Trainee Manual

A412

CITY OF SASKATOON

Water and Sewer Section

Water Connection Repair Trainee Manual

CITY OF SASKATOON

Water Connection Repair Trainee Manual

Table of Contents

INTRODUCTION 1

PROCEDURAL OVERVIEW 1

METHOD AND TECHNIQUES 3

PRE-REPAIR 3
GENERAL EXCAVATION SAFETY 16
PREPARING FOR REPAIR 18
REPLACING A SECTION OF PIPE 24
REPLACING THE MAIN STOP 27
INSTALLING COPPER GOOSENECK SECTION 33
ANODE INSTALLATION 38
POST-REPAIR 41
BACKFILL, GENERAL INFORMATION 45

RESOURCES REQUIRED 51

PEOPLE 51
EQUIPMENT / TOOLS 51
MATERIAL 60

Introduction

The objective of this manual is to train staff on how to repair a water connection in a timely and efficient manner while minimizing disruption in service and insuring the water connection repair meets current standards. Should substandard conditions of the peripheral infrastructure be identified, further renovations will be performed. This manual only applies to the repair of the water connection at the point of excavation. This procedure also lists additional substandard infrastructure that may require renovation.

Procedural Overview

The Clearances and Locations Work Group will acquire clearances for all utilities, (Gas, power, water, sewer, phone, cable, etc.) before the excavation begins. The Clearances and Locations Work Group will provide the required location numbers, job numbers, drawings and forms to the Supervisor IV as well as organize the removal of some site obstructions i.e. trees and utility poles. The Clearances and Locations Work Group will notify Railway Roadmasters (CN & CP) in advance of work progress near railroad corridors. All vehicles must be circle checked and the results logged before use. The Supervisor IV or the Clearances and Locations Work Group representative will mark the water and sewer lines and meet the other utility representatives at the repair

site. The Supervisor IV will request that the Sign Shop and/or the labourers install the required traffic control devices and ensure they are installed.

Every effort must be made to notify the public affected by a water outage prior to shutting down a water supply line. The Supervisor IV will ensure that buried utilities have been de-energized, if required. The Supervisor IV will coordinate, select and acquire all required equipment and materials and deploy their crew to the job site. Before using the equipment the tandem axle truck and excavator/backhoe operators must perform circle checks, log results and ensure that the regular maintenance schedule for that equipment has been adhered to. The tandem axle truck operator will ensure that the trailers are clean and in proper working order and the emergency water supply trailers are completely filled before storing. The tandem axle truck operator will haul the emergency water supply, shoring and crew trailers - transporting the emergency water supply trailer first and turning on its heater if required. The tandem axle truck operator notifies Central Dispatch of the location of the emergency water supply trailer.

The Supervisor IV will decide on the water connection repair location and size of excavation and discuss with the excavator/backhoe operator the best method for excavating. All staff must wear the personal protective equipment required. Asphalt and/or concrete must be stripped, separated and hauled to a designated reclamation site. Where possible, excavate parallel with the water connection. Consider the locations of other buried utilities. Excavate the area around the water connection. The labourers must locate and expose (shallow buried) underground utilities by hand. The labourers shall communicate the location of all buried utilities to the excavator/backhoe operator. Support all buried utilities as required by their owner's specifications. The labourers shall inspect shoring before use. The Supervisor IV will confirm that the shoring is in proper working order and installation is in accordance with regulations. Personnel must stay clear when lifting and lowering shoring and/or materials. The shoring is installed with the assistance of the excavator/backhoe and the labourers in accordance with manufacturer's recommendations. Shoring must be placed in excavation in such a manner as not to disturb any buried utilities. Shoring must be expanded to support trench walls, install endplates as required. The access/egress ladder must be in place while persons are in the excavation. Labourers shall observe the trench walls for signs of collapse throughout the repair. If at any time a bottom labourer is in danger the other labourers must immediately summon their exit from the excavation. The labourers will ensure the tools and crew trailer are clean and in proper working order.

The labourers will disinfect tools and equipment before use on the water connection repair. The water connection will be repaired according to the Trainee Manual. Remove old service clamps or service saddles and/or main stops from the water main if you change the type of pipe material or they are leaking. Install the new main stop into the new service clamp or service saddle. Service clamps must be used on AC pipe. The section of damaged water connection pipe must be replaced with copper pipe. A union and P.E insert must be used to connect polyethylene and copper pipe. Ensure new copper pipe is goose necked. The Supervisor IV will ensure the repair meets current standards and recommended practices.

The top labourer will install the throttle valve and hose for hydrant flushing, and operate hydrant. The water line shall be re-energized/filled. The bottom labourer will observe the new repair for leaks. Connect a 12 lb anode to copper water service lines, where the existing service lines are being reconnected into a non-metallic watermain. The Supervisor IV will perform or monitor the performance of the water quality testing. The top labourer will direct the tandem axle truck operator to dump the backfill material. Backfill all buried utilities as required by their owner's specifications and confirm backfill specifications have been met. The Supervisor IV ensures backfill material meets the requirements. Soil and granular material must be compacted to a standard proctor density minimum of 98% and be free from frozen or substandard backfill material. Non-shrink backfill

must be used beneath concrete or paving stone sidewalks or driveways. Pavement cut will be left down if instructed by the Asphalt Supervisor. Final grade of all excavations must be smooth and level.

Driveways, road surfaces and sidewalks must be swept clean. The Supervisor IV will inspect the site for cleanliness before leaving the site. All unnecessary traffic control devices will be removed from the roadway prior to leaving the site. The Supervisor IV will submit a plan of the closed valves to the Valve Supervisor. The Supervisor IV will ensure that all the required forms and documentation are complete and submitted - at the end of the day the job is completed. The Clearances and Locations Work Group will update the manual and electronic records.

Method and Techniques

Pre-Repair

As the Water Service Disruption Reports are created, each request for repairs needs to be followed through first by prioritizing them, then submitting them to the Clearances and Locations Work Group.

Notes:

City of Saskatoon - Water Service Disruption Report Memo #

Location: _____ WRR #: _____

Call to Dispatch: _____ Time Dispatched: _____ Arrival Time: _____ Completion Time: _____

Crew Members: _____; Date Initiated: _____; Outage Notification Given: ____ Yes; ____ No;

Type of Interruption		Units Affected (Number without service)
Water Main: _____	Valve: _____;	Houses: ___; Comments: _____
Water Conn: _____	Hydrant: _____;	Apartments: ___; Comments: _____
Curb Stop: ____; (M/S ___; P/S ___; C/S ___;)		School: ___; Comments: _____
Curb Box: Raise ___; Lower ____;		Business: ___; Type: _____
Primary Main: ____;	Private Leak: _____;	Other: _____
Primary Valve: ____;	Frozen Conn: _____;	

Valves out of Service

VALVES OPERATED Location of Valve	Valve GIS No.	Off YYMMDD	Off Time	Crew Initials	On YYMMDD	On Time	Crew Initials

Hydrants out of Service Location of Hydrant	Hydrant GIS No.	Off YYMMDD	Off Time	Crew Initials	On YYMMDD	On Time	Crew Initials

Connection drawings for: _____

Excavation Obstructio	Additional Information Required:
Tree: _____ Comments: _____	Correlation Required: _____ Yes; _____ No;
Utility Pole: _____ Comments: _____	Slow Leak: _____ Yes; _____ No;
Fence: _____ Comments: _____	Hydro Excavate: _____ Yes; _____ No;
Vehicle: _____ Comments: _____	Washout Visible: _____ Yes; _____ No;
Pavement: ___; Concrete: ___; Paving Stone:	Blvd: ___ Broke into Sanitary Main: _____ Yes; _____ No;
Other: _____	oke into Storm Main: _____ Yes; _____ No;
Temporary Water Provisi	Traffic Controls:
Water Trailer: _____ (On Site); _____ (Arran r);	etour Required: _____ Yes; _____ No;
Temporary Connection: _____ (Installed); ___ Arranged For);	Bus Route: _____ Yes; _____ No;
From: _____; To: _____;	Post for No Parking: _____ Yes; _____ No;
Fill-up: _____ (Time On); _____ (Time Off); _____	

PROPERTY DAMAGE: Yes: _____; No _____;

OTHER REMARKS / OBSERVATIONS:

Figure 1 – Water Service Disruption Report.

Section A of the Water Service Disruption Report. Contains the general data, the type of interruption, the units affected and all the valves out of service.

Notes:

City of Saskatoon - Water Service Disruption Report Memo #

Location: _____ WRR #: _____

Call to Dispatch: _____ Time Dispatched: _____ Arrival Time: _____ Completion Time: _____

Crew Members: _____; Date Initiated: _____; Outage Notification Given: ____ Yes; ____ No;

Type of Interruption		Units Affected (Number without service)
Water Main: _____	Valve: _____;	Houses: ___; Comments: _____
Water Conn: _____	Hydrant: _____;	Apartments: ___; Comments: _____
Curb Stop: ____; (M/S ___; P/S ___; C/S ___		School: ___; Comments: _____
Curb Box: Raise ____; Lower ____;		Business: ___; Type: _____
Primary Main: ____;	Private Leak: _____;	Other: _____
Primary Valve: ____;	Frozen Conn: _____;	_____

Valves out of Service

VALVES OPERATED Location of Valve	Valve GIS No.	Off YYMMDD	Off Time	Crew Initials	On YYMMDD	On Time	Crew Initials

Figure 2 - Section A of Water Service Disruption Report

Section B of the Water Service Disruption Report contains hydrant, excavation, temporary water, traffic controls and any additional information.

Notes:

Hydrants out of Service Location of Hydrant	Hydrant GIS No.	Off YYMMDD	Off Time	Crew Initials	On YYMMDD	On Time	Crew Initials

Connection drawings for: _____

Excavation Obstructions:	Additional Information Required:
Tree: _____ Comments: _____	Correlation Required: _____ Yes; _____ No;
Utility Pole: _____ Comments: _____	Slow Leak: _____ Yes; _____ No;
Fence: _____ Comments: _____	Hydro Excavate: _____ Yes; _____ No;
Vehicle: _____ Comments: _____	Washout Visible: _____ Yes; _____ No;
Pavement: ___; Concrete: ___; Paving Stone: ___; Blvd: ___;	Broke into Sanitary Main: _____ Yes; _____ No;
Other: _____	Broke into Storm Main: _____ Yes; _____ No;
Temporary Water Provisions:	**Traffic Controls:**
Water Trailer: _____ (On Site); _____ (Arranged For);	Detour Required: _____ Yes; _____ No;
Temporary Connection: _____ (Installed); _____ (Arranged For);	Bus Route: _____ Yes; _____ No;
From: _____; To: _____	Post for No Parking: _____ Yes; _____ No;
Fill-up: _____ (Time On); _____ (Time Off); _____	

PROPERTY DAMAGE: Yes: _____; No _____;

OTHER REMARKS / OBSERVATIONS:

TWE 03/0401

Figure 3 - Section B of Water Services Disruption Report

The Clearances and Locations Work Group will provide; drawings, utility locations, location numbers, and any required forms. If required the Clearances and Locations Work Group will coordinate the removal of objects obstructing the excavation like trees and utility poles.

Notes:

Figure 4 - Clearance and Locations Work Group

The daily work sheet is created to provide other departments with the location of the Water & Sewer work being performed that day.

Notes:

DATE: Friday May 9 - 03

Water and Sewer Maintenance Section

PIECOWYE:W&SMT1

STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL	SIGNING:	GIS	UTL+LOC:	STAFFING:	
Current	1006 Tiffin Crescent	Sanitary Connection	MBL	664	3112	5-6500	05-270	S/S			LABOURERS -	Parker/Klassen
2nd	Massey Drive & Marr Avenue	Water Main	MP1	146	3114	5-6100	02-150	On Site			BACKHOE OPERATOR -	Dmytrowich - 2343
Hold	175/303 Delaronde Road	Repair C/B Lead	MP1	775	3079	5-6710	07-310	On Site	27126		T/A OPERATORS -	Pingue
Hold	Arnhem St. & McNaughton Avenue	Hydrant (McAvity)	MP2	243	3059	5-6300	02-160	On Site	23535			
Hold	Field House	Water Connection	MBL	49246	1724067	5-6410	02-170	Crew				

:W&SMT2

STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL	SIGNING:	GIS	UTL+LOC:	STAFFING:	
Hold	Clarence Avenue - 8th St. - 9th St.	Water Main	MP1	146	3115	5-6100	02-150	S/S			LABOURERS -	
Hold	15 Moxon Crescent	Sanitary Connection	MBL	664	3108	5-6500	05-270	S/S			BACKHOE OPERATOR -	
			MBL								T/A OPERATORS -	
			MBL									
			MBL									

:W&SMT3

STATUS	LOCATION:	REPAIR T	PRIORITY	JOB #	Loc:	ACTIVITY:	GL	SIGNING:	GIS	UTL+LOC:	STAFFING:	
Hold	Dudley Street	Leakage Prio	FMP	46806	1724067	5-6100	17-596	N/A			LABOURERS -	
			MBL								BACKHOE OPERA	
			MBL								OPERATORS -	
			MBL									
Hold	8th Street Yard	Cleanup Yard	MBL	49195	1724067	5-6100	02-150	N/A				

:W&SMT4

STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL	SIGNING:	GIS	UTL+LOC:	STAFFING:	
			MBL								LABOURERS -	
Hold	Isabella Street / Eastlake Avenue	Repair C/B Lead	MBL	48959	1724067	5-6710	07-310	S/S			BACKHOE OPERATOR -	
Hold	Isabella Street / Eastlake Avenue	Valve (WPL)	MP2	146	3031	5-6200	02-150	S/S	1168		T/A OPERATORS -	
			MBL									
			MBL									

DAY OFF/EDO	VACATION:	SICK:	OTHER:	ADDITIONAL STAFFING:
Ross, Young, Maskwa & Crews, Olchoye,	Hilton, Swidzinski		Collins - Medical	Loader - Cousins @ Landfill -

Priority Legend

(MP1) Maintenance Priority - (MBL) Maintenance Backlog - (MPS) Maintenance Program Support - (FMP) Funded Maintenance Program

Pending Water & Sewer Work

STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL	SIGNING:	GIS
Hold	Boychuck Dr. South of Taylor St.	m MH F&C	MBL	760	3010	5-6620	07-310	Crew	21925
Hold	Boychuck Dr. South of Taylor St.	m MH F&C	MBL	760	3010	5-6620	07-310	Crew	21924
Hold	4200 Block Taylor Street	tary MH F&C	MBL	563		5-6620	05-260	Crew	8575
Hold	412 Avenue C South	Stop (C&S)	MP2	48237	1724067	5-6400	02-170	S/S	
Hold	213 Avenue I South	Stop (C&S)	MP	48150	1724067	5-6400	02-170	S/S	
Hold	4th Avenue & 23th Street	San Bev Top	M	573	3012	5-6620	05-260	S/S	3813
Hold	Ottawa Avenue / 20th Street	San Bev Top	FMP	573	3068	5-6620	05-260	S/S	3231

Figure 5 - Daily Work Sheet

Section A shows the tasks for each Supervisor IV. In this view status, location, repair type, priority, GIS #, job #, location #, activity #, and GL # are shown. ~~The~~ Staff not at work are listed at the bottom of section A.

Notes:

DATE: **Friday May 9 - 03** **Water and Sewer Maintenance Secti**

	PIECOWYE:W&SMT1						
STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL
Current	**1006 Tiffin Crescent**	Sanitary Connection	**MBL**	**664**	**3112**	**5-6500**	05-270
2nd	**Massey Drive & Marr Avenue**	Water Main	**MP1**	**146**	**3114**	**5-6100**	02-150
Hold	**175/303 Delaronde Road**	Repair C/B Lead	**MP1**	**775**	**3079**	**5-6710**	07-310
Hold	**Arnhem St. & McNaughton Avenue**	Hydrant (McAvity)	**MP2**	**243**	**3059**	**5-6300**	02-160
Hold	**Field House**	Water Connection	**MBL**	**49246**	**1724067**	**5-6410**	02-170
	:W&SMT2						
STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL
Hold	**Clarence Avenue - 8th St. - 9th St.**	Water Main	**MP1**	**146**	**3115**	**5-6100**	02-150
Hold	**15 Moxon Crescent**	Sanitary Connection	**MBL**	**664**	**3108**	**5-6500**	05-270
			MBL				
			MBL				
			MBL				
	:W&SMT3						
STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL
Hold	**Dudley Street**	Cathodic Protection	**FMP**	**46806**	**1724067**	**5-6100**	17-596
			MBL				
			MBL				
			MBL				
Hold	**8th Street Yard**	Cleanup Yard	**MBL**	**49195**	**1724067**	**5-6100**	02-150
	:W&SMT4						
STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL
			MBL				
Hold	**Isabella Street / Eastlake Avenue**	Repair C/B Lead	**MBL**	**48959**	**1724067**	**5-6710**	07-310
Hold	**Isabella Street / Eastlake Avenue**	Valve (WPL)	**MP2**	**146**	**3031**	**5-6200**	02-150
			MBL				
			MBL				

DAY OFF/EDO	VACATION:	SICK:	
Ross, Young, Maskwa & Crews, Olchove,	Hilton, Swidzinski		Collins - Medical

Priority Legend

(MP1) Maintenance Priority - (MBL) Maintenance Backlog - (MPS) Maintenance Program Support - (FMP) F

Figure 6 - Daily Work Sheet Section A

Section B shows additional information on signing, GIS#, utility locations, staffing and comments.

Notes:

on

SIGNING:	GIS	UTL>LOC:	STAFFING:		COMMENTS:
S/S			LABOURERS -	Parker/Klassen	
On Site			BACKHOE OPERATOR -	Dmytrowich - 2343	
On Site	27126		T/A OPERATORS -	Pingue	Gravel required to complete
On Site	23535				
Crew					

SIGNING:	GIS	UTL>LOC:	STAFFING:		COMMENTS:
S/S			LABOURERS -		No homes out!
S/S			BACKHOE OPERATOR -		
			T/A OPERATORS -		

SIGNING:	GIS	UTL>LOC:	STAFFING:		COMMENTS:
N/A			LABOURERS -		
			BACKHOE OPERATOR -		
			T/A OPERATORS -		
N/A					

SIGNING:	GIS	UTL>LOC:	STAFFING:		COMMENTS:
			LABOURERS -		
S/S			BACKHOE OPERATOR -		
S/S	1168		T/A OPERATORS -		

OTHER:	ADDITIONAL STAFFING:		COMMENTS:
	Loader - Cousins @ Landfill -		

unded Maintenance Program

Figure 7 - Daily Work Sheet Section B

Section C shows work pending.

Notes:

Pending Water & Sewer Work

STATUS	LOCATION:	REPAIR TYPE:	PRIORITY	JOB #	Loc:	ACTIVITY:	GL	SIGNING:	GIS
Hold	**Boychuck Dr. South of Taylor St.**	Storm MH F&C	**MBL**	**760**	**3010**	**5-6620**	07-310	Crew	21925
Hold	**Boychuck Dr. South of Taylor St.**	Storm MH F&C	**MBL**	**760**	**3010**	**5-6620**	07-310	Crew	21924
Hold	**4200 Block Taylor Street**	Sanitary MH F&C	**MBL**	**563**		**5-6620**	05-260	Crew	8575
Hold	**412 Avenue C South**	Curb Stop (C&S)	**MP2**	**48237**	**1724067**	**5-6400**	02-170	S/S	
Hold	**213 Avenue I South**	Curb Stop (C&S)	**MP2**	**48150**	**1724067**	**5-6400**	02-170	S/S	
Hold	**4th Avenue & 23th Street**	San Bev Top	**MBL**	**573**	**3012**	**5-6620**	05-260	S/S	3813
Hold	**Ottawa Avenue / 20th Street**	San Bev Top	**FMP**	**573**	**3068**	**5-6620**	05-260	S/S	3231

Figure 8 - Daily Work Sheet Section C

The Supervisor IV will pick up all materials that can be transported with a ¾ ton truck from Public Works stores. (For larger material a truck hoist or tandem truck will be used)

Notes:

Figure 9 - Yards Stores

Choose excavator/backhoe and shoring types based on size of excavation and soil condition.

Notes:

Figure 10 – Shoring on Trailer

Upon arrival at the work site, a good spot for the trailers will be determined in order to keep them clear of the excavation site.

Notes:

Figure 11 - Trailer Location

Representatives from utility companies can field locate their lines if required. All buried and overhead utilities shall be identified and marked prior to beginning an excavation. The Clearances and Locations Work Group representative, or the Supervisor IV will mark the city owned utilities. Locations of the utilities will be a determining factor in performing the excavation.

Notes:

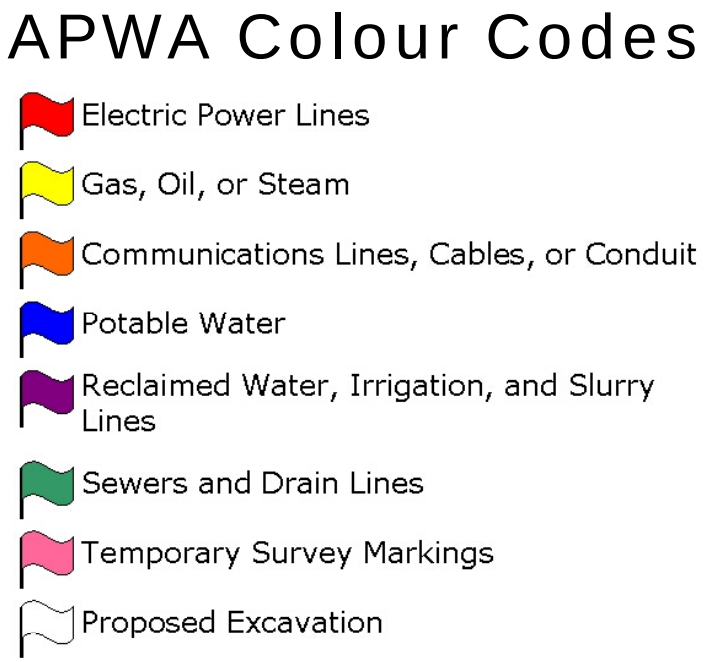


Figure 12 - APWA Colour Codes

Every effort should be made to cut the asphalt or concrete with an earth saw (winter), quickie saw or asphalt saw (summer), prior to excavating.

Notes:

Figure 13 – Concrete Saw

Asphalt or concrete will be stripped, separated and hauled away to the designated reclamation site. Asphalt and concrete are to be recycled.

Notes:

Figure 14 – Recycling

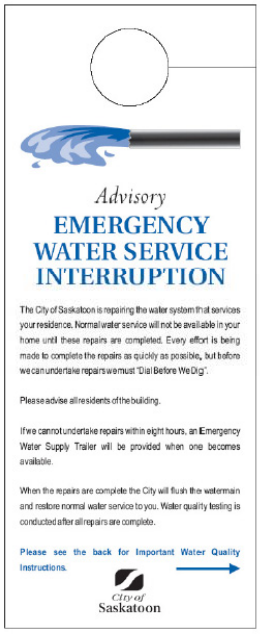
Every effort will be made to notify the public affected by a water outage. Emergency water supply trailers and temporary hook ups are options to consider when there is a water outage.

Notes:

Figure 15 - Emergency Water Supply Trailer

Service interruption advisories will be distributed in the case of a water disruption more than 1 hr but less than 36hr. Each affected residence will receive a door hanger on the main entrance door as well as a verbal message.

Notes:


Advisory

EMERGENCY WATER SERVICE INTERRUPTION

The City of Saskatoon is repairing the water system that services your residence. Normal water service will not be available in your home until these repairs are completed. Every effort is being made to complete the repairs as quickly as possible, but before we can undertake repairs we must "Dial Before We Dig".

Please advise all residents of the building.

If we cannot undertake repairs within eight hours, an Emergency Water Supply Trailer will be provided when one becomes available.

When the repairs are complete the City will flush the watermain and restore normal water service to you. Water quality testing is conducted after all repairs are complete.

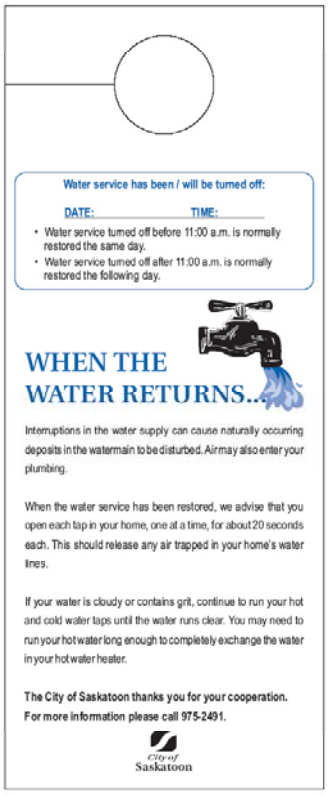
Please see the back for Important Water Quality Instructions.

City of Saskatoon

Figure 16 - Service Interruption Advisory Front

The date and time of the start of the water disruption must be written or stamped on the back of the hanger. Apartments require hangers on the main doors only. Gated communities will require hangers on each residence if access is given to the community, if not hangers may be posted on the main entrances.

Notes:


Water service has been / will be turned off:

DATE: TIME:

- Water service turned off before 11:00 a.m. is normally restored the same day.
- Water service turned off after 11:00 a.m. is normally restored the following day.

WHEN THE WATER RETURNS...

Interruptions in the water supply can cause naturally occurring deposits in the watermain to be disturbed. Air may also enter your plumbing.

When the water service has been restored, we advise that you open each tap in your home, one at a time, for about 20 seconds each. This should release any air trapped in your home's water lines.

If your water is cloudy or contains grit, continue to run your hot and cold water taps until the water runs clear. You may need to run your hot water long enough to completely exchange the water in your hot water heater.

The City of Saskatoon thanks you for your cooperation.
For more information please call 975-2491.

City of Saskatoon

Figure 17 - Service Interruption Advisory Back

Temporary water connections are sometimes used to supply water when a curb stop is being replaced. Temporary hook ups can be installed from neighbouring properties or a hydrant. Notes:

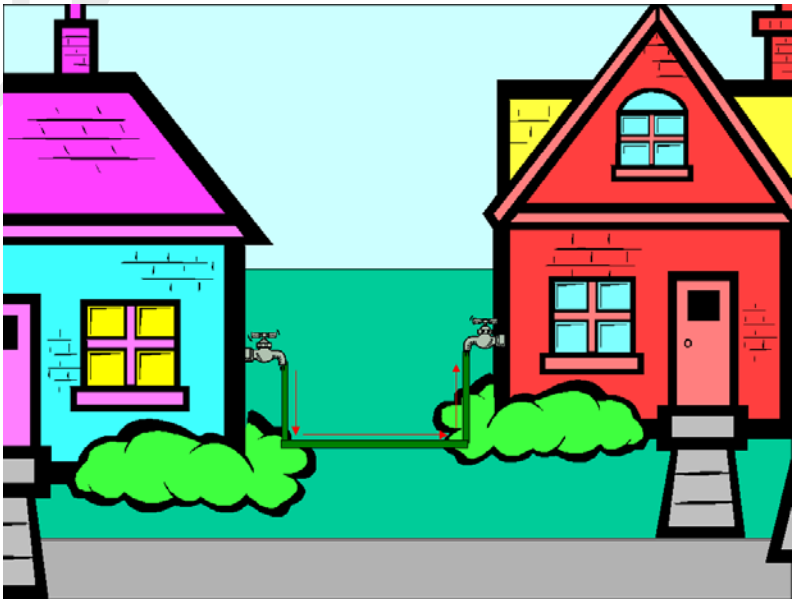


Figure 18 - Temporary Water Connection

When excavating to repair a water main, ensure that the majority of the excavation is on the opposite side of the sewer main, - if possible.

Notes:

Figure 19 - Excavator/backhoe Excavating

The trench will be sorted into salvageable material (wet or dry), and non-salvageable material. If stockpiling of salvageable material on site is not a viable option, a dumpsite will be used. The toe of the spoil piles must be a minimum of 1m (3feet 4inches) from the edge of the excavation.

Notes:

Figure 20 –Spoil Piles

Protect labourers in an excavation by sloping the walls or installing shoring. A combination 1:1 (45 degree) slope and vertical face may be used, as long as the vertical face does not exceed 1.2m (4feet) and the overall depth of the excavation is not greater than 5m (15feet)

Notes:

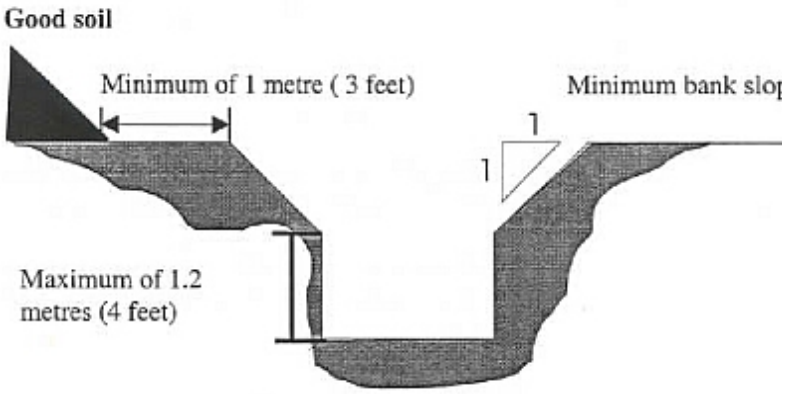


Figure 21 - Sloping the excavation walls.

To calculate the size of the excavation if shoring is not used, determine the depth required. The depth can be determined by measuring manhole depths, valve casings, valve chambers etc. Use the following formula given in Figure 22 - Excavation Width Calculation

Notes:

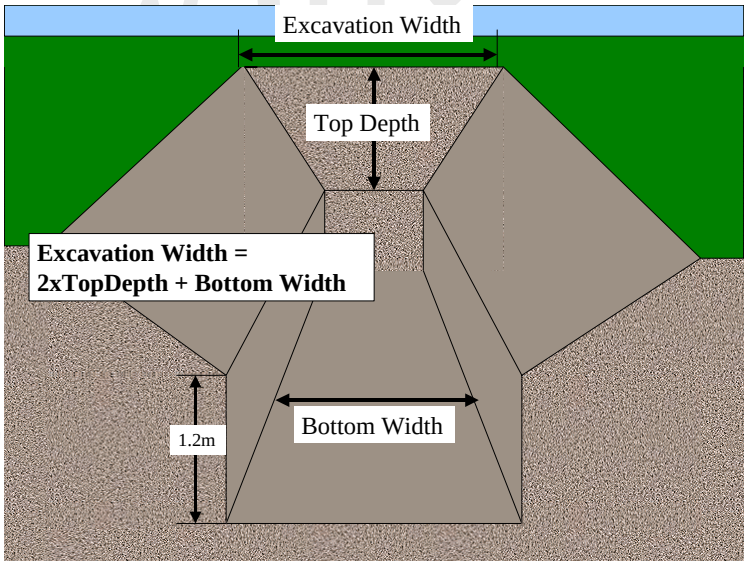


Figure 22 - Excavation Width Calculation

It is best practice to minimize the size of the excavation by installing shoring instead of sloping the excavation walls.

Notes:

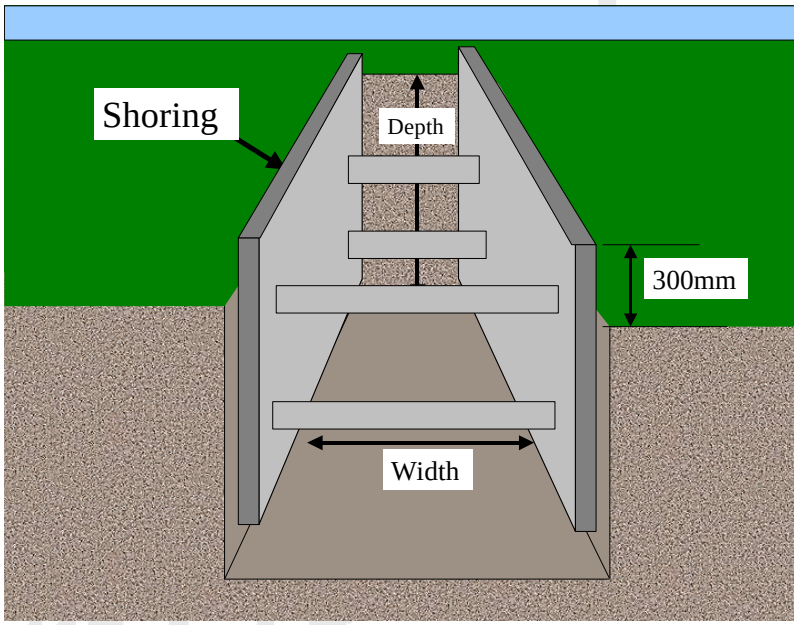


Figure 23 - Excavation With Shoring

While locating a buried utility deeper than 1.2meters (4feet), shoring shall be placed in excavation prior to a worker probing for the utility.

Notes:

Figure 24 - Feeling Rod

Support buried utilities as required during excavation.

Notes:

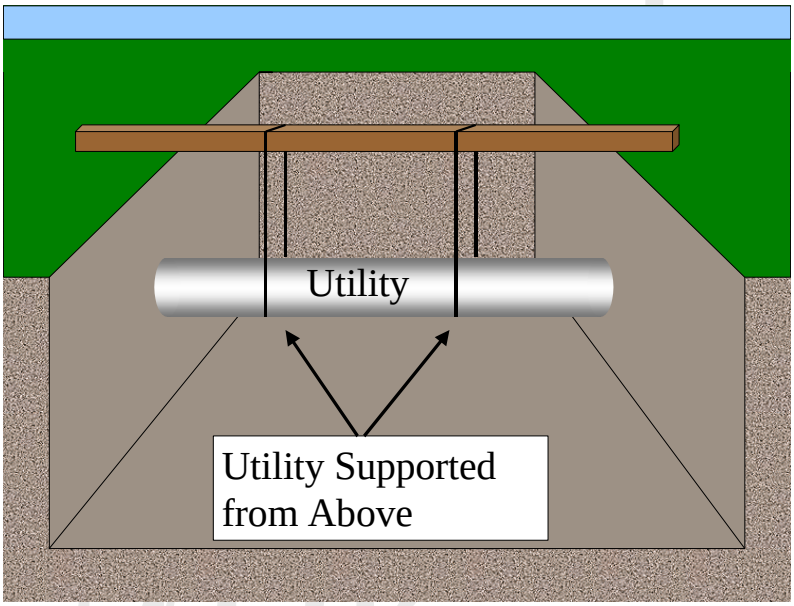


Figure 25 - Supported Utility

General Excavation Safety

In the event of a natural gas line hit, the machine shall be immediately turned off, as the engine may ignite the gas, especially in calm conditions.

Notes:

Figure 26 - Excavator/backhoe that struck gas line.

Should a power line come to rest on the equipment, do not exit the equipment. Exit only when told it is safe to do so.

Notes:

Figure 27 - Truck contacted overhead power lines.

Don't get between excavator bucket and the truck being loaded. Never stand under the bucket of the excavator/backhoe. Keep everyone in work area clear of the swing of the turntable and reach of the excavator/backhoe.

Notes:

Figure 28 – Danger Zone

No worker will enter a trench greater than 1.2m (4feet) in depth, without the installation of a temporary protective structure.

Notes:

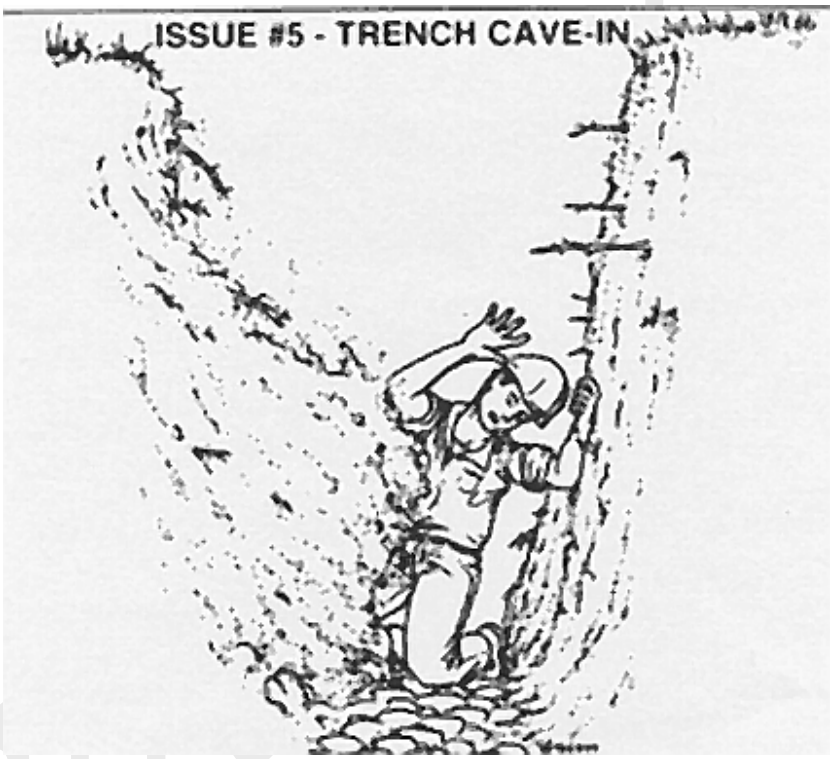


Figure 29 - Trench Cave-in

Preparing for Repair

Should an excess amount of water be observed in the trench, install a submersible pump.

Notes:

Figure 30 - Submersible Pump

Make sure shoring and trailer, are clean and in proper working order for transporting. Shoring trailers shall not be used to transport material unless designated for such use. Park trailer where there are no overhead lines or tree branches. Look for cracks on eyebolts and chains. Ensure that tie down straps are in good condition (Not frayed or torn).

Notes:

Figure 31 - Shoring on Trailer

Hook up chain appropriately so as not to crowd lift or flexibility. Keep the chain short when transporting the shoring from the trailer to the excavation, to prevent shoring from swinging.

Notes:

Figure 32 – Shoring Installation.

Position the excavator/backhoe far enough back so the shoring can be lifted and lowered safely. Use tag lines whenever possible. Naturally frozen soil is not considered safe and therefore must be shored.

Notes:

Figure 33 – Shoring in Excavation.

Once the shoring is in the excavation the side panels must be expanded hydraulically to be tight against the excavation walls. Endplates must be installed if the ends of the excavation are not sloped.

Notes:

Figure 34 – Shoring with Endplates

All tools must be disinfected prior to use on a water main, especially if they have been previously used on a sewer repair. Ensure that the proper disinfectant applicator is used.

Notes:

Figure 35 - Disinfectant Applicator

Clean off excess dirt with a rag and wire brush prior to soaking with disinfectant. Soak items with disinfectant solution (Min 5% Sodium Hypo-chlorite solution), let soak for a minimum of 7 seconds. Scrub item with a clean rag, and then rinse clean with disinfectant solution. Let tools dry before use.

Notes:

Figure 36 – Disinfecting

After shoring is in place, install and secure the ladder in the excavation. Labourers must wear all the required personal protective equipment.

Notes:

Figure 37 – Labourer Entering Excavation

Three points of contact must be kept on the ladder when in use.

Notes:

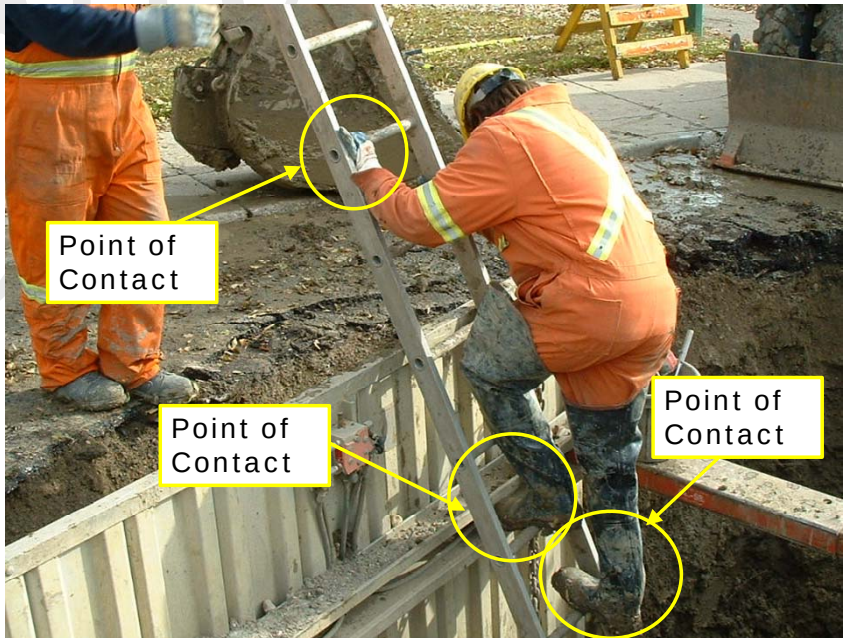


Figure 38 - Three Points of Contact

Expose pipe by removing soil with tunnelling shovel.

Notes:

Figure 39 - Excavating with tunnelling shovel

Pipe should be washed in order to inspect condition and to determine what method and materials will be used to perform repairs.

Notes:

Figure 40 – Cleaning pipe to Identify break type

Replacing A Section of Pipe

Water connection repairs include anything from the main stop to the curb stop. The repair can be the replacement of a section of pipe or the replacement of the main stop and the connection pipe.

Notes:

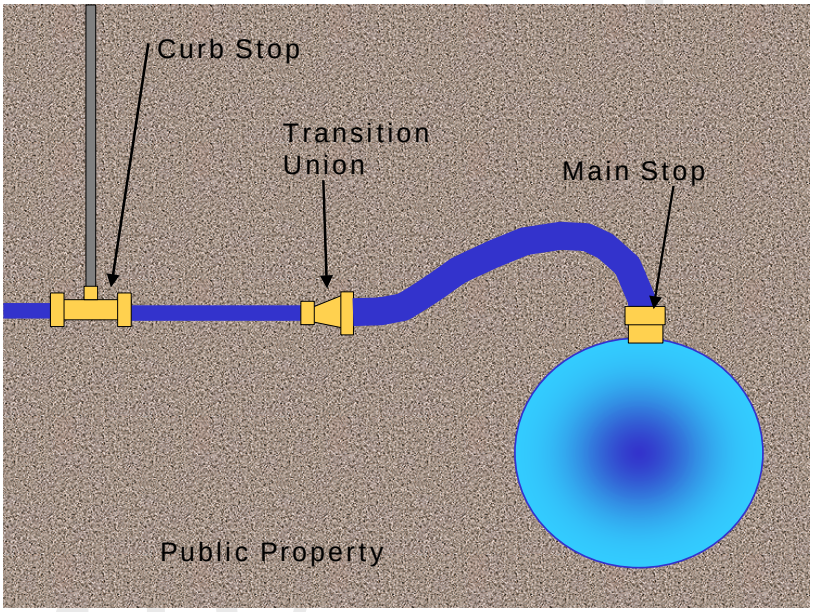


Figure 41 - Water Connection

If a small section of pipe is damaged it can be replaced with a new section of pipe and two unions.

Notes:

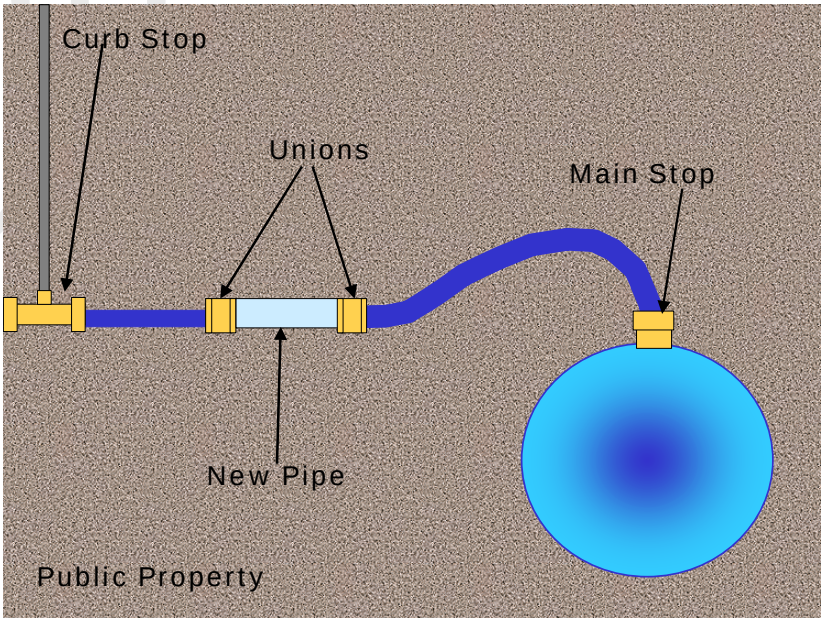


Figure 42 - Pipe Replacement

Remove the damaged pipe section and cut new pipe to fit.

Notes:

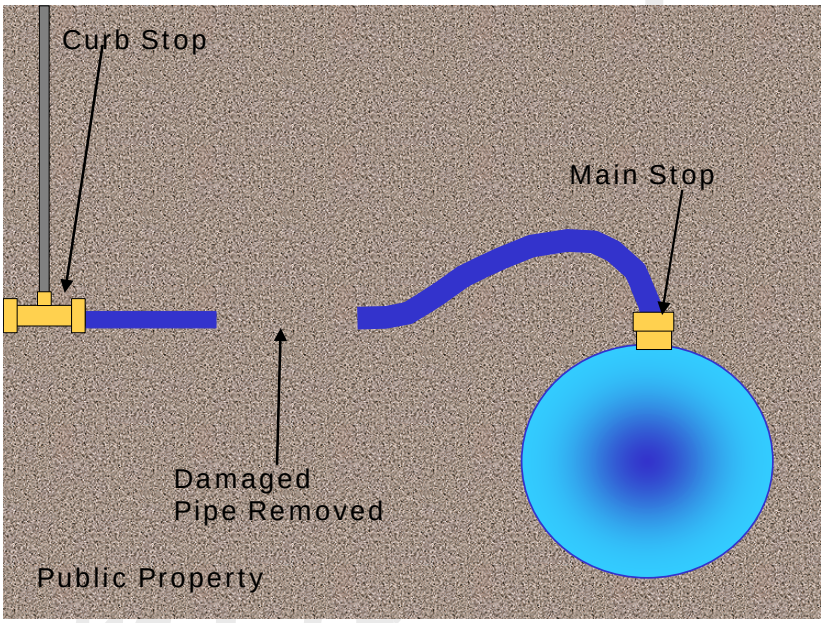


Figure 43 - Damaged Pipe Removed

If using polyethylene pipe, polyethylene inserts must be put into the pipe prior to inserting it into the union.

Notes:

Figure 44 - Inserting the Insert

Unscrew the nuts on the ends of the union. Slide the nut onto the pipe, and then slide the pipe into the union until it hits the centring stop.

Notes:

Figure 45 - Union Apart

Tighten the nut on the union. Repeat the process with the other pipe end.

Notes:

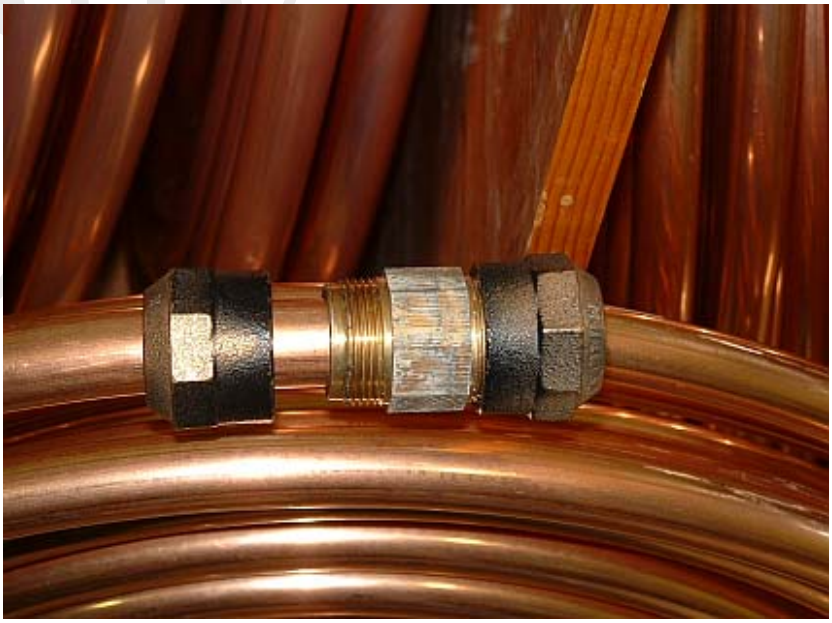


Figure 46 - Union on Pipe

Replacing the Main Stop

If the main stop requires replacement it must not be inserted into old direct taps, instead a service clamp or tapping saddle must be used.

Notes:

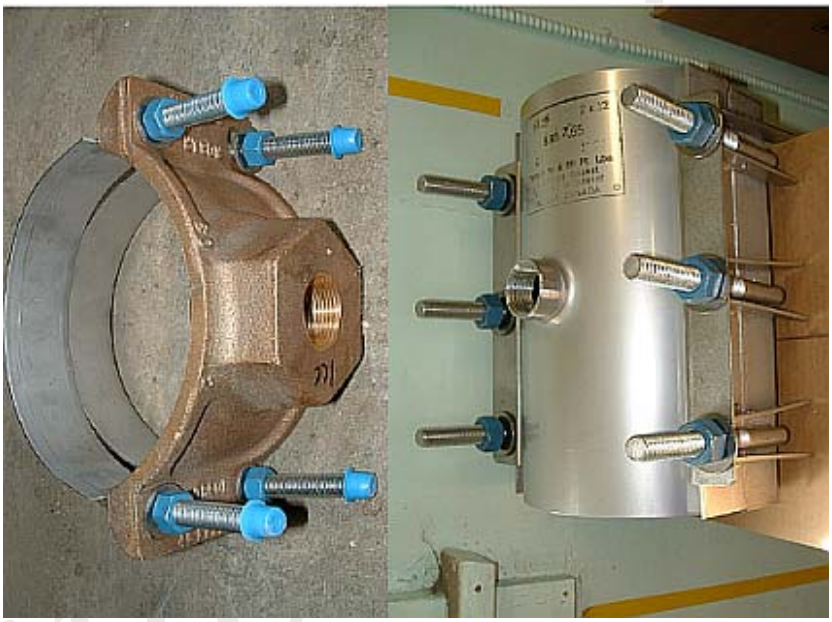


Figure 47 - Service Saddle and Tapping Sleeve

To remove the existing main-stop, loosen the brass nut on the main stop and pull existing pipe out. Unscrew the main stop from the main, service clamp or tapping sleeve

Notes:

Figure 48 - Removing Pipe

Move the existing pipe to make room for the repair. Tie a rag around the end to prevent debris from entering the pipe.

Notes:

Figure 49 - Protect Pipe from Debris

Clean entire circumference of water main, attention should be given to area around tapping hole. This will ensure the gasket seals properly.

Notes:

Figure 50 - Clean Section of Pipe

Set the top section of the service saddle on the pipe. Slip the strap under the pipe.

Notes:

Figure 51 - Service Saddle Top

Slip the second strap under the pipe. Feed the threaded section of the straps through the top section.

Notes:

Figure 52 - Service Saddle Straps

Hand tighten the service saddle nuts onto the threaded sections of the straps.

Notes:

Figure 53 - Service Saddle Nuts

Tighten the nuts with the strong arm.

Notes

Figure 54 - Tighten With Strong Arm

Tighten new service clamp or tapping sleeve over cleaned pipe. Make certain the holes line up with water main and service clamp or tapping sleeve

Notes:

Figure 55 - Tighten With Drill

Alternately tighten bolts to ensure even torque and periodically check alignment of the tapping. The service saddle shall be torqued to 45 ft-lbs and the tapping sleeve is torqued to 30-35 ft-lbs.

Notes:

Figure 56 - Alternate Tightening Pattern

Install main stop into service clamp or tapping sleeve. Threads of main stop should be covered with Teflon tape. Tighten with pipe a wrench.

Notes:

Figure 57 - Installing Main Stop

If the existing water connection pipe is copper or polyethylene than it can be reconnected to the curb stop. Ensure the pipe is checked for damage prior to re-connecting it.

Notes:

Figure 58 - Inserting Pipe into Main

Installing Copper Gooseneck Section

If the existing water connection pipe is not copper or polyethylene the pipe must be cut back and a "goose necked" section of copper pipe will be installed from the main stop.

Notes:

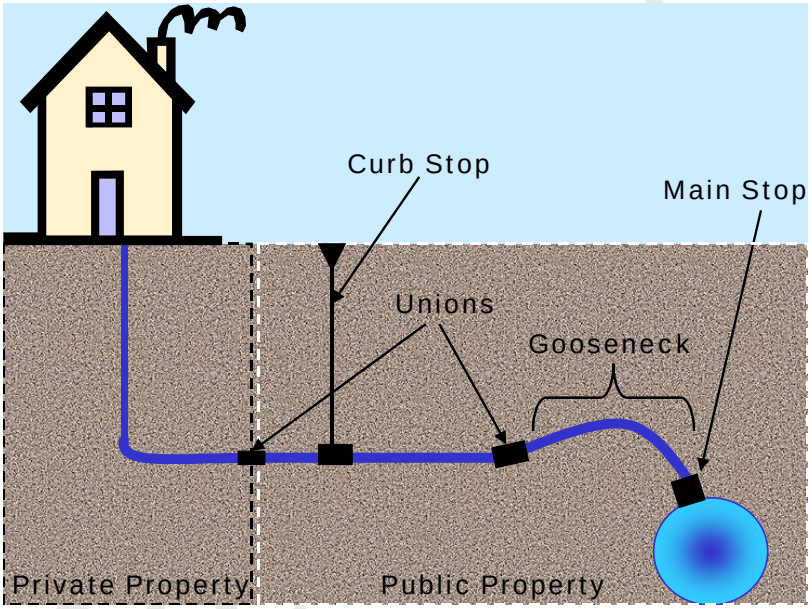


Figure 59 – Gooseneck Section

Cut existing pipe back approximately 1m (3ft). Make sure the new copper pipe is not flattened or deformed.

Notes:

Figure 60 - Cut Pipe

Cut a new piece of copper pipe with the copper pipe cutters.

Notes:

Figure 61 - Cutting Copper Pipe

Bend the pipe slowly so it angles about 85°. A pipe bender may be used to shape the pipe.

Note:

Figure 62 - Bending Pipe

Join the two pieces of pipe (existing and gooseneck) together by means of a brass compression fitting or union.

Notes:

Figure 63 - Joining Pipe

Connect the gooseneck pipe section to the water main. Take compression nut off main stop and slide over new copper

Notes:

Figure 64 - Main Stop Connection

Insert pipe into main stop and slide nut back, hand start threads. Caution must be taken not to cross thread the nut. If having difficulty starting threads, wiggle copper pipe to align threads.

Notes:

Figure 65 - Inserting Pipe

Tighten the compression nut onto the main stop, using crescent wrenches.

Notes:

Figure 66 - Tighten the Main Stop

After both union and main stop have been tightened open main stop slowly.

Notes:

Figure 67 - Opening the Main Stop

Check the main stop and connection pipe for leaks.

Notes:

Figure 68 - Inspecting For Leaks

Anode Installation

A 12lb anode must be installed on copper service connections, connected to non-metallic water mains.

Notes:

Figure 69 - 12lb Anode

A brass anode clamp will be used to connect the anode to copper pipe. Loose the screws and open as shown in Figure 70 - Open Anode Clamp.

Notes:

Figure 70 - Open Anode Clamp

Install clamp onto pipe and tighten screws.

Notes:

Figure 71 - Tighten Clamp onto Pipe

Loosen the top screw.

Notes:

Figure 72 - Loosen Top Screw

Insert the anode wire under the top screw of the clamp.

Notes:

Figure 73 - Insert Anode Wire

Tighten the top screw.

Notes:

Figure 74 - Tighten top Screw

In order for the anode to work, the cardboard packaging must be wet. Depending on the ground conditions, it can take several months to a year before a dry anode will soak up enough groundwater to work efficiently. In order to allow the anodes to function sooner, it is standard practice to soak the anodes with water before backfilling.

Notes:

Figure 75 - Anode

Post-repair

Remove all hand tools from excavation, exit, and remove ladder. Never throw tools out of excavation. Clean tools prior to storing.

Notes:

Figure 76 - Worker exiting excavation

The water connection will be flushed through a private tap for approximately 5min. If it is believed that the watermain has been contaminated the main will be flushed though the appropriate hydrant.

Notes:

Figure 77 - Running Faucet

If a water sample is taken at a private tap, remove the aerator, flush the tap and then take the sample. Ensure the address and location of the taps is recorded.

Notes:

Figure 78 - Removing Tap Aerator

If unable to flush the connection through a private tap or if it is believed the water main has become contaminated then use a hydrant for flushing. Disinfect throttle valve and hydrant port with disinfectant solution. Attach throttle valve and hose onto hydrant. Ensure throttle valve is open and run hose to the storm manhole or catch basin; alternately a diffuser can be used.

Notes:

Figure 79 - Disinfecting Throttle Valve

Test for turbidity and chlorine. Flush until turbidity and chlorine levels have been reached. Take a water sample with the water sample jar. Deliver water sample to the water treatment plant for bacteriological testing. Follow the procedures in the water quality SOP.

Notes:

Figure 80 - Water Testing

If the repair requires testing it will be left isolated from the rest of the water system until bacteriological results have been received.

Notes:

Figure 81 - Testing

Excavator/backhoe operator removes shoring from excavation, placing it on trailer. Ensure all shoring equipment and its trailer have been serviced and are ready for the next job. Keep shoring clean. Keep shoring & trailer clean. End plates should be stored in proper place on trailer and be easily accessible.

Notes:

Figure 82 – Removal of shoring

Backfill, General Information

If soil conditions at base of excavation are saturated and/or unstable, remove unsuitable material below pipe and replace with crushed rock and/or granular material.

Notes:

Figure 83 - Saturated Soil

Cover services connection and mains with 150mm [6in.] of granular material and compact. Use spoil material if suitable. If not, bring in clean backfill material.

Notes:

Figure 84 – Backfill

Non-shrink backfill shall be used when concrete or brick will be replaced, for example; curb boxes and hydrants. Leave non-shrink backfill a minimum of 300mm(12inch) below grade.

Notes:

Figure 85 - Non-shrink backfill

Ensure utilities are backfilled according to the specifications of the owner of the utility. A representative from the utility may be required to inspect and approve the bedding.

Notes:

Figure 86 - Backfilling with shovel

Backfill material should be free from loam [fertile material] sod, boulders, foreign material and frozen lumps.

Notes:

Figure 87 - Backfill Material

Mechanical methods of compaction are required. Select the method of compaction based on suitability.

Notes:

Figure 88 – Compactor

Handheld plate tampers are to be used for compacting in the pipe zone, around manholes etc. Backfill shall be placed in 150mm (6 inch) lifts.

Notes:

Figure 89 – Handheld plate tamper

Hydraulic tamper [excavator attachment] cannot be used closer than 1m (3ft.) directly above pipe or service. Backfill shall be placed in 150mm (6 inch) lifts.

Notes:

Figure 90 - Hydraulic Tamper

Walk behind vibratory compactor can be used around mains, connections and manhole barrels etc. Backfill shall be placed in 150mm (6inch) lifts.

Notes:

Figure 91 - Vibratory Compactor

Bucket tamping is not an approved method of compacting.

Notes:

Figure 92 - Tamping with the Excavator/backhoe

Before leaving the site any unnecessary traffic control devices will be removed, as per traffic control manual.

Notes:

Figure 93 - Road sign

Others will perform site restoration.

Notes:

Figure 94 – Restoration of Water Connection

Resources Required

People

1 - Supervisor IV

2 - Labourers

1 - Excavator/Backhoe operator

2 - Tandem axle truck operators

1 - Loader operator (as required)

Figure 95- Crew

Equipment / Tools

Figure 96 - Feeling rod

Notes:

Figure 97 - Tunnelling Shovel

Notes:

Figure 98 - Shovels

Notes:

Figure 99- Broom

Notes:

Figure 100 - Cordless drill

Notes:

Figure 101 - Strong Arm

Notes:

Figure 102 - Sledge Hammer

Notes:

Figure 103 - Pick Axe

Notes:

Figure 104 - Valve Key

Notes:

Figure 105 - Disinfectant Sprayer

Notes:

Figure 106 – Asphalt/Concrete Saw

Notes:

Figure 107 – Emergency Water Supply Trailer

Notes:

Figure 108 - Crew Trailer

Notes:

Figure 109 – Excavator/backhoe

Notes:

Figure 110 - Shoring & Trailer

Notes:

Figure 111 – Truck

Notes:

Figure 112 - Front End Loader

Notes:

Figure 113 - Hydrant Key

Notes:

Figure 114 - Hydrant Hose

Notes:

Figure 115 - Diffuser

Notes:

Figure 116 - Hydraulic Tamper [excavator attachment]

Notes:

Figure 117 - Vibratory Compactor

Notes:

Figure 118 - Handheld Plate Tamper

Notes:

Figure 119 - Turbidity Meter

Notes:

Figure 120 - Chlorine Tester

Notes:

Figure 121 - Crescent Wrench

Notes:

Figure 122 - Copper Pipe Cutters

Notes:

Figure 123 – Hacksaw

Notes:

Figure 124 - Pipe Wrench

Notes:

Figure 125 - Levelling Rake

Notes:

Figure 126 - Torque Wrench

Notes:

Figure 127 - Copper Pipe Bender

Notes:

Material

Figure 128 – Service Saddle

Notes:

Figure 129 – Tapping Sleeve

Notes:

Figure 130 – Pipe Insert

Notes:

Figure 131 – Copper Pipe

Notes:

Figure 132 - Brass Union

Notes:

Figure 133 - Transition Union

Notes:

Figure 134 - Water sample Jar

Notes:

Figure 135 - Cleaning rags

Notes:

Figure 136 - Treated block

Notes:

Table of Figures

FIGURE 1 – WATER SERVICE DISRUPTION REPORT. 3
FIGURE 2 - SECTION A OF WATER SERVICE DISRUPTION REPORT 4
FIGURE 3 - SECTION B OF WATER SERVICES DISRUPTION REPORT 4
FIGURE 4 - CLEARANCE AND LOCATIONS WORK GROUP 5
FIGURE 5 - DAILY WORK SHEET 5
FIGURE 6 - DAILY WORK SHEET SECTION A 6
FIGURE 7 - DAILY WORK SHEET SECTION B 7
FIGURE 8 - DAILY WORK SHEET SECTION C 7
FIGURE 9 - YARDS STORES 8
FIGURE 10 – SHORING ON TRAILER 8
FIGURE 11 - TRAILER LOCATION 9
FIGURE 12 - APWA COLOUR CODES 9
FIGURE 13 – CONCRETE SAW 10
FIGURE 14 – RECYCLING 10
FIGURE 15 - EMERGENCY WATER SUPPLY TRAILER 11
FIGURE 16 - SERVICE INTERRUPTION ADVISORY FRONT 11
FIGURE 17 - SERVICE INTERRUPTION ADVISORY BACK 12
FIGURE 18 - TEMPORARY WATER CONNECTION 12
FIGURE 19 - EXCAVATOR/BACKHOE EXCAVATING 13
FIGURE 20 –SPOIL PILES 13
FIGURE 21 - SLOPING THE EXCAVATION WALLS. 14
FIGURE 22 - EXCAVATION WIDTH CALCULATION 14
FIGURE 23 - EXCAVATION WITH SHORING 15
FIGURE 24 - FEELING ROD 15
FIGURE 25 - SUPPORTED UTILITY 16
FIGURE 26 - EXCAVATOR/BACKHOE THAT STRUCK GAS LINE. 16
FIGURE 27 - TRUCK CONTACTED OVERHEAD POWER LINES. 17
FIGURE 28 – DANGER ZONE 17
FIGURE 29 - TRENCH CAVE-IN 18
FIGURE 30 - SUBMERSIBLE PUMP 18
FIGURE 31 - SHORING ON TRAILER 19
FIGURE 32 – SHORING INSTALLATION. 19
FIGURE 33 – SHORING IN EXCAVATION. 20
FIGURE 34 – SHORING WITH ENDPLATES 20
FIGURE 35 - DISINFECTANT APPLICATOR 21
FIGURE 36 – DISINFECTING 21
FIGURE 37 – LABOURER ENTERING EXCAVATION 22
FIGURE 38 - THREE POINTS OF CONTACT 22
FIGURE 39 - EXCAVATING WITH TUNNELLING SHOVEL 23
FIGURE 40 – CLEANING PIPE TO IDENTIFY BREAK TYPE 23
FIGURE 41 - WATER CONNECTION 24
FIGURE 42 - PIPE REPLACEMENT 24
FIGURE 43 - DAMAGED PIPE REMOVED 25
FIGURE 44 - INSERTING THE INSERT 25
FIGURE 45 - UNION APART 26
FIGURE 46 - UNION ON PIPE 26
FIGURE 47 - SERVICE SADDLE AND TAPPING SLEEVE 27
FIGURE 48 - REMOVING PIPE 27
FIGURE 49 - PROTECT PIPE FROM DEBRIS 28
FIGURE 50 - CLEAN SECTION OF PIPE 28
FIGURE 51 - SERVICE SADDLE TOP 29
FIGURE 52 - SERVICE SADDLE STRAPS 29
FIGURE 53 - SERVICE SADDLE NUTS 30
FIGURE 54 - TIGHTEN WITH STRONG ARM 30
FIGURE 55 - TIGHTEN WITH DRILL 31
FIGURE 56 - ALTERNATE TIGHTENING PATTERN 31
FIGURE 57 - INSTALLING MAIN STOP 32
FIGURE 58 - INSERTING PIPE INTO MAIN 32
FIGURE 59 – GOOSENECK SECTION 33
FIGURE 60 - CUT PIPE 33
FIGURE 61 - CUTTING COPPER PIPE 34
FIGURE 62 - BENDING PIPE 34
FIGURE 63 - JOINING PIPE 35
FIGURE 64 - MAIN STOP CONNECTION 35
FIGURE 65 - INSERTING PIPE 36
FIGURE 66 - TIGHTEN THE MAIN STOP 36
FIGURE 67 - OPENING THE MAIN STOP 37

FIGURE 68 - INSPECTING FOR LEAKS 37
FIGURE 69 - 12LB ANODE 38
FIGURE 70 - OPEN ANODE CLAMP 38
FIGURE 71 - TIGHTEN CLAMP ONTO PIPE 39
FIGURE 72 - LOOSEN TOP SCREW 39
FIGURE 73 - INSERT ANODE WIRE 40
FIGURE 74 - TIGHTEN TOP SCREW 40
FIGURE 75 - ANODE 41
FIGURE 76 - WORKER EXITING EXCAVATION 41
FIGURE 77 - RUNNING FAUCET 42
FIGURE 78 - REMOVING TAP AERATOR 42
FIGURE 79 - DISINFECTING THROTTLE VALVE 43
FIGURE 80 - WATER TESTING 43
FIGURE 81 - TESTING 44
FIGURE 82 – REMOVAL OF SHORING 44
FIGURE 83 - SATURATED SOIL 45
FIGURE 84 – BACKFILL 45
FIGURE 85 - NON-SHRINK BACKFILL 46
FIGURE 86 - BACKFILLING WITH SHOVEL 46
FIGURE 87 - BACKFILL MATERIAL 47
FIGURE 88 – COMPACTOR 47
FIGURE 89 – HANDHELD PLATE TAMPER 48
FIGURE 90 - HYDRAULIC TAMPER 48
FIGURE 91 - VIBRATORY COMPACTOR 49
FIGURE 92 - TAMPING WITH THE EXCAVATOR/BACKHOE 49
FIGURE 93 - ROAD SIGN 50
FIGURE 94 – RESTORATION OF WATER CONNECTION 50
FIGURE 95- CREW 51
FIGURE 96 - FEELING ROD 51
FIGURE 97 - TUNNELLING SHOVEL 51
FIGURE 98 - SHOVELS 52
FIGURE 99- BROOM 52
FIGURE 100 - CORDLESS DRILL 52
FIGURE 101 - STRONG ARM 52
FIGURE 102 - SLEDGE HAMMER 53
FIGURE 103 - PICK AXE 53
FIGURE 104 - VALVE KEY 53
FIGURE 105 - DISINFECTANT SPRAYER 53
FIGURE 106 – ASPHALT/CONCRETE SAW 54
FIGURE 107 – EMERGENCY WATER SUPPLY TRAILER 54
FIGURE 108 - CREW TRAILER 54
FIGURE 109 – EXCAVATOR/BACKHOE 54
FIGURE 110 - SHORING & TRAILER 55
FIGURE 111 – TRUCK 55
FIGURE 112 - FRONT END LOADER 55
FIGURE 113 - HYDRANT KEY 55
FIGURE 114 - HYDRANT HOSE 56
FIGURE 115 - DIFFUSER 56
FIGURE 116 - HYDRAULIC TAMPER [EXCAVATOR ATTACHMENT] 56
FIGURE 117 - VIBRATORY COMPACTOR 56
FIGURE 118 - HANDHELD PLATE TAMPER 57
FIGURE 119 - TURBIDITY METER 57
FIGURE 120 - CHLORINE TESTER 57
FIGURE 121 - CRESCENT WRENCH 57
FIGURE 122 - COPPER PIPE CUTTERS 58
FIGURE 123 – HACKSAW 58
FIGURE 124 - PIPE WRENCH 58
FIGURE 125 - LEVELLING RAKE 58
FIGURE 126 - TORQUE WRENCH 59
FIGURE 127 - COPPER PIPE BENDER 59
FIGURE 128 – SERVICE SADDLE 60
FIGURE 129 – TAPPING SLEEVE 60
FIGURE 130 – PIPE INSERT 60
FIGURE 131 – COPPER PIPE 60
FIGURE 132 - BRASS UNION 61
FIGURE 133 - TRANSITION UNION 61
FIGURE 134 - WATER SAMPLE JAR 61
FIGURE 135 - CLEANING RAGS 61
FIGURE 136 - TREATED BLOCK 62

Index

A

asphalt....11
Asphalt....2, 3, 11, 55, 65

B

Backfill....i, 2, 46, 47, 48, 49, 50, 65
Backhoe....2, 14, 17, 18, 45, 50, 52, 55, 64, 65

C

Clamp....2, 28, 32, 33, 39, 40, 41, 65
Colour Codes....10, 64
Compactor....48, 50, 57, 65
Copper Pipe....35, 59, 60, 61, 64, 65
curb stop....25

D

Diffuser....44, 57, 65
Disinfectant....22, 44, 54, 64, 65

E

Emergency Water Supply Trailer....12, 55, 64, 65
excavation....i, 15, 42, 45
Excavator....2, 9, 14, 17, 18, 21, 45, 49, 50, 52, 55, 57, 64, 65
Excavator/Backhoe....2, 9, 18, 21, 52

G

Gasket....29

H

hand tools....42
Hydraulic tamper....49

M

main stop....2, 25, 28, 33, 34, 36, 37, 38
Main Stop....i, 2, 25, 28, 33, 34, 36, 37, 38, 64
manhole....15

P

Polyethylene....2, 26, 33, 34
Pump....19, 64

Q

quickie saw....11

S

Service Interruption Advisory....12, 13
shoring....2, 9, 16, 20, 21, 23, 45
Shoring....2, 9, 15, 16, 20, 21, 23, 45, 56, 64, 65
slope....15
Slope....15
Strong Arm....53
strong arm.....31

T

Tamper....49, 57, 58, 65
Torque....32, 60, 65

U

union....2, 26, 27, 36, 38
Union....2, 26, 27, 36, 38, 62, 64, 65

V

Valve Key....54, 65
valves....3, 5