; Special rivet cutting tips; Gouging and scarfing; Adding iron or steel as cutting catalysts; Summary of cutting procedures.

*Optional. You will not be tested on material in this lesson, but you may study it on your own time if you wish.