Welcome to the 'Maintain and Repair Wastewater Collection Assets', unit in the course Certificate II in Water Industry Operations (CWI).

- Each screen has an activity.
- Each activity is supported with three tabs, called Mentor Advice, Resources and Feedback.
- Click each of these tabs to learn more.

Over the next 60 minutes you will work through a series of screens.

Click the mentor advice tab at any time to get advice on what you need to learn to complete an activity.

Acknowledgments

Our thanks to Tyco for sponsoring these E-Learning materials.
In this topic you will learn how to:
- Plan and prepare for maintenance
- Conduct maintenance and repair work
- Finalise Work

In this topic you will:
- Complete various on-screen activities
- Receive advice from a mentor
- Watch videos and listen to audio
- Read procedures and other documents.
At the end of this topic, you will sit a review. Your score from this review is for learning purposes only and does not count towards your formal assessment.

This training is based on the competency unit called "Maintain and Repair Wastewater Collection Assets (NWP2558)" This unit is part of the qualification called Certificate II in Water Industry Operations.
**Scenario:** Wastewater is also referred to as sewerage. The wastewater system is influenced by a variety of factors including flow, inflow and infiltration.

<table>
<thead>
<tr>
<th>Terms</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic and Industrial</td>
<td>The ingress of stormwater in the sewer system through illegal connections, disconnector guilty traps, overflow relief guilty or other sewer faults</td>
</tr>
<tr>
<td>Gravity flow, pump stations, vacuum stations</td>
<td>The ingress of rainwater or groundwater into the wastewater collection system through deteriorating or faulty pipe mains</td>
</tr>
<tr>
<td>Inflow</td>
<td>Terms for the different types of wastewater</td>
</tr>
<tr>
<td>Infiltration</td>
<td>Factors that govern flow of reticulated wastewater</td>
</tr>
</tbody>
</table>

**Question:** What OH&S requirements need to be considered before undertaking a maintenance or repair task?

- [ ] Personal Protective Equipment
- [ ] Site Hazard assessment
- [ ] Ensuring relevant tickets and licenses are held
- [ ] All of the above.
**Question:** Why is it important to locate services before excavation (for example by using Dial Before You Dig)? Choose all the correct options.

- To avoid damage to other utilities
- It is required by legislation
- It’s not important to use these services
- To factor in additional costs

---

**Question:** The worksite should be assessed for hazards in order to:

- Note the hazards but take no action
- Determine what additional safety measures are required
- Make sure you avoid the hazards but not mention them to others or staff
- Do nothing
It is extremely important that trench excavation is completed in a safe manner.

- Excavating the site – What is incorrect in this picture?
  - Ensure there is spotter when operating equipment near live electrical parts.
  - Machinery can be used for some excavations.
  - Incorrect PPE is worn in this photo. E.g., no long sleeves, long pants.
  - Operator is not wearing seat belt.
  - Area is not sectioned off appropriately (witch’s hats are not sufficient).

Some trench excavation safety hazards are:
- Insufficient shoring.
- Entering a deep trench without shoring and placing spoil on the uphill slope of a trench.

- Excavating the site
  - Store tools and equipment away from excavation.
  - Ensure correct PPE is worn by all on site.
  - Install fencing where required.
  - Excavations deeper than 1.5m require shoring/benching.
  - Hand tools may be used for certain excavations.
**Question:** Which is the correct method, scenario 1 or 2?

- **Scenario 1:**
  Worker A is preparing for repair of a wastewater asset. They have used a 12 volt electric pump to dewater the trench. The worker is pumping the wastewater back through the main.

- **Scenario 2:**
  Worker B is preparing for repair of a wastewater asset. They have used a flex drive pump to dewater the trench. The worker is pumping the wastewater onto the footpath nearby.

---

**Question:** You arrive at the worksite and are going to clear a blockage in the sewer main by use of jetter/cutter. Have a go at putting the steps in the correct order.

- **Process name**
  - The obstruction is cleared (if it cannot be cleared it’s noted for further CCTV investigation)
  - Dismantle equipment and fill jetter/cutter with oil. Replace manhole lid and ensure site is cleaned
  - Check the area against the map to identify relevant manholes
  - Place a catching cage downstream of manhole (if large amount of debris is expected)
  - Assemble the jetter/cutter, tigertail and guide roller
  - Place the jetter/cutter in manhole and turn on
  - A crew member proceeds to target manhole to signal to the machine operator when the jetter/hoodel cutter appears

---

© Commonwealth of Australia 2009
National Water Training

CCTV Survey of sewers

Instructions

The pipe needs to be sufficiently clean to assess its condition via CCTV?
The camera and crawler can be lowered or raised over a person in the manhole?
The camera can traverse the pipe in an upstream direction only?
All defects in the pipe should be noted?
All recorded measurements are to be taken from the manhole?

True False

Mentor Advice

Only specially trained personnel should operate CCTV equipment.

Resources

Smoke Testing of Sewers

Question: What equipment is needed to smoke test sewers? Click all the correct answers.

Instructions

Select the equipment needed to smoke test sewers. Submit your choices for Feedback. When you are done, click Next to continue.

Mentor Advice

Move the mouse over each choice for a description.

Option one
Option two
Option three
Option four

Resources

Index Glossary Help © Commonwealth of Australia 2009
Overflow Cleanup

Question: Sewer overflow can be caused by (tick all that apply).

- Equipment malfunction
- Power outage
- Excessive wet weather infiltration
- Sewer break/blockage

Resources

Index Glossary Help

The Environmental Protection Agency/Department of Environment enforces the Environmental Protection Act 1994. While its primary purpose is to protect the environment, the safety of people comes first and anyone taking action to protect the environment must first have determined that their methods will be safe.

Resources

Index Glossary Help

© Commonwealth of Australia 2009

Question: Tick all that apply. Contaminated materials should be...

- Disposed of onsite
- Left wherever at the site
- Contained onsite and then removed to an appropriate disposal site
- Kept anywhere onsite and then removed

Resources

Index Glossary Help

© Commonwealth of Australia 2009
**Overflow Cleanup**

**Question:** In the event of a sewer overflow you will need to assess which of the following impacts? Tick all that apply.

- Environmental
- Health
- Safety
- Visual

**Sewer Patching**

**Question:** You arrive at the worksite where you are required to undertake sewer patching of a cracked and broken sewer pipeline. How will you go about this? Have a go at putting the steps in order.

- **Process name**
  - Attach to pressure check gauge to monitor pressure during curing
  - Deflate and remove packer after recommended curing time
  - Clean and survey pipe for repair. Locate and mark defect location
  - Insert packer into protective polythene tube and secure both ends
  - Mix resin and coat both sides of glass matting
  - Wrap impregnated glass around packer
  - Position packer at point of repair. Inflate to recommended pressure with compressor
**Pipe Section Replacement**

**Question:** You have been called upon to undertake pipe section replacement. How will you go about this job? Have a go at putting the steps in order.

**Process name**

- Place the gibaunt or adapter onto the main to be repaired.
- Tighten the gibaunts or adapters sequentially as per manufacturer’s instructions.
- Cut out the failed pipe section and set aside for future examination.
- Undertake bevelling and cleaning of the section of pipes where coupling or gibaunt joints will sit.
- Measure and cut a new section of pipe for insertion.

---

**Sewer Junction and Jump Up Replacement**

Common faults with **junctions** are cracking and tree root infiltration causing blockage. **Jump-ups** are often cracked through ground movement or poor installation and usually allow infiltration by tree roots, or in extreme cases are completely misaligned.

*Please note the excavation in the images below is below 1.5m*

**Sewer Junction and Jump Up Replacement**

Cut out failed junction or jump up, chain cutters may be required dependent upon pipe material.
Common faults with junctions are cracking and tree root infiltration causing blockage. Jump-ups are often cracked through ground movement or poor installation and usually allow infiltration by tree roots, or in extreme cases are completely misaligned.

*Please note the excavation in the images below is below 1.5m

When the original pipe work is vitreous clay the repair will commonly result in full replacement of the connection.

The pipe ends should be primed with RED primer and glued with BLUE adhesive.

Replacement PVC pipe should be measured and cut ready for installation.

The joining method will vary based on materials being used.
Common faults with junctions are cracking and tree root infiltration causing blockage. Jump-ups are often cracked through ground movement or poor installation and usually allow infiltration by tree roots, or in extreme cases are completely misaligned.

*Please note the excavation in the images below is below 1.5m*
Backfilling and restoration

Not all excavations need to be backfilled by suitable compactable materials. True or False?

Excavation should be backfilled in layers no deeper than 300mm to a minimum 95% standard relative density.

Selected materials should be hand shovelled over each exposed joint.

Final backfilling can only be completed by machine.

Compaction

Where compaction has been ordered the trench has been externally dewatered. The dewatering equipment should be kept operating until the compaction of the trench has been completed.
Scenario: There are different requirements for trench floors. Consider each floor type. What action would you recommend?

<table>
<thead>
<tr>
<th>Trench floor type</th>
<th>Recommended action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholly in rock</td>
<td>Dig deeper and use more bedding sand</td>
</tr>
<tr>
<td>Firm, stiff or hard clay soil</td>
<td>Seek specialist advice to ensure zero post installation partial or total settlement</td>
</tr>
<tr>
<td>Soft clay or sand</td>
<td>Leave as irregular and place bedding directly on the floor</td>
</tr>
<tr>
<td>Very soft clay, old fill, refuse, irregular outcrops of rock</td>
<td>Trim to smoothen, remove all loose material and place bedding material directly on the floor</td>
</tr>
</tbody>
</table>

For each maintenance or repair job relevant documentation will need to be completed, this may include:

- A work order and record details on other documents
- Asset condition form detailing root cause of fault
- GIS map detailing the location of the repair
- Photograph of completed repair for future reference.

It is important that you maintain all required documentation for each job.
Great work, you have completed Maintain and Repair Wastewater Collection Assets. Now it's time to review your learning. When you click Next you will be presented with a series of questions to test your knowledge.

Question: The ingress of stormwater in the sewer system through illegal connections, disconnector gully traps, overflow relief gully or other sewer faults is termed:

- Infiltration
- Inflow
- Gravity flow
- Soverage

Submit
Question 2 of 10

It is a requirement of legislation to locate other utilities before excavation.

True False

Submit

Question 3 of 10

When the water main is isolated it is not important that the water level of the excavation is below the level of the pipe to be repaired.

True False

Submit
A jet rodder is the preferred method for sewer cleaning.

Question: When attending to sewer overflows contaminated materials should be:

- Disposed of onsite
- Left wherever at the site
- Contained onsite and then removed to an appropriate disposal site
- Kept anywhere onsite and then removed
Question 6 of 10

A gas detector is used to force smoke into the sewer system via the manhole/inspection.

Submit

Question 7 of 10

A gabaulk joint would be used to repair a sewer rising main or gravity PVC main.

Submit
Question: What tasks would you undertake in pipe section replacement?

- Cut out failed pipe section
- Beveling and cleaning
- Placing the gibauf/adapter on main to be repaired and tightening
- All of the above

True False

Final backfilling can only be completed by machine.
Question: Which of the following will need to be completed to finalise work?

- The work order form
- Asset condition form detailing root cause of fault
- GIS map detailing the location of the repair
- All of the above

Your Score: 0%
Great work, you have completed Maintain and Repair Wastewater Collection Assets.
Resources

Overflow Cleanup

The steps involved in the cleanup of sewage overflows caused through blockages, breakages or wet weather surcharge are detailed below.

**Note:** Before visiting the site, ensure health and safety risks have been assessed.

- Assess weather conditions, e.g. do not attend site during severe electrical storm or cyclonic wind and flood conditions
- Assess road conditions
- Obtain adequate personal protective equipment, e.g. Safety Boots (Waterproof if required); Boot top protectors; Gloves; Safety Glasses; Safety Vest (Reflective at Night).

Sewage overflows may be caused by:

- Sewer break/blockage,
- Equipment malfunction,
- Power outage, or
- Excessive wet weather infiltration causing sewer surcharge.

**In the event of a sewage overflow:**

- Assess environmental, health and safety impacts of the overflow and follow relevant organisational procedures.

**Note:** The Environmental Protection Agency/Department of Environment enforces the Environmental Protection Act 1994. While its primary purpose is to protect the environment, the safety of people comes first and anyone taking action to protect the environment must first have determined that their methods will be safe.

- Contain overflow if practicable through bunding, e.g. earthen embankment, sand bags.
- In the case of power outages, tankers may be required.
- Contact the supervisor or manager and advise of the situation.

- Where a private house needs to be entered, staff must ensure that the resident/occupier is notified beforehand.
- If the resident/occupier cannot be contacted request advice from management.
- Where private property has been damaged take photographs of the damage.

**Undertake clean up actions as required:**

a. All contaminated waste and materials are to be contained on site and then removed to an approved disposal site.

b. If it is impractical to remove all of the material, the contaminated area is to be adequately disinfected and left to dry.

c. If an event is likely to cause environmental harm such as sewage entering a storm water drain or creek do not use disinfectant chemicals described until an organised sample monitoring exercise has taken place and then in conjunction with management assess whether chemicals should be used.

d. The operators are to leave the site in a clean and sanitised manner.
CCTV Survey of Sewers

- The CCTV crew must ensure that they obtain the relevant plans and have received all relevant information.

- Before arriving at the job site the CCTV crew should ensure that the correct equipment and materials are available and are all in good working order (as per operating manual).

- Where applicable, permission must be obtained to enter a property.

CCTV Camera

CCTV Computer

Site Inspection

After consideration of the plan and defect information a preliminary inspection of the site is to be conducted. Particular attention should be given to the following points;

- Location of manholes
- Vehicle parking to avoid obstruction of motorists/ pedestrians/householders
- Placement of warning/traffic control signs/barricades/cones as required
**Setting up**

Using the correct lifting tools and manual handling methods, lift the manhole cover and make a visual check of the flow and condition of the manhole.

When manually handling or assembling the equipment, allowance is to be made for the weight of the assembled equipment and the distance it needs to be carried.

**General Operating Requirements**

Ensure that the pipe is sufficiently clean to accurately assess its condition.

Under no circumstances is the camera and crawler to be lowered or raised over any person in the manhole.

The camera can traverse the pipe in the upstream or downstream direction. The crew shall select the manhole which gives suitable access for the equipment.

The crew ensures that the camera and camera cable are correctly connected before lowering into the maintenance hole.

**Carry Out Survey**

The survey starts with the control panel operator noting all defects. Measurements are recorded accurately and data collection to enable future rehabilitation of the pipe. All recorded measurements are to be taken from the manhole.

The control panel operator communicates with the winch operator to ensure:

a) The camera cable is fed at the same rate

b) When the camera is reversing, the camera cable is taken up to prevent tangling with the crawler.

During the travel of the camera, all defects shall be observed and noted by the control panel operator. The plan is referred to throughout the survey to confirm the information as shown on the plan.

**Completion of Survey**

On completion of CCTV inspection, the camera is removed from the pipe.

If the camera is disconnected from its cable a suitable sealing cap must be fitted to the cable to prevent entry of foreign matter.

Retrieve camera cable and winch cables from pipe ensuring that they are cleaned and rewound onto cable drums.

After removal from pipe the camera is cleaned and the gas pressure checked.

Every week all electrical connections should be sprayed using recommended product
**Sewer Patching - Quick guide**

Sewer Patching is suitable for most repairs of cracked, broken or dislocated sewer pipelines. The fibre reinforced plastic (FRP) patch is wound around a rubber sleeve and placed at the repair point using a CCTV Camera to position the patch over the fault. The sleeve is then inflated and held in position until the cured.

Points requiring repair should be cleaned by water jet and have roots removed prior to commencement of work. The fault is reinforced and also sealed by the patch which adheres tightly to the inner surface. It is possible to undertake the work while effluent is flowing in the pipe providing the amount is limited.

**Installation process**

- Clean and survey pipe for repair
- Locate and mark defect location
- Insert packer into protective polythene tube and secure at both ends
- Mix resin and coat both sides of glass matting
- Wrap impregnated glass around packer
- Position packer at point of repair
- Inflate to recommend pressure with **compressor**.
- Attach to pressure check gauge to monitor pressure during curing
- Deflate and remove packer after recommended curing time

Details of all sewer patches applied shall be recorded on a report that details the exact location.
Backfilling – Quick guide

1. Selected materials should be hand shovelled over each exposed joint

2. Compact to give a **300mm minimum cover** (300-600mm)

3. Final backfilling to ground level can be completed by hand or machine, use soil originally excavated from the trench

4. Care should be taken to exclude large rocks and stones from the final backfill

Backfilling should be carried out as soon as possible after pipes have been installed to ensure:

- The installation is protected from damage
- The pipes do not float if the trench becomes flooded
- The pipe does not shift out of alignment
- The risks of accidents are minimised
- Avoid heavy compaction
- Keep large rocks (>300mm) out of fill
## Recommendations for different trench floors

<table>
<thead>
<tr>
<th>Trench floor</th>
<th>Recommendation for action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholly in rock</td>
<td>Leave as irregular and place bedding directly on the floor</td>
</tr>
<tr>
<td>Firm, stiff or hard clay soil</td>
<td>Trim to smoothen, remove all loose material and place bedding material directly on the floor</td>
</tr>
<tr>
<td>Soft clay or sand</td>
<td>Dig deeper and use more bedding sand</td>
</tr>
<tr>
<td>Very soft clay, old fill, refuse, irregular outcrops of rock or disturbed by groundwater inflow</td>
<td>Seek specialist advice to ensure zero post installation partial or total settlement.</td>
</tr>
<tr>
<td>Other issues</td>
<td>Seek specialist advice</td>
</tr>
</tbody>
</table>