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SIN WATER MANAGEMENT PROJECT

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INSTALLATION OF NEW SERVICES

A TRAINING/JOB MANUAL

BY

GLENN LYNCH

INSTRUMENTATION TECHNICIAN

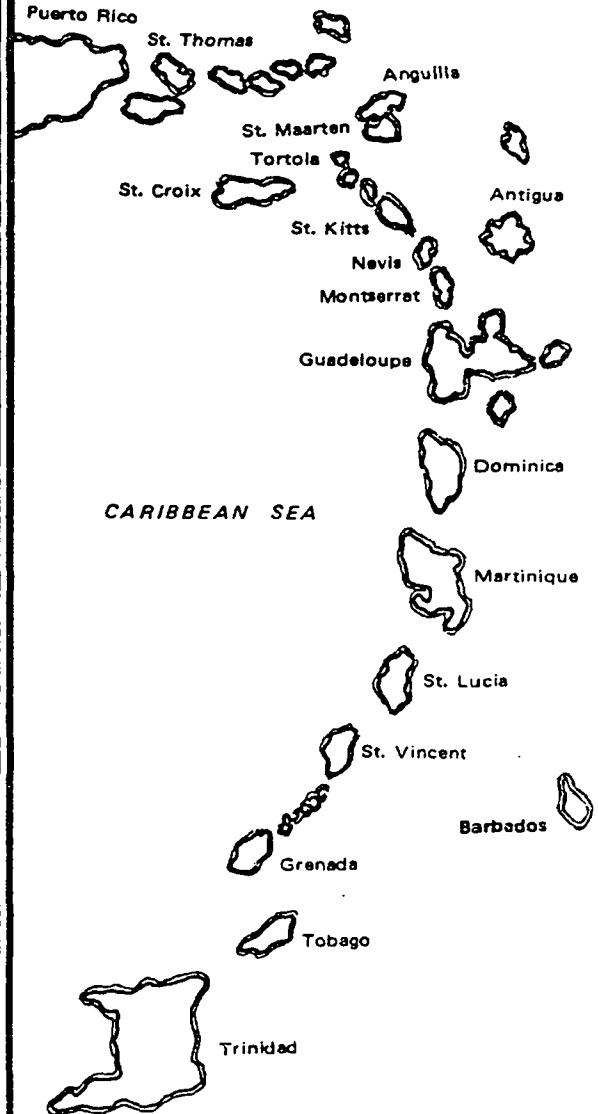
ST. VINCENT CENTRAL WATER AUTHORITY

A JOINT-VENTURE PROJECT OF THE GOVERNMENTS OF:

ANGUILLA, ANTIGUA, BRITISH VIRGIN ISLANDS, BARBADOS,
DOMINICA, GRENADA, MONTSERRAT, ST. KITTS/NEVIS,
ST. LUCIA, ST. VINCENT, CANADA, UNITED KINGDOM, HOLLAND

AND

THE PAN AMERICAN HEALTH ORGANIZATION



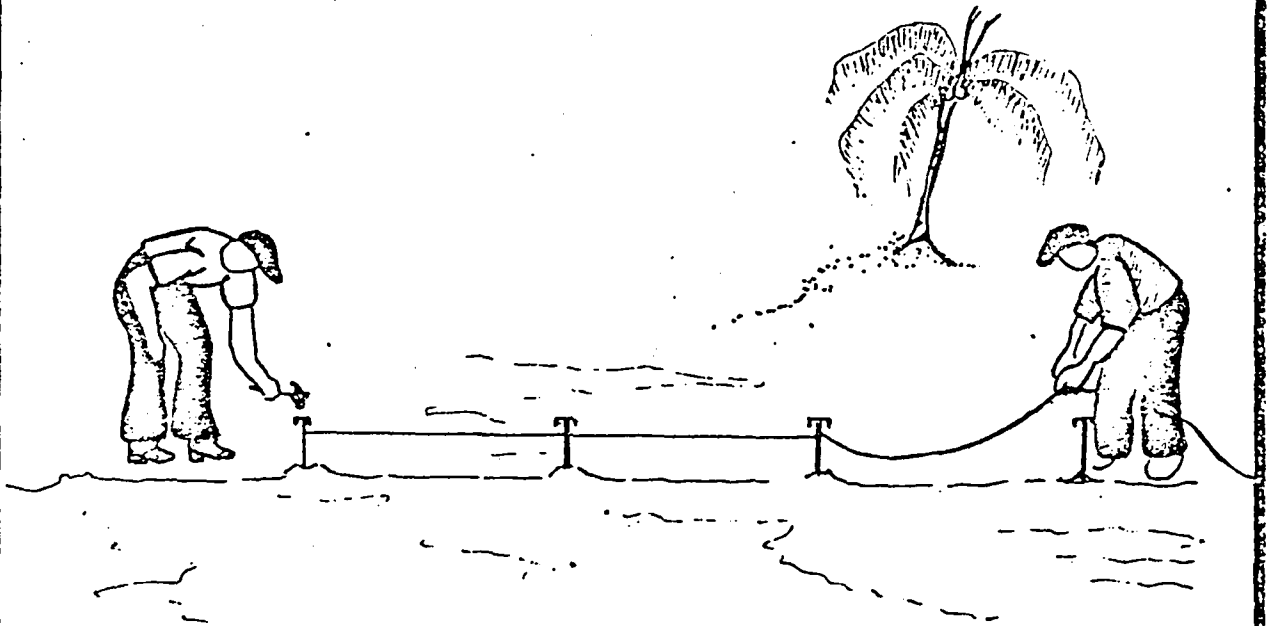
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OPERATION

2

LINING OUT PIPE TRACK



STEP (HOW HE DOES IT)

1. Review drawing at the job site.
2. For pipelines along the roadway, the pipe track will be in the gutter and road reserve.
3. For pipeline through fields and agricultural areas, stake the left or right side of the track which ever is more convenient.

KEY POINTS (IN PERFORMING THE STEP)

1. Check location, elevations, directions.
2. The edge of the road will mark the track. Measure 18" from edge of road on the road reserve, then measure out width of track.
- 3.1 Measure and drive pins according to location of proposed track.
- 3.2 Try to maintain as straight a line as possible.
- 3.3 Tie a strong line between the stakes.

CARIBBEAN BASIN WATER MANAGEMENT PROJECT

INSTALLATION OF NEW SERVICES

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PREFACE

PURPOSE OF TRAINING/JOB MANUAL

MAINTAINING EFFECTIVE AND EFFICIENT ON-THE-JOB PERFORMANCE SHOULD BE THE AIM OF NOT ONLY EVERY SUPERVISOR AND FOREMAN BUT ALSO OF EVERY WORKER. FREQUENTLY SOME IMPROVEMENT IN PERFORMANCE IS NOTED AFTER TRAINING. OVER TIME, HOWEVER, PERFORMANCE OFTEN DECREASES TO, OR BELOW, THE ORIGINAL LEVEL. ONE WAY TO SET STANDARDS OF PERFORMANCE AND TO SUGGEST METHODS OF ATTAINING THE DESIRED PERFORMANCE SO THAT IT IS CLEAR TO THE WORKER, SUPERVISOR, OR FOREMAN, AS WELL AS THE TRAINER, IS TO PROVIDE A TRAINING/JOB (T/J) MANUAL WHICH CLEARLY STATES THE DESIRED PERFORMANCE AND SUGGESTS PROCEDURES FOR THE WORKER TO ATTAIN THIS LEVEL OF PERFORMANCE. THE FOLLOWING T/J MANUAL DOES JUST THIS.

HOW TO USE THE TRAINING/JOB MANUAL

THE MATERIALS THAT FOLLOW CAN BE USED IN A NUMBER OF DELIVERY SYSTEMS, DEPENDING ON THE NATURE OF PERFORMANCE THAT NEEDS TO BE IMPROVED. IF THE TRAINEES ARE NEW TO THE SUBJECT MATTER, THE T/J MANUAL CAN BE USED IN A FORMAL TRAINING SYSTEM. THERE ARE SUFFICIENT DETAILED DESCRIPTIONS OF SUPPLIES AND MATERIALS AS WELL AS TRAINING ACTIVITIES TO GUIDE THE TRAINER.

A SUPERVISOR, FOREMAN, OR TRAINER REQUIRED TO DIAGNOSE PERFORMANCE DEFICIENCIES CAN USE THE OPERATION BREAKDOWN SHEET AS A REFERENCE TO IDENTIFY THE AREA OF PERFORMANCE DEFICIENCY. HE CAN THEN CONCENTRATE TRAINING ON THIS PARTICULAR AREA BY USING THE APPROPRIATE SECTIONS OF THE T/J MANUAL AS A GUIDE.

PREFACE (cont'd)

WORKERS WHO ARE EAGER TO MOVE AHEAD IN ACQUIRING NEW KNOWLEDGE AND SKILLS COULD USE THE T/J MANUAL, ALONG WITH ASSISTANCE FROM FELLOW WORKERS WHO ARE KNOWLEDGEABLE IN THE SUBJECT AREA, TO STUDY THE MATERIAL ON THEIR OWN.

THE T/J MANUAL IS DESIGNED TO BE USED ON THE JOB AS A READY REFERENCE AS NEEDED. IN MANY CASES, THE JOB-AIDS CAN BE LIFTED FROM THE MANUAL AND POSTED DIRECTLY AT THE SITE WHERE THE PERFORMANCE IS TO TAKE PLACE AS A CONSTANT REMINDER TO THE WORKER OF THE PROPER PROCEDURE FOR A TASK.

WHERE TO GET MORE INFORMATION

THIS T/J MANUAL IS ONE OF MANY BEING DEVELOPED BY THE CARIBBEAN BASIN WATER MANAGEMENT PROJECT TO IMPROVE THE PERFORMANCE OF PERSONNEL IN THE WATER UTILITIES OF THE EASTERN CARIBBEAN. MANUALS WILL BE DEVELOPED IN MANY ASPECTS OF WATER UTILITY OPERATION, MAINTENANCE, AND ADMINISTRATION. FOR MORE DETAILS ON MANUAL AVAILABILITY AND OTHER ASPECTS OF THIS PROJECT CONTACT:

ENGINEER NEIL F. CAREFOOT, MANAGER
CARIBBEAN BASIN WATER MANAGEMENT PROJECT
PAHO/WHO
BRIDGETOWN, BARBADOS

ACKNOWLEDGEMENT

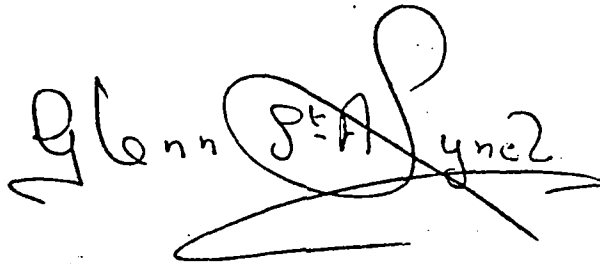
I wish to acknowledge with gratitude the help which has been given by the following people in compiling this manual.

Eng. Neil Carefoot and his Organisation (PAHO/WHO) for selecting me, and Messrs. D. Wittington, Q. Francis, and J. Barrow for their useful advice and criticisms.

The St. Vincent Central Water Authority for giving me time off from my duties to participate in the workshops. Sandra Mills, out typist, and my other fellow staff members for their help.

Last of all, to Donna Flanagan for her support and criticism my sincere thanks. To all the others whose names I have not mentioned, my thanks for your help in making the manual a reality.

Credit and thanks must also go to the Mueller Company for use of some of their illustrations.

A handwritten signature in cursive script that reads "Glenn Lynch". The signature is written in dark ink and includes a large, stylized flourish at the end.

Glenn Lynch
Instrumentation Technician
ST. VINCENT CENTRAL WATER AUTHORITY

INTRODUCTION

WHAT IS THIS MANUAL ALL ABOUT?

This manual explains the procedures for installing a new service for a customer. It further provides details of how each operation is performed, giving related knowledge necessary for efficient performance.

WHY DOES THE TRAINEE NEED TO LEARN THIS?

The utility plumber may be responsible for making service connections without having adequate guidance. Thus, to ensure quality work for the customer, the utility plumber should have a thorough mastery of the various operations and steps required to satisfactorily carry out the task of installing new service lines.

WHAT DOES THE TRAINEE NEED TO KNOW BEFORE BEGINNING?

The trainee needs ability and skill in handling tools and equipment as well as an ability and knowledge of grading, leveling, and communicating.

WHAT ARE THE OBJECTIVES?

The trainee will be able to:

1. Supervise excavation including determining and laying out track and measuring trench.
2. Cut and thread mains.
3. Determine and select appropriate fittings and assemble and tighten fittings.
4. Attach drilling and tapping machine to pipe.
Attach tool to boring bar.
Attach boring bar to body cylinder.
Drill and tap the main using a hand-operated method.
Attach and tighten corporation stop, release the screw plug, and remove the machine.
5. Cut galvanised pipe, prepare die, and cut threads.
6. Assemble threaded ends and tighten joints.
7. Attach and tighten valve in position.
8. Align, attach, and tighten pipe in position.
9. Align, attach, and tighten meter in position.
10. Test service pipe joints and identify and correct leaks.
11. Determine and select the appropriate soil and supervise compacting.
12. Clean and store tools and equipment.

WHAT SUPPLEMENTARY MATERIAL WILL HELP?

Operating Instructions for Tapping and Drilling, Form 8910, Revised

Mueller Co.
Main Office and Plant
500 West Eldorado Street
Decatur, Illinois 62525
U.S.A.

WHAT EQUIPMENT AND SUPPLIES ARE NEEDED?

ITEM	LESSONS															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Picks	x															
Shovels	x															
Hacksaw		x							x							x
Manual die		x							x							x
Plumber's tape			x							x	x	x				
Pipe wrenches		x	x	x						x	x	x	x	x		x
Drilling and tapping machine				x	x	x	x	x								x
Corporation stop								x								
Stand yoke vice									x	x						x
Reducing tee			x								x					
Union			x							x	x					
Nipple or short piece of pipe			x							x	x					
Valve											x					
Galvanised service pipe									x			x				
Meter														x		
Tail pieces with couplings														x		
Coupling washer														x		
Wrench														x		x
Sockets, bends										x				x		
Galvanised main pipe		x														
Measuring tape		x														
Pencil or marker		x														
Threaded galvanised main pipe			x													
Line and stakes	x															

WHAT EQUIPMENT AND SUPPLIES ARE NEEDED (cont'd)

ITEM	LESSONS															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Steel 6" to 12" main pipe				x				x								
Wire brush				x								x				x
Rammer																x
Soil material																x
Light oil		x							x							x
Broom																
Complete water and service connection															x	x

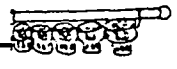




These lessons have been written to be useful in an on-site training situation. However, they may be adapted for classroom work if necessary. If used in a classroom, the trainer must supply sample pieces of equipment for the trainees to practice with.

ME, AND FITTINGS

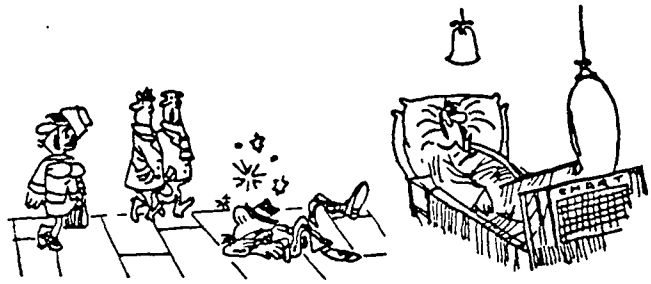
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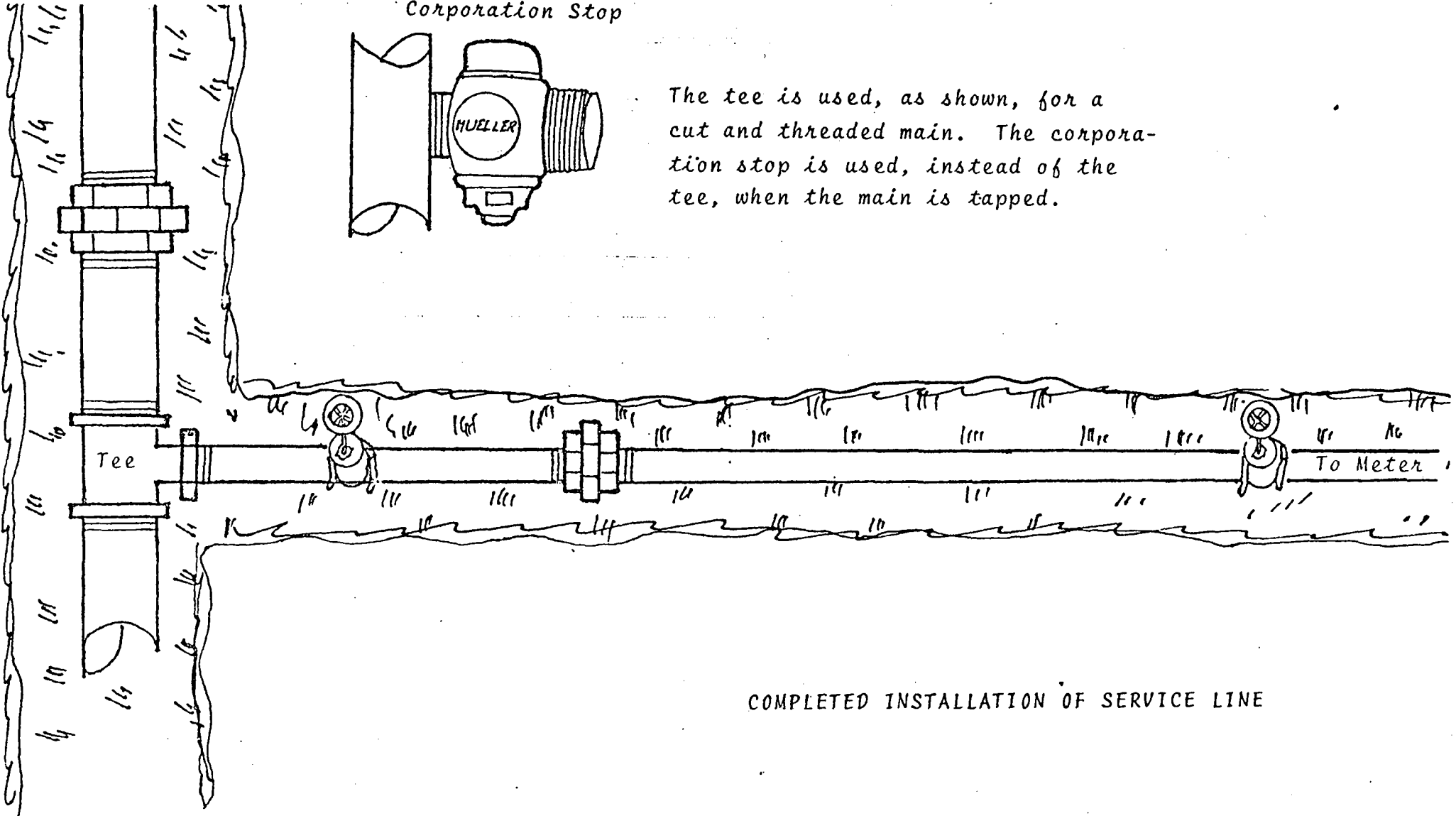
nipple, bands, union



DETERMINE SAFETY REQUIREMENTS

- Signs
- Clean up
- Replacement (sidewalk or street)





Corporation Stop

The tee is used, as shown, for a cut and threaded main. The corporation stop is used, instead of the tee, when the main is tapped.

COMPLETED INSTALLATION OF SERVICE LINE

LESSON 1



SUPERVISING EXCAVATION

ESTIMATED TIME

45 minutes

PREREQUISITES

Basic knowledge of gradients
and levels

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
supervise excavation including determining and laying out track and measuring trench.
- Under the following conditions:
given appropriate situation and equipment.
- To this standard:
excavation should be neat, clean, and 100% accurate.

TRAINING RESOURCES

Information Sheets L1:IS:01 through L1:IS:03.

SUPPLIES AND EQUIPMENT

Tools for excavation of trench, viz., picks, shovels,
and line and stakes.NOTELabourers to actually excavate the trench are required
for this lesson.

TRAINING ACTIVITIES

L1

TRAINER ACTIVITY	TRAINEE ACTIVITY
1. Using Operation Breakdown sheet L1:IS:01, discuss the sequence of steps in supervising the excavation.	1. Read and discuss with trainer.
2. Show and explain how to check area; customer premises and appropriate main.	2. Observe and explain as requested by trainer.
3. Demonstrate and explain how to mark trench and area around main for excavation.	3. Observe proper method and demonstrate how to mark trench and area around main for excavation.
4. Demonstrate and explain how to check trench bottom.	4. Observe, demonstrate, and explain how to check trench bottom as shown by trainer.
5. Demonstrate and explain how to check trench width.	5. Observe, demonstrate, and explain how to check trench width as shown by trainer.
6. Demonstrate and explain how to check excavation.	6. Observe excavation and explain points to look for in good excavation.

OPERATION BREAKDOWN SHEET

L1:IS:01

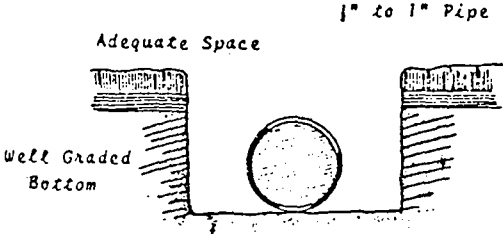
POSITION Water Utility Plumber TASK Installing new service

OPERATION Supervising Excavation

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Determine what equipment will be necessary and make sure it is <u>all</u> brought to the site.</p> <p>2. Investigate area.</p> <p>3. Mark out excavation.</p>	<p>1. See check list, page 6.</p> <p>2.1 Check utility map to find the location of mains, their types, sizes, and depths.</p> <p>2.2 Check with other local utilities to determine if there are other lines in the area.</p> <p>2.3 Check customer application to determine location of new service. See SAMPLE APPLICATION FORM, L1:IS:02.</p> <p>3.1 Know the type of soil and likely problems in excavation. (Check with soil lab if necessary)</p> <p>3.2 Use pick to mark out excavation.</p> <p>3.3 Be sure to allow for enough working space. (Approximately three feet around main)</p>

(cont'd next page)

OPERATION BREAKDOWN SHEET
(continued)

STEPS	KEY POINTS
<p>4. Inspect trench.</p> <div style="text-align: center;">  <p style="text-align: center;">CROSS SECTION OF TRENCH & PIPE</p> </div> <p>5. Inspect excavation around main.</p> <p>6. Determine diameter of existing main to decide on type of connection required.</p>	<p>4.1 Make sure trench bottom is well graded and even so the barrel of the pipe will have soil support throughout its length. There should be no rocks in the bottom of the trench.</p> <p>4.2 Make sure trench is wide enough to permit proper installation of the pipe. Be sure there is enough room for assembling joints and proper backfilling.</p> <p>5. See that the space around the main is adequate for manipulation of tools.</p> <p>6. See <u>note</u> on L1:IS:03.</p>

ST. VINCENT CENTRAL WATER AUTHORITY
APPLICATION FOR WATER CONNECTION

NAME OF APPLICANT: _____ REQUEST NO.: _____

ADDRESS OR LOCATION: _____

SIGNATURE OF APPLICANT: _____

FOR OFFICIAL USE ONLY

NAME OF OWNER (ON TAX REGISTER): _____

ANNUAL RENTAL VALUE OF PROPERTY: _____

TAX OFFICER SIGNATURE: _____

TO BE COMPLETED BY C.W.A

CLASS OF SERVICE		TYPE OF SERVICE REQUIRED	
DOMESTIC	()	NEW	()
INDUSTRIAL	()	CONSTRUCTION	()
COMMERICAL	()	SPECIAL	()
PUBLIC	()	METER REQUIRED	()

SERVICES

DIAMETER OF CONNECTION:	URINALS:	
WATER CLOSETS:	GARDEN HOSE:	
SHOWER HEAD:	TAPS:	
WASH BASIN:	GARAGES:	NO. OF CARS:
KITCHEN SINK:	SWIMMING POOL:	GALLONS:

INSPECTED BY: _____ AREA SUPERVISOR: _____

APPROVED ON: _____ AMOUNT OF DEPOSIT: _____

DATE PAID: _____ RECEIPT NO: _____

DATE WORK COMPLETED: _____ CERTIFIED BY: _____

NOTE TO THE SUPERVISOR: PLEASE MAKE SKETCH OF INSTALLATION ON
THE BACK SHEET

ACTUAL COST OF WORK

- 1. MATERIALS: _____
- 2. LABOUR: _____
- 3. EXCAVATION: _____
- 4. UNPAVED ROAD: _____
- 5. PAVED ROAD: _____

TOTAL EC\$ _____

BALANCE (IF ANY)

PAID EC\$ _____

RECEIPT NO.: _____

CASHIER: _____

1. GEN. WATER RATE ($\frac{1}{2}\%$ ANNUAL RENTAL VALUE):

2. ADDITIONAL CHARGES:

W.C.: _____

GARDEN HOSE: _____

URINAL: _____

PRIVATE GARAGE (FOR EACH CAR): _____

STORAGE TANK (100-400 GALS): _____

(401-600 GALS): _____

TOTAL EC\$ _____

DATE: _____

TOTAL EC\$ _____

CWA 011-76



The type of connection to be made with the main is determined by the diameter of that main.

1. If the diameter of the main is 3" or smaller, the correct procedure is to cut and thread the main. In this case, follow Lessons 2, 3, and 9 through 16.
2. If the diameter of the main is 4" or larger, the correct procedure is to drill and tap the main. In this case, follow Lessons 4 through 16 (omitting Lessons 2 and 3).

However, you must be familiar with both procedures for use under the appropriate conditions.

LESSON 2



CUTTING AND THREADING MAIN

ESTIMATED TIME

45 minutes

PREREQUISITES

Lesson 1

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
cut and thread mains.
- Under the following condition:
given necessary equipment.
- To this standard:
ends to be cut squarely and threads to be class A (B.S.P.T.).

TRAINING RESOURCES

Information Sheet L2:IS:01.

SUPPLIES AND EQUIPMENT

Hacksaw, manual die, wrenches of appropriate sizes,
oil can with oil, galvanised main pipe, measuring tape,
and pencil.

TRAINING ACTIVITIES

L2

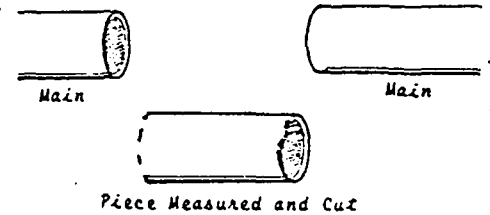
TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Using L2:IS:01 discuss with trainees the steps to be observed in cutting and threading mains.</p>	<p>1. Read and discuss.</p>
<p>2. Show and explain how to measure pipe and mark length.</p>	<p>2. Observe methods and measure pipe to length as shown by trainer.</p>
<p>3. Explain and demonstrate how to cut pipes. See illustration L2.IS.02.</p>	<p>3. Observe method and practice cutting pipe.</p>
<p>4. Explain and demonstrate how to set die.</p>	<p>4. Observe and practice how to set die. (Repeat until perfect.)</p>
<p>5. Explain and demonstrate how to attach die to pipe end.</p>	<p>5. Observe and practice how to attach die to pipe end.</p>
<p>6. Explain and demonstrate how to operate die.</p>	<p>6. Observe and operate die. (Repeat until perfect.)</p>
<p>7. Explain and demonstrate how to remove die.</p>	<p>7. Observe and remove die as shown by trainer.</p>
<p>8. Using L2:IS:01 review steps with trainees. Assign operation.</p>	<p>8. Repeat steps 2-7 under supervision of trainer.</p>

OPERATION BREAKDOWN SHEET

L2:IS:01

POSITION Water utility plumber TASK Installing new service

OPERATION Cutting and threading main

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Notify customers in area that water is to be closed off.</p> <p>2. Ensure that main valve is turned off.</p> <p>3. Measure and mark length to be cut from main.</p> <p>4. Cut main.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>5. Set die.</p>	<p>1. Workmen go to houses.</p> <p>2.1. Determine if valve is left hand or right hand.</p> <p>2.2. Close valve slowly.</p> <p>3.1. Brush off dirt from the main at the location to be cut.</p> <p>3.2. Make accurate measurement. (usually 8" to 15").</p> <p>3.3. Make marks clearly. Use pencil or hacksaw.</p> <p>3.4. Make 1/4" allowance for expansion and contraction.</p> <p>4.1. Use hacksaw or roller cutter to cut main ends squarely.</p> <p>4.2. If using hacksaw, be sure to make clean cuts so that pipe will not be torn when threading main.</p> <p>5. Pull out ratchet detent knob and insert cutter. Set for clockwise rotation.</p>

(cont'd next page)

LESSON 3



INSTALLING FITTINGS

ESTIMATED TIME

45 minutes

PREREQUISITES

Basic knowledge of use of tools
Lesson 2

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
*determine and select appropriate fittings;
assemble and tighten fittings.*
- Under the following condition:
given appropriate equipment.
- To this standard:
100% correctly so that there are no leaks.

TRAINING RESOURCES

Information Sheet L3:IS:01.

SUPPLIES AND EQUIPMENT

Threaded galvanised main pipe, plumber's tape, fittings
(union, reducing tee, short nipple), 18 or 24 inch pipe
wrenches.

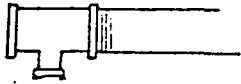
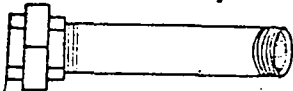
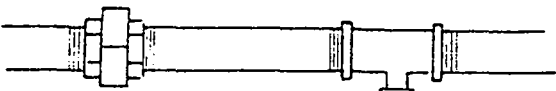
TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Using Operation Breakdown sheet L3:IS:01, discuss with the trainees the steps to be observed in installing fittings.</p>	<p>1. Read and discuss.</p>
<p>2. Explain and show how to check the condition of fittings.</p>	<p>2. Observe and demonstrate how to check fittings.</p>
<p>3. Explain and demonstrate the sealing of ends.</p>	<p>3. Observe and explain the reasons for sealing ends with seal tape. Practice sealing.</p>
<p>4. Explain and demonstrate how to attach fittings.</p>	<p>4. Observe and practice how to attach fittings.</p>
<p>5. Explain and demonstrate how to tighten fittings in position.</p>	<p>5. Observe and practice how to tighten fittings.</p>

OPERATION BREAKDOWN SHEET

L3:IS:01

POSITION Water utility plumber TASK Installing new service

OPERATION Installing fittings

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Check condition of fittings.</p> <p>2. Seal threaded ends on main.</p> <p>3. Attach fittings.</p> <div style="text-align: center; margin: 10px 0;">  <p>TEE ATTACHED TO MAIN</p> </div> <div style="text-align: center; margin: 10px 0;">  <p>UNION ATTACHED TO SHORT OR NIPPLE</p> </div> <div style="text-align: center; margin: 10px 0;">  <p>FITTINGS ATTACHED TO MAIN</p> </div> <p>4. Tighten fittings in position.</p>	<p>1.1 Be sure threads are not damaged.</p> <p>1.2 Be sure joints are not burst.</p> <p>2.1 Roll on plumber seal tape counter-clockwise.</p> <p>2.2 Be sure tape is neither too loose nor too tight.</p> <p>3. Ensure proper alignment to avoid cross threading or breakage of threads.</p> <p>4.1 Adjust wrench to fitting's size.</p> <p>4.2 Back up with back wrench on main while fittings are being securely tightened in position.</p>

LESSON 4

ATTACHING DRILLING/TAPPING
MACHINE TO MAIN

ESTIMATED TIME

15 minutes

PREREQUISITES

Basic knowledge of tools and
equipment

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
attach drilling and tapping machine to main.
- Under the following Condition:
*given drilling/tapping machine and main
in excavated trench.*
- To this standard:
100% accurately within 15 minutes.

TRAINING RESOURCES

Information Sheets L4:IS:01 through L4:IS:03.

SUPPLIES AND EQUIPMENT

Wire brush, Mueller B-100 drilling and tapping machine,
steel main, and pipe wrench.

TRAINING ACTIVITIES

L4

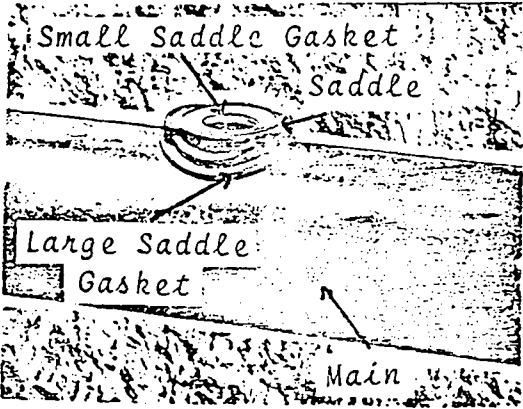
TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Read and discuss all the steps necessary to attach drill and tap machine to pipe. See L4:IS:01.</p>	<p>1. Read and discuss with trainer.</p>
<p>2. Explain why and demonstrate how to clean pipe for tapping.</p>	<p>2. Explain the reasons for cleaning the pipe. Clean pipe.</p>
<p>3. Explain and demonstrate how to prepare saddle.</p>	<p>3. Observe and prepare saddle as shown by trainer.</p>
<p>4. Explain and demonstrate how to position saddle.</p>	<p>4. Observe and position saddle as shown by trainer.</p>
<p>5. Explain why and demonstrate how to tighten machine.</p>	<p>5. Observe and explain the reasons for tightening the machine. Tighten the machine as shown by trainer.</p>
<p>6. Ask trainees to attach drilling/tapping machine to main.</p>	<p>6. Attach drilling/tapping machine to main under supervision of trainer.</p>

OPERATION BREAKDOWN SHEET

L4:IS:01

POSITION Water utility plumber TASK Installing new service
 OPERATION Attaching drilling/tapping machine to main

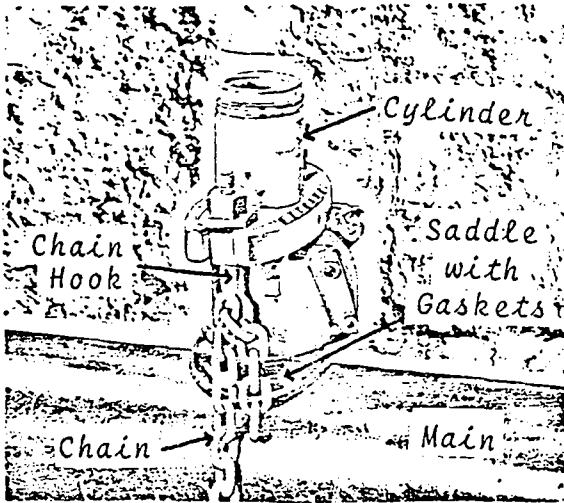
STEPS (Significant actions which advance the operation towards completion)	KEY POINTS (Keys to doing the steps efficiently and accurately)
1. Clean main.	1.1 Use wire brush or cleaning chisel and thoroughly clean the main at the location for the tap. 1.2 Include an area greater than the larger saddle gasket.
2. Prepare saddle.	2.1 Place saddle on the large saddle gasket. 2.2 Place small saddle gasket in the recess of the top of the saddle.
3. Position saddle.	3.1 Place prepared saddle on top of main even with the location for the tap with the raised small saddle gasket.



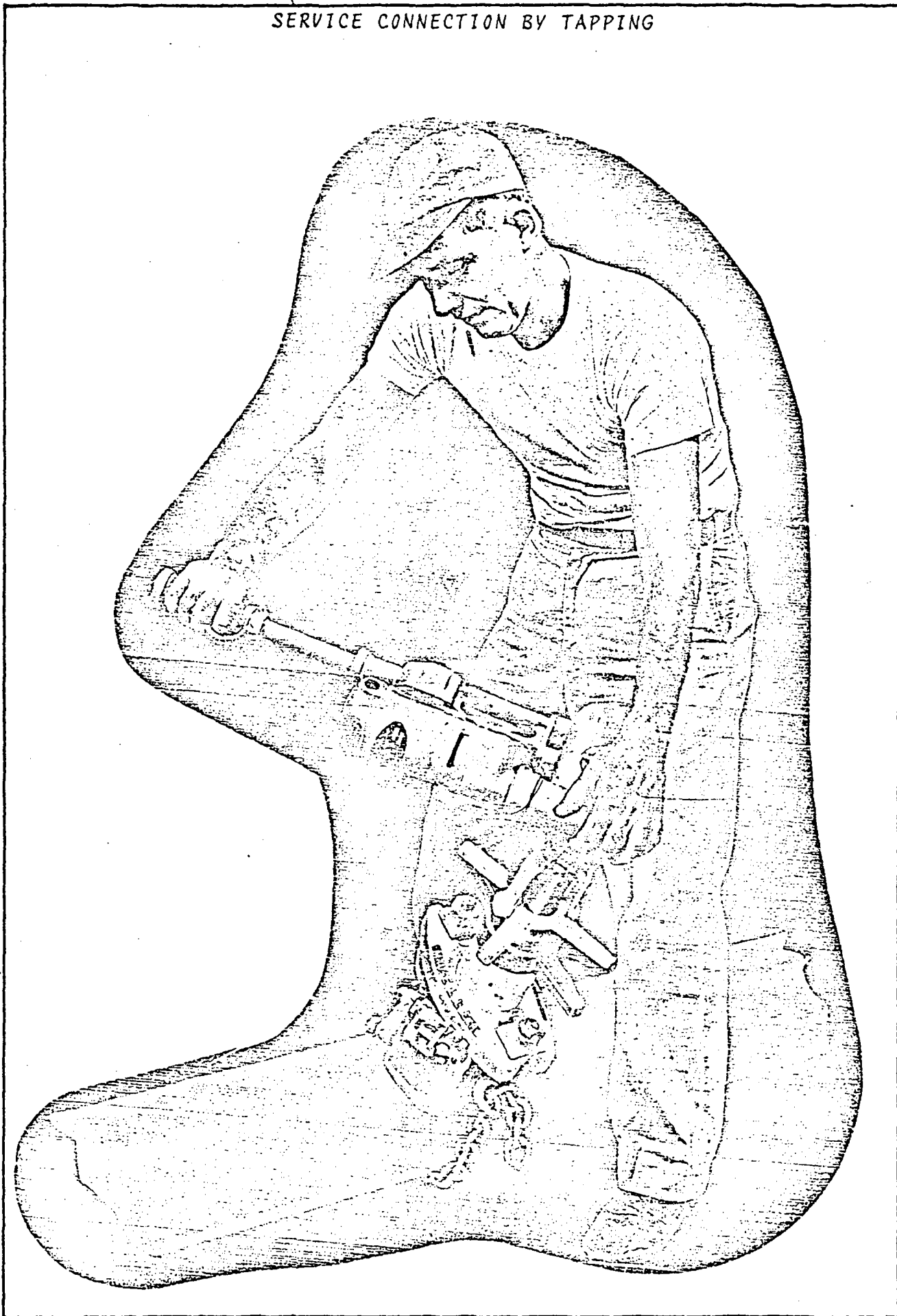
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OPERATION BREAKDOWN SHEET
(continued)

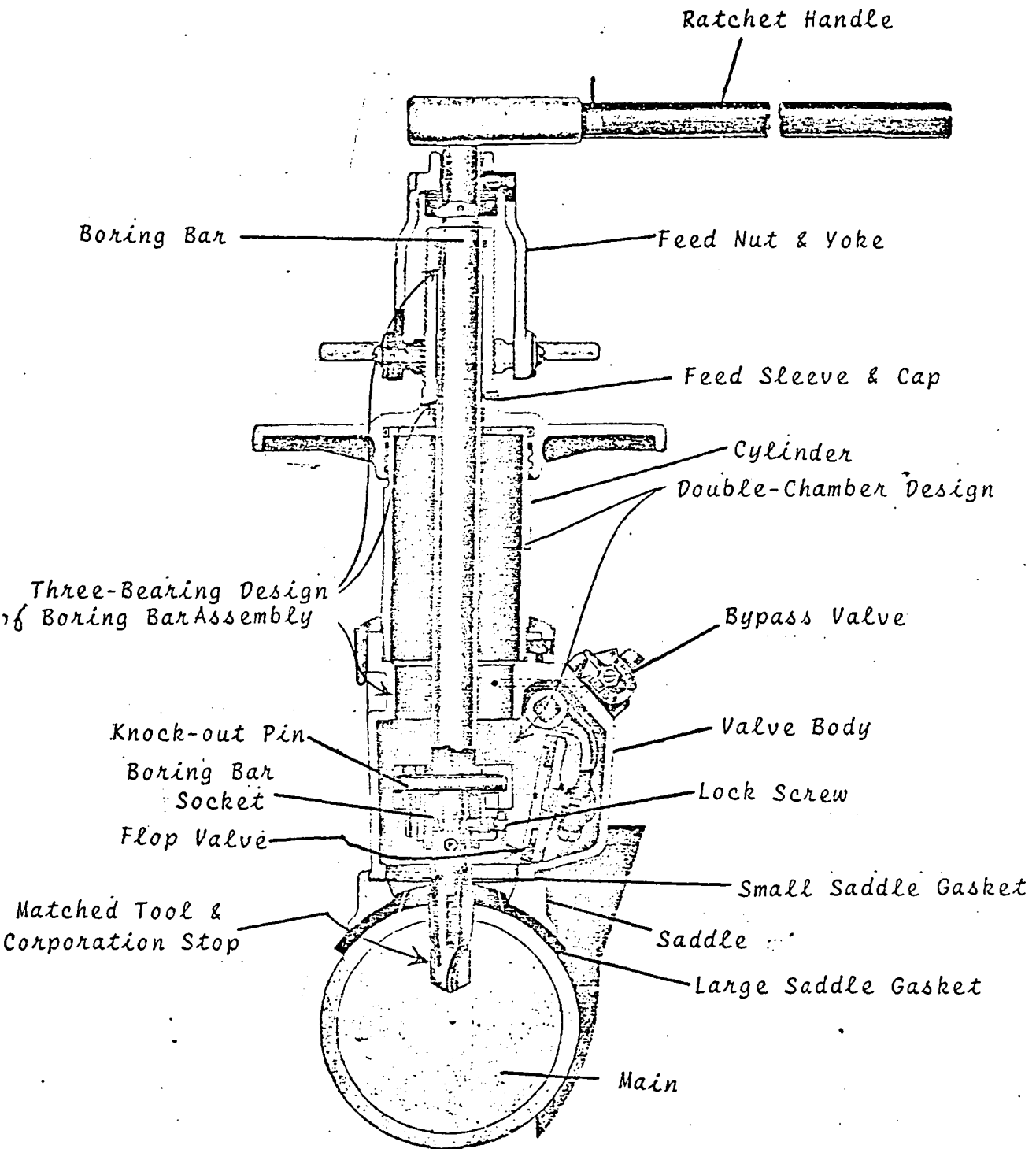
L4:IS:01 (cont.)

STEPS	KEY POINTS
 <p>4. Position body cylinder and tighten.</p>	<p>3.2 Be sure projection is up away from the main. (If the machine is to be operated in any position other than the vertical, flop valve lever handle will be on the lower side of the machine.)</p> <p>3.3 Unscrew the feed sleeve and cap containing the boring bar assembly from the cylinder of the machine (2½ turns).</p> <p><u>NOTE:</u> This can be done more conveniently if the boring bar is in the retracted position.</p> <p>4.1 Place the body cylinder of the machine on top of small saddle gasket.</p> <p>4.2 Position the machine on top so that the bypass valve is on the upper side.</p> <p>4.3 Attach chain to one chain hook and bring under the main, then hook to the nearest link. Use wrench furnished with machine.</p> <p>4.4 Tighten chain hook evenly.</p> <p>4.5 Slide machine on main to desired position or angle.</p>

SERVICE CONNECTION BY TAPPING



TAPPING MACHINE



LESSON 5



ATTACHING TOOL TO BORING BAR

ESTIMATED TIME

15 minutes

PREREQUISITES

Lesson 4

PERFORMANCE OBJECTIVES:

- ① The trainee will be able to:
attach tool to boring bar.
- ② Under the following condition:
*given a drilling/tapping machine and man
in excavated trench.*
- ③ To this standard:
100% accurately and efficiently within 15 minutes.

TRAINING RESOURCES

Information Sheet L5:IS:01.

SUPPLIES AND EQUIPMENT

Tapping machine with attachments, cutting grease.

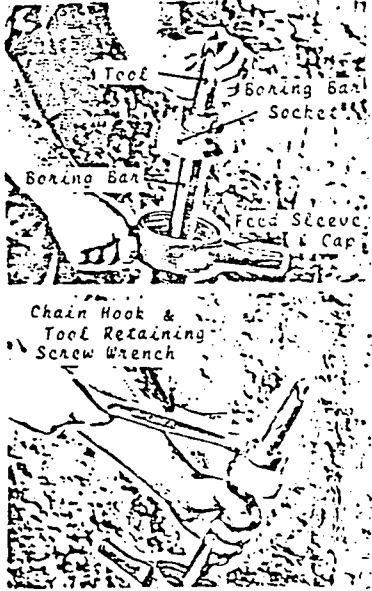
TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Read and discuss all the steps necessary to correctly attach the tool to the boring bar. See L5:IS:01.</p>	<p>1. Read and discuss with trainer.</p>
<p>2. Explain and demonstrate how to position knock-out pin and insert drill and tap tool into boring bar socket.</p>	<p>2. Observe and practice.</p>
<p>3. Explain and demonstrate how to position boring bar to its rearmost position in feed sleeve and cap.</p>	<p>3. Observe and practice.</p>
<p>4. Explain and demonstrate how to grease drilling and tapping threads.</p>	<p>4. Observe and practice.</p>
<p>5. Ask trainees to attach the tool to the boring bar.</p>	<p>5. Attach the tool to the boring bar under the supervision of the trainer.</p>

OPERATION BREAKDOWN SHEET

L5:IS:01

POSITION Water utility plumber TASK Installing new service

OPERATION Attaching tool to boring bar

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Insert drill and tap to boring bar socket.</p>  <p>2. Position boring bar.</p> <p>3. Grease drilling and tapping threads.</p>	<p>1.1 Slide knock-out pin in boring bar socket to its outward position.</p> <p>1.2 Insert shank end of combined drill and tap into boring bar.</p> <p>1.3 Align driving pins on tool with slots in end of boring bar.</p> <p>1.4 Strike tool on drill end with a block of wood to be sure it fits tightly in socket.</p> <p>1.5 Tighten tool retaining screw in boring bar, using small socket end of chain hook nut and tool retaining screw wrench.</p> <p>2. Retract boring bar to its rearmost position in sleeve and cap.</p> <p>3. Coat drill and tap threads with cutting grease.</p>

LESSON 6

ATTACHING THE DRILLING AND
TAPPING MACHINE

ESTIMATED TIME

15 minutes

PREREQUISITES

Basic knowledge of using
tools/equipment
Lesson 5

PERFORMANCE OBJECTIVE:

- ① The trainee will be able to:
attach boring bar to body cylinder.
- ② Under the following condition:
*given an assembled boring bar and body
cylinder attached to main.*
- ③ To this standard:
attaching 100% accurately and efficiently.

TRAINING RESOURCES

Information Sheets L6:IS:01 and L6:IS:02.

SUPPLIES AND EQUIPMENT

Complete tapping machine.

TRAINING ACTIVITIES

L6

TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Explain and demonstrate how to position flop valve.</p>	<p>1. Observe and practice.</p>
<p>2. Explain and demonstrate how to position boring bar feed sleeve and tool assembly.</p>	<p>2. Observe and practice.</p>
<p>3. Explain and demonstrate how to position boring bar and tool to pipe.</p>	<p>3. Observe and practice.</p>
<p>4. Explain and demonstrate how to turn bypass valve to bypass position.</p>	<p>4. Observe and practice.</p>
<p>5. Ask trainees to perform entire operation.</p>	<p>5. Under the trainer's supervision, attach the drilling and tapping machine to the main.</p>

OPERATION BREAKDOWN SHEET

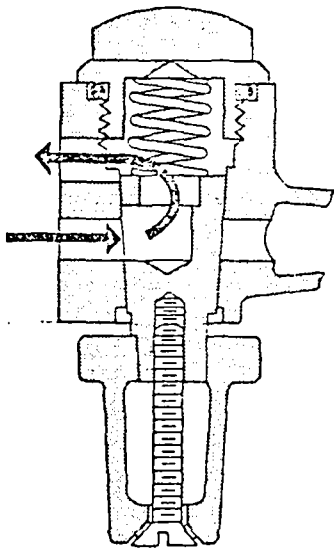
L6:IS:01

POSITION Water utility plumber TASK Installing new service

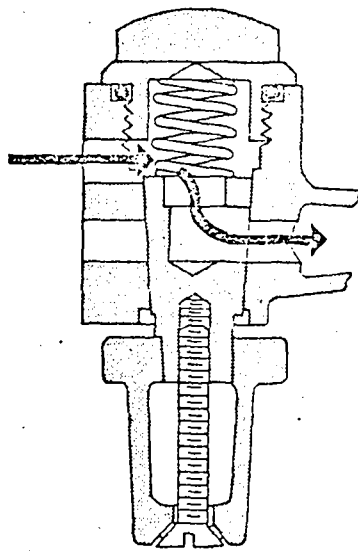
OPERATION Attaching the drilling/tapping machine

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Position flop valve.</p> <p>2. Attach boring bar, feed sleeve, and tool assembly.</p> <p>3. Position boring bar and tool to main.</p> <p>4. Turn bypass valve to bypass position.</p>	<p>1. Open flop valve to its wide open position by pushing level handle down.</p> <p>2. Attach to cylinder of machine and tighten cap securely (2½ turns).</p> <p>3.1 Push boring bar down by hand until tool contacts main.</p> <p>3.2 Adjust feed nut and yoke on feed sleeve and cap so that yoke engages thrust collar on boring bar.</p> <p><u>NOTE:</u> Spring-loaded detents in yoke will keep yoke from falling away from the bar.</p> <p>4.1 Arrow on bypass valve handle indicates valve position.</p> <p>4.2 The socket in the end of the chain hook nut and tool retaining screw wrench may also be used to turn the handle on the bypass valve.</p>

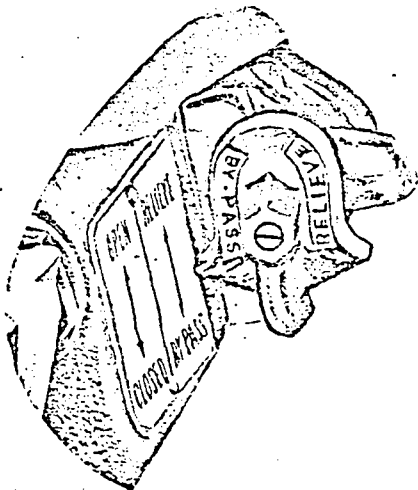
BYPASS VALVE



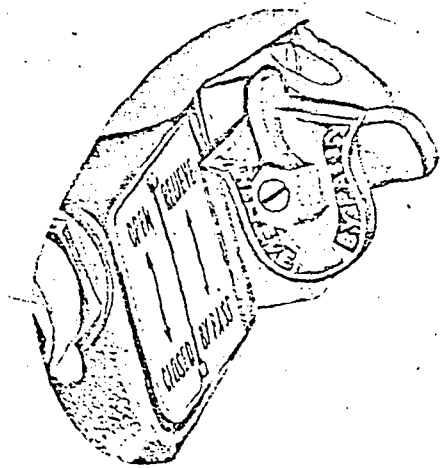
Top View



Top View

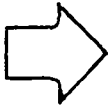


Bypass Position



Relieving Position

LESSON 7

DRILLING AND TAPPING THE MAIN:
HAND-OPERATED METHOD

ESTIMATED TIME

15 minutes

PREREQUISITES

Basic knowledge of using
tools/equipment
Lesson 6

PERFORMANCE OBJECTIVES:

- ⊙ The trainee will be able to:
*drill and tap the main using a
hand-operated method.*
- ⊙ Under the following condition:
*given drilling and tapping machine attached
to pipe with boring bar assembly.*
- ⊙ To this standard:
100% accurately and with class A threads.

TRAINING RESOURCES

Information Sheet L7:IS:01.

SUPPLIES AND EQUIPMENT

Complete tapping machine.

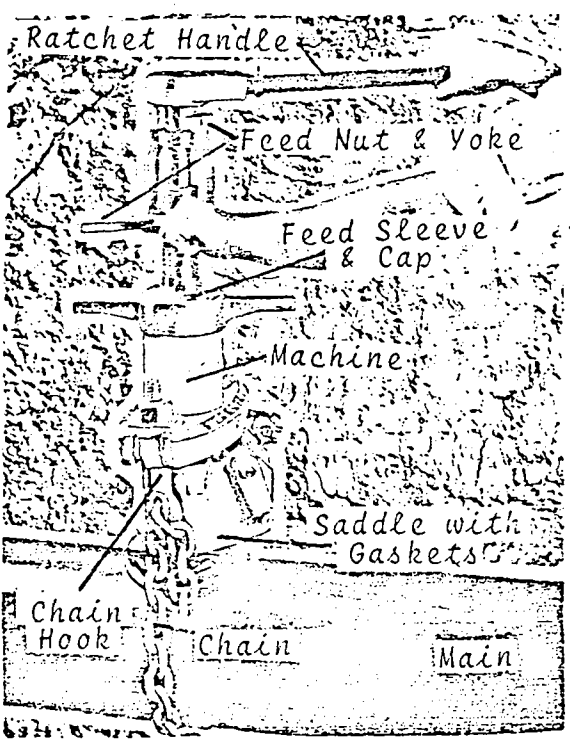
TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Read and discuss all the steps in Operation Breakdown Sheet L7:IS:01.</p>	<p>1. Read and discuss with trainer.</p>
<p>2. Explain and demonstrate how to position ratchet handle.</p>	<p>2. Observe and practice how to position ratchet handle.</p>
<p>3. Explain and demonstrate how to drill mains.</p>	<p>3. Observe and practice drilling mains.</p>
<p>4. Explain and demonstrate how to rotate ratchet handle.</p>	<p>4. Observe and explain the reasons for rotating ratchet handle as shown by trainer, and practice rotating handle.</p>
<p>5. Explain and demonstrate how to remove tool from main.</p>	<p>5. Observe and practice.</p>
<p>6. Ask trainees to perform entire operation.</p>	<p>6. Drill and tap main under the supervision of trainer.</p>

OPERATION BREAKDOWN SHEET

L7:IS:01

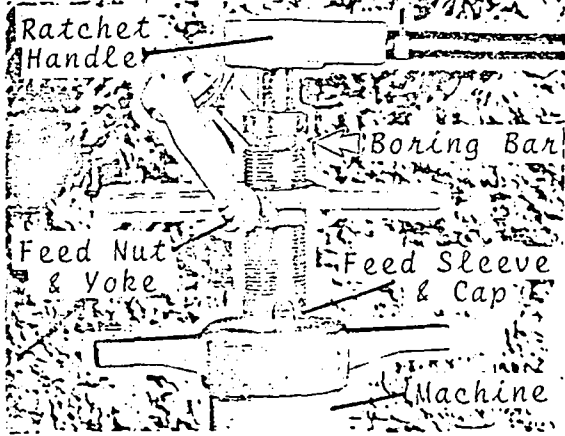
POSITION Water utility plumber TASK Installing new service

OPERATION Drilling and tapping main: hand-operated method

<p>STEPS (Significant actions which advance the operation towards completion)</p>	<p>KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Position ratchet handle.</p>  <p>2. Drill main.</p>	<p>1. Place ratchet handle on boring bar and set for clockwise rotation by pulling outward on ratchet detent knob, and adjusting it for clockwise rotation.</p> <p>2.1 Operate ratchet handle clockwise, turning the feed nut and yoke clockwise a little at a time.</p> <p>2.2 Use a light, even feed at the start. Pull the ratchet handle in an arc parallel to the axis of the main.</p> <p>(cont'd next page)</p>

OPERATION BREAKDOWN SHEET
(continued)

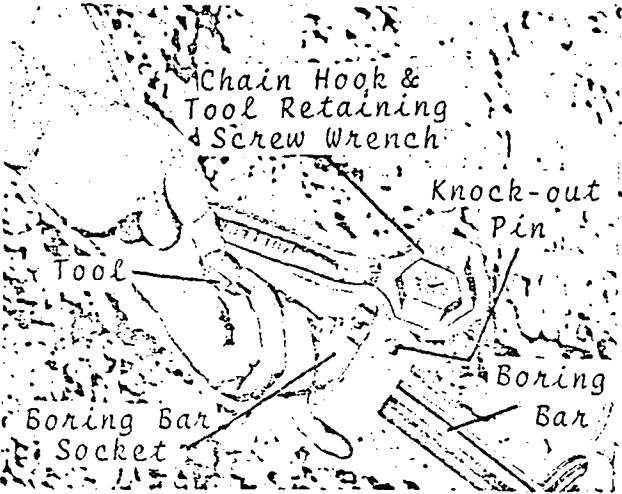
L7:IS:01 (cont'd)

STEPS	KEY POINTS
	<p>2.3 Turn the feed nut as the boring bar is being turned.</p> <p>2.4 Continue drilling operation until the boring bar feeds easily and rotates easily, indicating that the drill portion of the tool is through the main.</p>
<p>3. Rotate ratchet handle until drilling and tapping are complete.</p>	<p>3.1 Rotate ratchet handle clockwise and rotate feed nut clockwise to engage tapped part of tool into main.</p>
	<p>3.2 Continue to rotate feed nut until tap is securely started into the main and feed yoke is no longer needed to take the thrust of the boring bar.</p> <p>3.3 At this point, remove the feed yoke from contact with the thrust collar as the boring bar moves downward, and allow the tool to feed itself.</p> <p>3.4 Continue to rotate ratchet handle until tapping line on boring bar is flush with the top of feed sleeve part of the cap.</p>
<p>4. Remove tool from main.</p>	<p>4.1 Adjust ratchet handle for counter-clockwise rotation. Rotate the ratchet handle counter-clockwise carefully and back out the tool.</p> <p>4.2 Do not force up when removing it, as this may cause breakage of the tap teeth.</p>

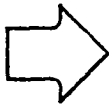
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OPERATION BREAKDOWN SHEET
(continued)

L7:IS:01 (cont'd)

STEPS	KEY POINTS
	<p>4.3 Pressure inside the machine will tend to raise the boring bar. Hold down on the upper end of the boring bar or use the feed yoke to control the upward motion of the boring bar. This will prevent stripped threads in the main and shock and damage to the machine.</p> <p>4.4 With boring bar in its uppermost position, close flop valve by loosening handle screw (if lever handle was locked open) and raising upward on lever handle.</p> <p>4.5 With flop valve closed, turn bypass valve to relieve position. This relieves the pressure above the flop valve and allows the line pressure to keep flop valve closed. The handle screw may be useful here.</p> <p>4.6 Retain boring bar in its uppermost position while feed sleeve and cap and boring bar assembly are removed from cylinder of machine.</p> <p>4.7 Remove combined drill and tap from boring bar by first loosening the tool retaining screw with the socket end of the chain hook nut and tool retaining screw wrench, but do not remove screw.</p> <p>4.8 Strike the head of the knock-out pin a light blow, which will loosen the combined drill and tap.</p>

LESSON 8



INSTALLING CORPORATION STOP

ESTIMATED TIME

2 hours

PREREQUISITES

Basic knowledge of using
tools/equipment
Lesson 7

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
*attach and tighten the corporation stop,
release the screw plug, and remove the machine.*
- Under the following condition:
using tapping machine given a corporation stop.
- To this standard:
*attach and assemble corporation stop to
boring bar 100% correctly.*

TRAINING RESOURCES

Information Sheets L8:IS:01 and L8:IS:02.

SUPPLIES AND EQUIPMENT

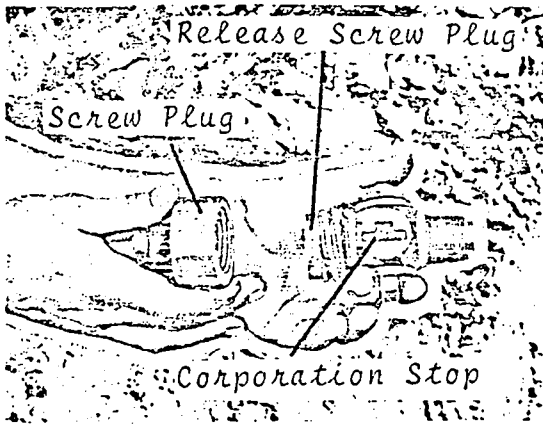
Six to twelve inch main pipe, corporation stop,
complete drilling and tapping machine.

TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Read and discuss all the steps in the Operation Breakdown sheet L8:IS:01.</p>	<p>1. Read and discuss.</p>
<p>2. Explain and demonstrate how to attach corporation stop to boring bar.</p>	<p>2. Observe and practice.</p>
<p>3. Explain and demonstrate how to insert corporation stop.</p>	<p>3. Observe and practice.</p>
<p>4. Explain and demonstrate how to release corporation stop.</p>	<p>4. Observe and practice.</p>
<p>5. Explain and demonstrate how to remove machine.</p>	<p>5. Observe and practice.</p>
<p>6. Ask trainees to perform all steps.</p>	<p>6. Under supervision of trainer, install the corporation stop.</p>

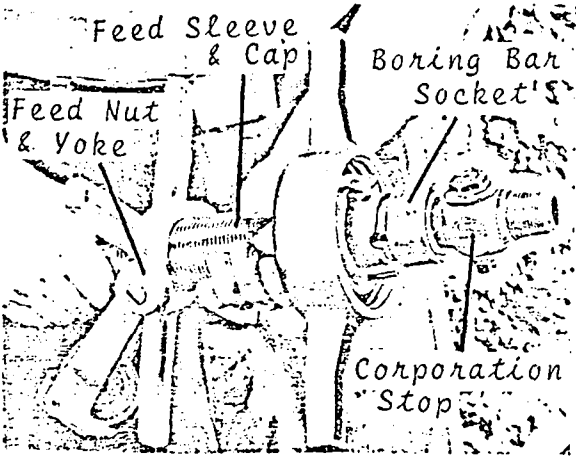
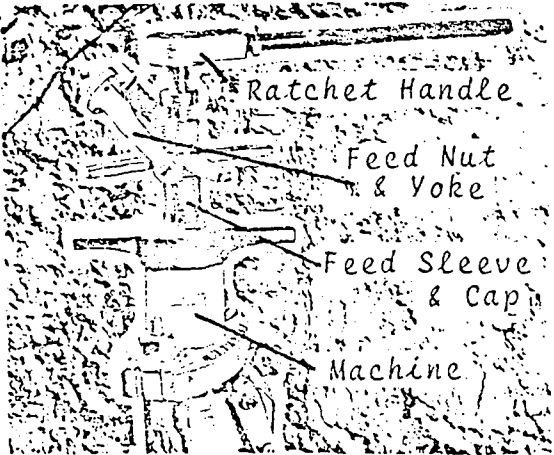
OPERATION BREAKDOWN SHEET

L8:1S:01

POSITION Water utility plumber TASK Installing new service
 OPERATION Installing corporation stop

STEPS (Significant actions which advance the operation towards completion)	KEY POINTS (Keys to doing the steps efficiently and accurately)
<p>1. Attach corporation stop to boring bar.</p> 	<ol style="list-style-type: none"> 1.1 Check to be sure that the stop or tee to be inserted is fully closed. 1.2 Screw together the proper screw plug and the corporation stop to be inserted. Lubricate these threads and check yoke to be sure these screw together freely without binding. Also lubricate and check the threads between the two parts of the screw plug. 1.3 Slide knock-out pin in boring bar socket to its outward position using pin extending through bottom of boring bar bearing as a handle. 1.4 Insert shank end of screw plug into boring bar socket, aligning drilling pins on tool with slots in end of boring bar. Firmly push screw plug and corporation stop assembly to its rearmost position. 1.5 Tighten tool retaining screw in boring bar using small socket end of chain hook nut and tool retaining screw wrench. 1.6 Push the cap down on the boring bar as far as possible. 1.7 Coat the inlet threads of the corporation stop with heavy grease. <p style="text-align: right;">(cont'd next page)</p>

OPERATION BREAKDOWN SHEET
(continued)

STEPS	KEY POINTS
 <p>2. Insert corporation stop.</p>	<p>1.8 Replace feed sleeve and cap and boring bar assembly on cylinder of machine and tighten cap securely so that a pressure-tight joint is formed.</p> <p>2.1 Hold boring bar assembly in uppermost position and turn bypass valve to bypass position.</p> <p>2.2 Attach ratchet handle and set for clockwise rotation.</p> <p>2.3 Open flop valve by loosening handle screw, if it was tightened, and pushing lever handle all the way down. Handle screw may be engaged in socket on side of body to retain flop valve in open position during this operation.</p> <p>2.4 Push boring bar down until inlet threads of corporation stop contact the main. (For pressures greater than 90 PSI use a power clevis to force the boring bar down.)</p> <p>2.5 Adjust feed nut and yoke, and slip yoke over thrust collar on boring bar.</p> <p>2.6 Rotate boring bar clockwise while feed nut is also carefully rotated clockwise. When threads on corporation stop have engaged the tapped hole in the main, stop rotation of the feed nut and remove yoke from contact with the thrust collar while screwing the fitting into its seat. (When stop is inserted in a thin-walled pipe or asbestos cement pipe, or under high pressure, use the feed yoke to</p>
	

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OPERATION BREAKDOWN SHEET
(continued)

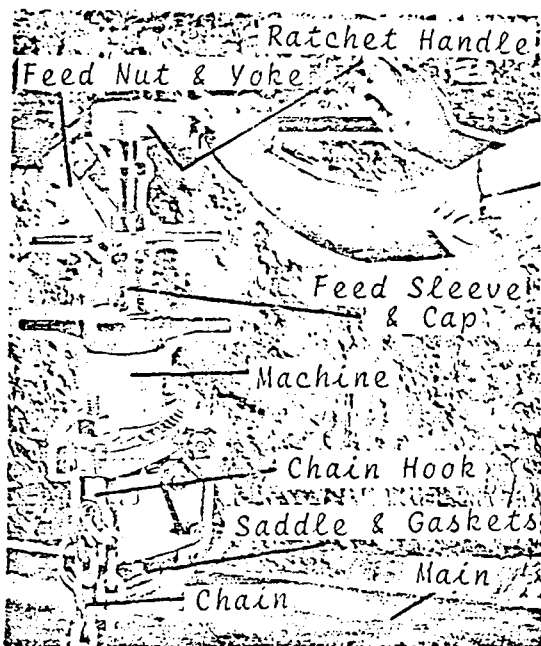
STEPS

KEY POINTS

follow the collar all the way way down.)

- 2.7 Screw the stop into the tapped hole until it feels solid. DO NOT ATTEMPT TO FORCE IT TO ITS PERMANENT TIGHTNESS WITH THE MACHINE.

3. Release the screw plug.

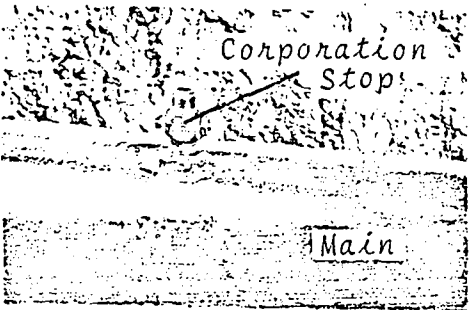


- 3.1 Pull out on ratchet detent knob and adjust it for counter-clockwise rotation.
- 3.2 Turn the ratchet handle counter-clockwise to take out the play, and strike the end of the handle a blow counter-clockwise with the palm of the other hand. If using an E-2 release screw plug, this will release the threaded connection between the screw plug and the stop and also release the threaded connection between the two parts of the screw plug.
- 3.3 Rotate ratchet handle counter-clockwise until screw plug is completely free.
- 3.4 Turn the bypass valve (See L8:IS:02) to release position, which will release pressure from the machine and indicate the tightness of the connection between the stop and the pipe. If there is full pressure flow from the bypass valve, the screw plug has not been released. Therefore screw the stop in again a little tighter than before, and try again to release the screw plug.

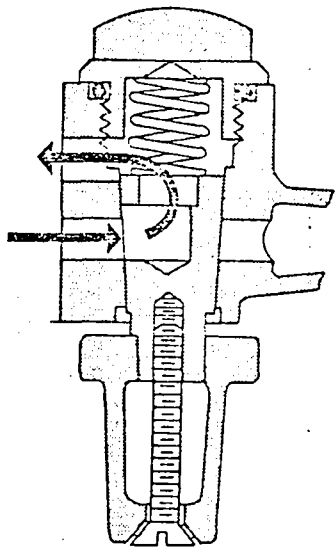
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OPERATION BREAKDOWN SHEET
(continued)

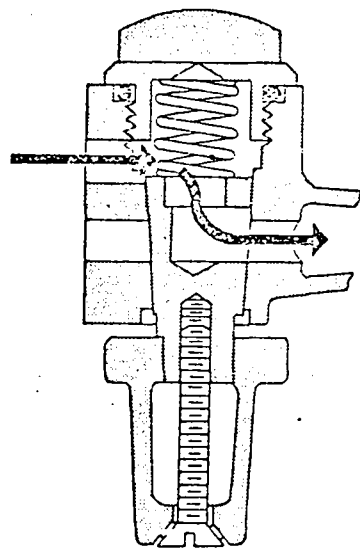
L8:IS:01 (cont'd)

STEPS	KEY POINTS
<p>4. Remove the machine.</p>  <p><i>NOTE:</i> If the fitting being installed is a machine-inserted valve, tee, or corporation stop with compression-type inlet gasket, clean chips from under gasket before tightening compression nuts to a pressure-tight joint on the main.</p>	<p>4.1 Loosen the chain hook nuts.</p> <p>4.2 Unhook the chain and remove hooks and chain.</p> <p>4.3 Remove machine saddle and gaskets.</p> <p>4.4 Tighten stop to final tightness with a suitable wrench on the inlet side.</p> <p>4.5 If using an E-Z release screw plug, remove the nut part from the stop or tee with the E-Z release screw plug wrench furnished with the machine.</p>

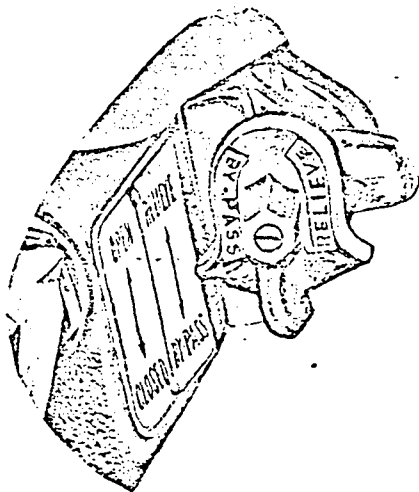
BYPASS VALVE



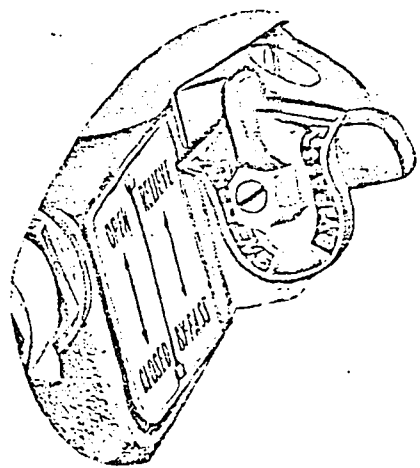
Top View



Top View



Bypass Position



Relieving Position

LESSON 9



CUTTING AND THREADING SERVICE PIPE

ESTIMATED TIME

45 minutes

PREREQUISITES

Basic knowledge of using tools
Lesson 3

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
cut galvanised pipe, prepare die, and cut threads.
- Under the following condition:
using appropriate equipment.
- To this standard:
*cut end squarely; operate die 100% accurately; and
make class A (B.S.P.T.) threads.*

TRAINING RESOURCES

Information Sheet L9:IS:01.

SUPPLIES AND EQUIPMENT

Hacksaw, stand yoke vice, 1 inch galvanised service pipe,
manual die, oil can with oil.

TRAINER ACTIVITY	TRAINEE ACTIVITY
1. Explain and demonstrate how to set up vice.	1. Explain and practice setting up vice.
2. Explain and demonstrate how to secure pipe in vice.	2. Explain and demonstrate how to secure pipe in vice.
3. Explain and demonstrate how to measure and mark length.	3. Explain how to measure and mark length of pipe.
4. Explain and demonstrate how to cut pipe.	4. Explain and practice how to cut pipe.
5. Explain and demonstrate how to set die.	5. Observe and practice how to set die.
6. Explain and demonstrate how to attach die to pipe end.	6. Observe and practice how to attach die to pipe end.
7. Explain and demonstrate how to operate die.	7. Observe and practice how to operate die.
8. Explain and demonstrate how to remove die.	8. Observe and practice how to remove die.
9. Ask trainees to perform entire operation.	9. Perform entire operation (cutting and threading service pipe) under supervision of trainer.

OPERATION BREAKDOWN SHEET
(continued)

L9:IS:01 (cont'd)

STEPS	KEY POINTS
3. Determine the length of pipe necessary.	3.1 Make $\frac{1}{4}$ " allowance for expansion and contraction. 3.2 Use pencil or marker for marking. 3.3 Make marks clean.
4. Cut pipe.	4.1 Use hacksaw. Cut pipe end squarely and cleanly to avoid tearing pipe. 4.2 Use additional support for heavy or long length pipe.
5. Set die.	5.1 Use hand to pull out on ratchet detent knob. 5.2 Insert cutter and set for clockwise rotation.
6. Attach die to pipe end.	6.1 Ensure proper alignment with pipe end. 6.2 Insert pipe through die and carefully line up cutter with pipe end.
7. Operate die.	7.1 Use hand to position die to pipe end. 7.2 Apply pressure on die face for first three threads. 7.3 Operate die handle clockwise, in a push arc.

(cont'd next page)

OPERATION BREAKDOWN SHEET
(continued)

L9:IS:01 (cont'd)

STEPS	KEY POINTS
8. Remove die.	7.4 Oil while cutting threads. 7.5 Operate die until first thread shows at die face. 7.6 Do not force die. 8.1 Pull detent knob outward and adjust for counter-clockwise movement. 8.2 Rotate die handle counter-clockwise. 8.3 Do not force die when removing. This may cause breakage of threads on cutter's teeth. 8.4 Support with hand when backing off.

LESSON 10



ASSEMBLING THREADED ENDS

ESTIMATED TIME

15 minutes

PREREQUISITES

Basic knowledge of using tools
Lesson 9

PERFORMANCE OBJECTIVES:

- ⊗ The trainee will be able to:
assemble threaded ends and tighten joints.
- ⊗ Under the following condition:
given appropriate equipment.
- ⊗ To this standard:
100% accurately.

TRAINING RESOURCES

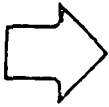
Information Sheet L10:IS:01.

SUPPLIES AND EQUIPMENT

Stand yoke vice, galvanised pipe, short nipple 9 inches long, plumber's tape, fittings (union, socket, bend), 14 inch pipe wrenches.

TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Review with trainees the steps to be observed in assembling threaded ends. Use L10:IS:01.</p>	<p>1. Read and discuss with trainer.</p>
<p>2. Remind trainees how to secure pipe in vice.</p>	<p>2. Explain the technique of securing pipe in vice and practice securing.</p>
<p>3. Remind trainees how to tape threaded end.</p>	<p>3. Observe and explain the reasons for tapping threaded end and practice doing it.</p>
<p>4. Remind trainees how to attach fittings.</p>	<p>4. Observe and practice how to attach fittings.</p>
<p>5. Remind trainees how to tighten fittings.</p>	<p>5. Observe and practice how to tighten fittings.</p>
<p>6. Ask trainees to perform entire operation.</p>	<p>6. Perform entire operation (assembling threaded ends) under supervision of trainer.</p>

LESSON 11



INSTALLING VALVES

ESTIMATED TIME

20 minutes

PREREQUISITES

Basic knowledge of using tools
Lesson 10

PERFORMANCE OBJECTIVES:

- ① The trainee will be able to:
attach and tighten valve in position.
- ② Under the following condition:
using appropriate equipment.
- ③ To this standard:
tighten valve without stripping threads.

TRAINING RESOURCES

Information Sheet L11:IS:01.

SUPPLIES AND EQUIPMENT

Valve, 14 inch pipe wrench, fittings attached to main with short nipple attached to reduction tee, plumber's tape.

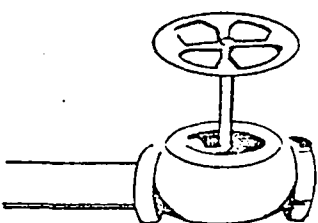
TRAINING ACTIVITIES

L11

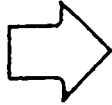
TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Explain and show how to check valve. If possible, let the trainees practice checking a variety of valves in various conditions.</p>	<p>1. Observe and practice how to check valve.</p>
<p>2. Remind trainees how to seal ends.</p>	<p>2. Observe and explain the reasons for sealing the ends. Practice sealing ends.</p>
<p>3. Explain and demonstrate how to attach valve.</p>	<p>3. Observe and practice how to attach valve.</p>
<p>4. Explain and demonstrate how to tighten valve in position.</p>	<p>4. Observe and practice how to tighten valve in position.</p>
<p>5. Ask trainees to perform the entire operation.</p>	<p>5. Perform the entire operation under the supervision of the trainer.</p>

OPERATION BREAKDOWN SHEET

POSITION Water utility plumber TASK Installing new serviceOPERATION Installing valve

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Check valve.</p> <p>2. Seal ends.</p> <p>3. Attach valve.</p> <p>4. Tighten valve in position.</p> <div style="text-align: center;">  <p style="text-align: center;">TIGHTENED VALVE IN POSITION</p> </div>	<p>1.1 Use wrench and loosen valve top.</p> <p>1.2 Use hand to remove valve top.</p> <p>1.3 Be sure valve washer and valve seating are both in good condition.</p> <p>1.4 Replace valve top and tighten with wrench.</p> <p>2. Use hand to roll plumber's seal tape counter-clockwise.</p> <p>3.1 Attach valve by hand and hand-tighten.</p> <p>3.2 Ensure proper alignment for water flow to avoid cross-threading and thread breakage.</p> <p>4.1 Use hand to adjust wrench to fit valve size.</p> <p>4.2 Back up with back-up wrench on pipe while valve is securely tightened in position.</p>

LESSON 12



LAYING SERVICE PIPE

ESTIMATED TIME

25 minutes

PREREQUISITES

Basic knowledge in using tools
Lesson 11

PERFORMANCE OBJECTIVES:

- ① The trainee will be able to:
align, attach, and tighten pipe in position.
- ② Under the following condition:
given appropriate situation and equipment.
- ③ To this standard:
no leaks.

TRAINING RESOURCES

Information Sheet L12:IS:01.

SUPPLIES AND EQUIPMENT

Threaded galvanised service pipe, plumber's seal tape,
wire brush, pipe wrench.

TRAINER ACTIVITY	TRAINEE ACTIVITY
<ol style="list-style-type: none"> 1. Discuss with the trainees the steps to be observed in laying a service pipe. See L12:IS:01. 2. Demonstrate and explain how to clean threaded end. 3. Show and explain how to place pipe in trench. 4. Explain and demonstrate how to tape and attach pipe. 5. Explain and demonstrate how to tighten pipe. 6. Ask trainee to perform entire operation. 	<ol style="list-style-type: none"> 1. Read and discuss with trainer. 2. Observe, explain the reasons for, and demonstrate how to clean threaded end. 3. Observe, explain the reasons for, and demonstrate how to place pipe in trench. 4. Observe and demonstrate how to tape and attach pipe. 5. Observe and demonstrate how to tighten pipe. 6. Under the supervision of the trainer, perform all the steps in laying a service pipe.

OPERATION BREAKDOWN SHEET
(continued)

L12:IS:01 (cont'd)

STEPS	KEY POINTS
4. Tighten pipe.	4.1 Use hand to adjust wrench to fit pipe size. 4.2 Back up with wrench on fittings or pipe while pipe is securely tightened.

LESSON 13



INSTALLING METER

ESTIMATED TIME

45 minutes

PREREQUISITES

Lesson 12

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
align, attach, and tighten meter in position.
- Under the following condition :
given appropriate equipment.
- To this standard:
no leaks.

TRAINING RESOURCES

Information Sheet L13:IS:01.

SUPPLIES AND EQUIPMENT

Meter, tail pieces with couplings, coupling washers,
10 and 14 inch pipe wrenches, pipe fitting, wrench.

SPECIAL NOTE

THE PROCEDURES IN THIS LESSON ARE
NECESSARY ONLY WHEN A METER IS REQUIRED.

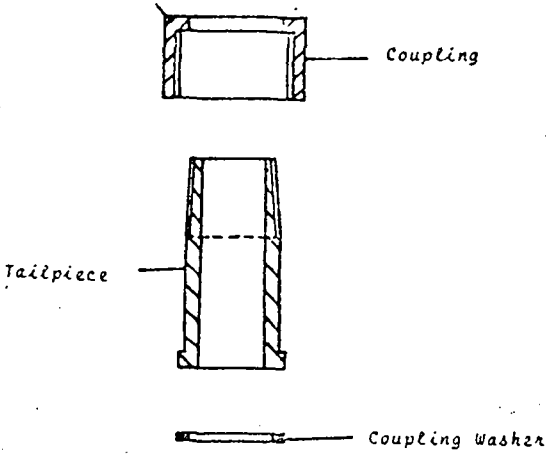
TRAINER ACTIVITY	TRAINEE ACTIVITY
<p>1. Explain and demonstrate how to check meter.</p>	<p>1. Observe and demonstrate how to check meter.</p>
<p>2. Explain and demonstrate how to attach and tighten tail pieces.</p>	<p>2. Observe, demonstrate, and explain the manner of attaching and tightening tail pieces.</p>
<p>3. Explain and show how to position coupling washers.</p>	<p>3. Observe and explain reasons for positioning of coupling washers. Practice positioning washers.</p>
<p>4. Explain and show how to position and align meter.</p>	<p>4. Observe and explain the reasons for positioning and aligning meter. Practice positioning and aligning.</p>
<p>5. Explain and demonstrate how to tighten couplings.</p>	<p>5. Observe and demonstrate how to tighten couplings.</p>
<p>6. Assign trainees to perform entire operation.</p>	<p>6. Install meter under supervision of trainer.</p>

OPERATION BREAKDOWN SHEET

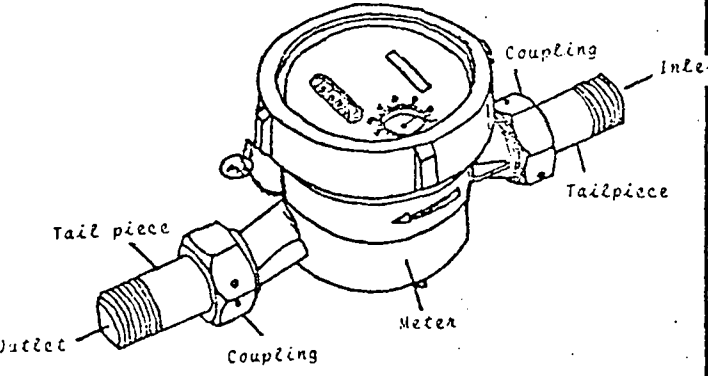
L13:IS:01

POSITION Water utility plumber TASK Installing new service

OPERATION Installing meter

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Inspect meter.</p> <p>2. Attach and tighten tail pieces.</p> <div style="text-align: center;">  <p style="margin-left: 100px;">Coupling</p> <p style="margin-left: 10px;">Tailpiece</p> <p style="margin-left: 100px;">Coupling Washer</p> </div> <p>3. Position coupling washers.</p>	<p>1. Carefully check meter threads, glass, coupling, and coupling washer.</p> <p>2.1 Ensure proper alignment to avoid cross threading or breakage.</p> <p>2.2 Attach tail pieces into pipe sockets and tighten with pipe wrench.</p> <p>2.3 Back up with back-up wrench on socket.</p> <p>3. Use hand and place washers in coupling until washers seat on tail pieces.</p> <p style="text-align: right;">(cont'd next page)</p>

OPERATION BREAKDOWN SHEET
(continued)

STEPS	KEY POINTS
<p>4. Position and align meter.</p> <p>5. Tighten coupling.</p> 	<p>4.1 Ensure proper alignment for water flow.</p> <p>4.2 Check for arrow indicating direction of flow.</p> <p>5. Use hand and adjust wrench to fit coupling. Hold meter in position until coupling is securely tightened.</p>

LESSON 14



TESTING JOINTS AND SERVICE PIPE

ESTIMATED TIME

20 minutes

PREREQUISITES

Basic knowledge of testing
water lines
Lesson 13

PERFORMANCE OBJECTIVES:

- ① The trainee will be able to:
*test service pipe joints and identify
and correct any leaks.*
- ② Under the following condition:
given a new service installation.
- ③ To this standard:
joints and service pipe are drip-free.

TRAINING RESOURCES

Information Sheets L14:IS:01 and L14:IS:02.

SUPPLIES AND EQUIPMENT

Water and service connection, pipe wrench.

TRAINER ACTIVITY	TRAINEE ACTIVITY
1. Explain and demonstrate how to close stopcock at end of service pipe.	1. Observe and practice how to close stopcock at end of service pipe.
2. Explain and demonstrate how to open corporation stop or main service stopcock.	2. Observe and practice.
3. Explain and demonstrate how to check meter connections, if necessary.	3. Observe and practice.
4. Explain and show how to check pipe joints.	4. Observe and practice.
5. Explain and demonstrate how to open stopcock at end of service pipe.	5. Observe and practice how to open stopcock at end of service main.
6. Explain and show how to check meter operation if meter has been installed.	6. Observe, explain, and demonstrate how to check meter operation.
7. Ask trainees to perform entire operation.	7. Test pipe joints under supervision of trainer.

OPERATION BREAKDOWN SHEET

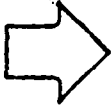
L14:IS:01

POSITION Water utility plumber TASK Installing new services

OPERATION Testing joints and service pipe

STEPS (Significant actions which advance the operation towards completion)	KEY POINTS (Keys to doing the steps efficiently and accurately)
1. Close stop at end of service pipe.	1. Use hand to turn stopcock counter-clockwise. Count and note the turns.
2. Open main service stopcock. (If main has been tapped, open corporation stop.)	2. Use hand to turn stopcock clockwise very slowly. (If main has been tapped, use hand to attach corporation stop wrench to corporation stop. Turn clockwise for one turn. Don't force while turning.)
3. Check meter connections if meter has been installed.	3. Carefully check that meter connections are leak-free.
4. Check pipe joints.	4.1 Carefully check that pipe joints are leak-free. 4.2 If there is leakage, use hand to adjust wrench and carefully tighten joints. Use back-up wrench if necessary.
5. Open stop at end of service pipe.	5. Use hand to turn stopcock clockwise the same number of turns as in step 1.
6. Check meter operation if one has been installed.	6. Carefully read the meter to make sure it is working.

LESSON 15



SUPERVISING BACKFILLING

ESTIMATED TIME

20 minutes

PREREQUISITES

Basic knowledge in compaction

PERFORMANCE OBJECTIVES:

- ① The trainee will be able to:
determine and select the appropriate soil and supervise compaction.
- ② Under the following condition:
given excavated trench with service pipe laid, and soil with and without stones.
- ③ To this standard:
backfill is compacted so settlement will not occur.

TRAINING RESOURCES

Information Sheet L15:IS:01.

SUPPLIES AND EQUIPMENT

Excavated trench with service pipe laid, soil with and without stones, rammer.

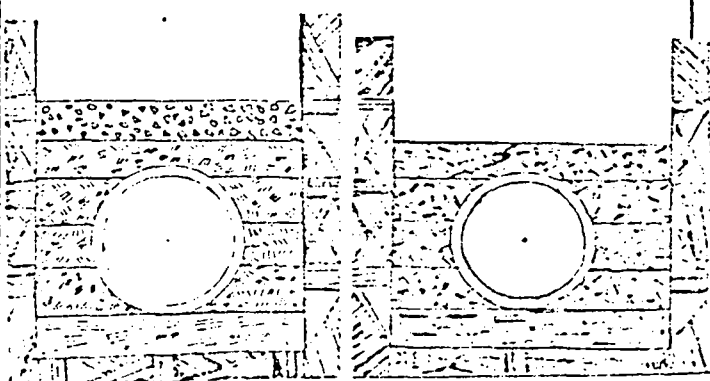
TRAINER ACTIVITY	TRAINEE ACTIVITY
<ol style="list-style-type: none"> 1. Explain and show what soil to select. 2. Explain and demonstrate how to compact. 3. Explain and show how to clean up after backfilling. 	<ol style="list-style-type: none"> 1. Observe; explain the reasons for selection of appropriate soil. Demonstrate how to select soil. . 2. Observe; explain the reasons for good compaction; demonstrate how to compact. 3. Observe and demonstrate how to clean up after backfilling.

OPERATION BREAKDOWN SHEET

115:IS:01

POSITION Water utility plumber TASK Installing new service

OPERATION Supervising backfilling

<p style="text-align: center;">STEPS (Significant actions which advance the operation towards completion)</p>	<p style="text-align: center;">KEY POINTS (Keys to doing the steps efficiently and accurately)</p>
<p>1. Check soil.</p>	<p>1.1 Be sure soil that will be used around and on top of pipe is of good quality and free from all stones.</p> <p>1.2 Be sure soil containing stones is used from a level above the top of the pipe to the ground surface or pavement but is not placed immediately on top of the pipe.</p>
<p>2. Compact soil.</p> <div style="text-align: center; margin-top: 20px;">  <p style="font-size: small; margin-top: 5px;">SOIL WITH STONES SOIL WITHOUT STONES TAMPED AROUND & OVER PIPE</p> </div>	<p>2.1 Be sure soil free from all stones is well tamped in 6" layers. Tamp the soil containing stones to the ground surface or pavement</p> <p>2.2 Be sure trench is backfilled and compacted in layers not exceeding 6" deep.</p>
<p>3. Clean up.</p>	<p>3. Be sure all pieces of pipe, extra fittings, tools, equipment, and excess spoil materials are removed from pavement and/or street. Clean all walks.</p>

LESSON 16

MAINTAINING AND CLEANING
TOOLS AND EQUIPMENT

ESTIMATED TIME

30 minutes

PREREQUISITES

Basic knowledge of tool handling

PERFORMANCE OBJECTIVES:

- The trainee will be able to:
clean and store tools and equipment.
- Under the following condition:
given appropriate tools and equipment.
- To this standard:
*stored tools and equipment are free of all
foreign matter and well lubricated or greased.*

TRAINING RESOURCES

Information Sheet L16:IS:01.

SUPPLIES AND EQUIPMENT

Tools and equipment that have been used on the job,
light oil or grease, wire brush.

TRAINER ACTIVITY	TRAINEE ACTIVITY
<ol style="list-style-type: none"> 1. Make sure trainees understand the importance of collecting tools and equipment and returning them to the workshop. 2. Demonstrate and explain how to remove dirt or foreign matter. 3. Show and explain how to check for damages. 4. Demonstrate and explain how to lubricate tools and equipment. 5. Show and explain how to store tools and equipment. 	<ol style="list-style-type: none"> 1. Discuss with trainer. 2. Observe, practice, and explain the reason for removing foreign matter. 3. Observe, practice, and explain the reason for checking damages. 4. Observe, practice, and explain the reason for lubricating tools and equipment. 5. Observe and practice how to store tools and equipment.

OPERATION BREAKDOWN SHEET

L16:IS:01

POSITION Water utility plumber TASK Installing new service

OPERATION Maintaining and cleaning tools and equipment

STEPS (Significant actions which advance the operation towards completion)	KEY POINTS (Keys to doing the steps efficiently and accurately)
<p>1. Collect tools and equipment.</p> <p>2. Remove dirt or foreign matter.</p> <p>3. Check for damages.</p> <p>4. Lubricate tools and equipment as necessary.</p> <p>5. Store tools and equipment.</p>	<p>1.1 Collect all tools and equipment.</p> <p>1.2 Ensure good working space for laying out tools and equipment. Do not drop on hard surface.</p> <p>2. Clean thoroughly with wire brush and water to ensure that tools and equipment are free from dirt and foreign matter.</p> <p>3. Inspect all tools and equipment, moving cutting edges and threaded parts.</p> <p>4. Lubricate tools and equipment bodies and moving parts with light oil or grease to prevent rusting.</p> <p>5. Store tools and equipment in individual compartments to prevent damage of threads or cutting edges.</p>

WHAT THE WORKER DOES (Operation)	HOW HE DOES IT (Step)	WHY HE DOES IT	WHAT HE NEEDS TO KNOW
•Supervises excavation.	•Directs excavation of earth from around main and trench or laying of pipe(s).	•To ensure that satisfactory alignment is maintained and main is not carelessly broken.	•Knowledge of gradients and levels. •Ability to communicate.
•Cuts and threads main.	•Measures and cuts to length with hacksaw. •Threads end(s) with manual die.	•To connect fittings for service (line) pipes.	•How to take and read measurements. •How to manipulate hacksaw. •How to adjust and use manual die.
•Installs fittings.	•Seals threaded pipe end. •Attaches fittings. •Tightens with wrench.	•To reconnect main for service (line) pipes.	•How to seal thread end. •How to install fittings. •How to adjust and manipulate wrench.
•Drills and taps main.	•Attaches bottom section of machine to main. •Assembles boring bar with drilling and tapping tool attached to top section of machine. •Sets ratchet for clockwise threading. •Places ratchet handle on boring bar and operates handle clockwise.	•To install corporation stop.	•How to assemble and operate tapping machine. •How to tap various types and sizes of pipe.
•Installs corporation stop.	•Raises boring bar above lower body chamber. •Closes flop valve. •Removes boring bar from lower section of machine. •Attaches corporation stop to boring bar. •Replaces drilling and tapping tool. •Replaces boring bar assembly on base sections of machine. •Opens flop valve. •Operates ratchet clockwise.	•To connect service pipe lines. •To insert corporation stop into tapping line. •To release pressure.	•How to assemble boring bar. •How to manipulate tapping machine.
•Cuts and threads service pipe.	•Measures and cuts to length using hacksaw. •Threads end(s) with manual die.	•To connect fitting and pipe(s).	•How to take and read tape. •How to manipulate hacksaw. •How to adjust and use manual die.
•Assembles threaded joints.	•Tapes threaded pipe end with plumber's tape. •Assembles joints. •Tightens with wrench.	•To ensure leak-free connection.	•How to tape threaded pipe. •How to manipulate wrench.
•Installs valve.	•Attaches valve to reducing tee. •Tightens with wrench.	•To provide a control point in service pipe.	•How to attach valve. •How to adjust and manipulate wrench.
•Lays service pipe.	•Positions pipe(s) in trench. •Attaches pipe(s) to valve. •Tightens with wrench.	•To connect service pipe to distribution main.	•How to adjust and manipulate wrench.
•Installs meter.	•Attaches and tightens tail pieces of meter into socket pipe ends and tightens with wrench. •Positions meter, attaches coupling (flynuts) to meter, and tightens with wrench.	•To hold meter in position.	•How to adjust and manipulate wrench.
•Tests joints and service pipe.	•Turns valve on and checks all joints.	•To ensure leak-free service pipe.	•How to test joints.
•Supervises backfilling.	•Observes operation and directs activity.	•To ensure that service is not easily broken.	•How to compact trench in layers.
•Maintains and cleans tools and equipment.	•Washes and cleans all tools with water. •Lubricates with oil. •Carefully store tools in place.	•To ensure availability of tools for further work.	•How to maintain and care for tools and equipment.