To improve the effectiveness of post drainage holes (gas drainage efficiency of the cross measure holes varies from 47% to 70%), drill rig operators should aim to ensure that the cross measure holes are set up to the correct dip and bearing of the sights marked underground. Holes are to be drilling in order and should penetrate the Wongawilli Seam. The graph below illustrates that Wongawilli Seam contains the most methane.

Gas Source

(Figure 48).
- Wongawilli seam contains by far the most gas of all the seams at Appin Colliery.
Since there is considerable variation in the distance between the seams, as illustrated in the sectional diagram on page 154, the operator should use longhole cuttings to identify firstly Balgownie then Cape Horn, Hargraves and finally Wongawilli. Note Wongawilli is 10m thick and has stone band within.

See below for example of 27 main gate fan pattern of drill holes for the cross measure drainage.

(Figure 50). Cross-Measure.

These holes actively drain gas released as the longwall advances over a given area. With this in mind, the longwall should not leave the influence of a set of gas drainage holes until the next pattern is complete. This is laid out in the Appin Gas Management Plan:

"The longwall shall not retreat beyond a fan site unless the outbye fan is completely drilled and connected to the gas extraction pipe range."

- All hose must be cased with continuous perforated casing.
(Figure 51). Graf ref. to in Cross-Measure Drilling section.

(Figure 52). Graf ref. to in Cross-Measure Drilling section.
Pipe Standards and Suction

Hanging Pipes

To ensure a safe environment and consistent work standard, the Colliery has adopted the following criteria for hanging pipes:

<table>
<thead>
<tr>
<th>Type of pipe</th>
<th>Type of hanging bracket</th>
<th>Type of chain (minimum)</th>
<th>No. of chains per pipe</th>
<th>Slinging method</th>
</tr>
</thead>
<tbody>
<tr>
<td>100mm (4&quot;)</td>
<td>nut &amp; loop</td>
<td>5mm vent chain</td>
<td>one</td>
<td>single fall</td>
</tr>
<tr>
<td>165mm (6.5&quot;)</td>
<td>nut &amp; loop</td>
<td>6mm vent chain</td>
<td>one</td>
<td>double fall</td>
</tr>
<tr>
<td>305mm (1.1/4&quot;)</td>
<td>8mm hanging bracket</td>
<td>8mm standard chain</td>
<td>one</td>
<td>double fall</td>
</tr>
<tr>
<td>457mm (1.8&quot;)</td>
<td>8mm hanging bracket</td>
<td>8mm standard chain</td>
<td>two</td>
<td>double fall</td>
</tr>
<tr>
<td>610mm (2&quot;)</td>
<td>10mm hanging bracket</td>
<td>8mm standard chain</td>
<td>three</td>
<td>double fall</td>
</tr>
</tbody>
</table>

(Figure 53).

Pipe Identification

The Colliery has adopted the following procedure to allow identification of pipes and valves without error:

- Identification Stickers must differentiate between:
  - compressed air
  - waste water
  - water
  - methane gas
- Identification Stickers must be attached to every 5th pipe in any pipe line.
- Identification Stickers must be attached to every valve in any pipe line.
- Isolation valves must be placed at easily distinguishable points, such as every branch, every 500 metres in the main line and every third cut through in the main gate, so it is easier to determine where a valve is at any given point in the suction range.

(Figure 54) 24” In-line Valve for Methane Gas line.
Main Range

Suction comes from the surface plant via a 24" line through the downcast shaft. Suction is then distributed via the underground pipe network as illustrated on the next page. (Figure 55).

The important point to observe is whether sufficient outlets have been installed at particular sites underground to provide satisfactory suction at that site.

Currently at the main gate branch there is:
  - 1x6 hole 18" manifold - 24m I/B each C/T
  - 2x6 hole 18" manifold - 41m O/B each C/T
  - 1x6" T-piece at every intersection
  - 1x6" T-piece at all low points for drainage
  (refer to Figure 56 on page 160)

At this point it is important to observe that a written Access Permit is required to work on methane suction pipes which are larger than 6" nominal bore.

An example of this permit is illustrated as Figure 57 on page 161).
(Figure 56). Appin Colliery u/g pipe network

(Figure 57). Gas Drainage Engineer Permit
(Uncontrolled Copy)
Main Branch to the Standpipe

Suction is required to capture the seam gas when the hole is completed and while the hole is being drilled.

**REMEMBER**

It is Colliery standard to have suction at an in-seam hole for primary drainage purposes and at a cross-measure site before drilling.

The Gas Drainage Engineer will nominate if suction is not required at a drill site established for secondary drainage or for core samplings.

(Figure 58).

The steps to install a suction line to a drill site from the main range are:

1. Fit an appropriate isolation valve to main range "T" piece. Keep valve off.
2. Fit measuring set.
3. Check the inside of pipe is clean.
4. Install pipes (100mm or 150mm) to the drill site.

5. Install a water separator or cyclone at in-seam sites.
6. Install a manifold (if more than one hole).
7. When possible avoid using 4 "T" pieces and install additional manifold if more outlets are required
8. Install plugs or valves into manifold inlets.
9. Turn the branch valve on to check for leaks.

**Use of Standpipes**

Standpipes are used to seal the hole so air cannot be drawn in to pollute the methane range. Additionally, they resist ground pressure and keep the initial length of the hole open to allow gases to be drained off over time. Standpipes are installed prior to drilling a hole to facilitate the addition of a stuffing box. The stuffing box allows suction to be regulated to draw off gas as the hole is being drilled and waste water diverted to the fines separator. (see Figure 64 on page 171).

It is Colliery standard to install a standpipe and apply suction before drilling an in-seam hole or cross-measure hole.

Two different types of standpipes are used:

1. Steel standpipes are used for a hole which will not be affected by mining, and cross-measure.
2. Copper stand-pipes - for holes which are in the path of mining, i.e. in-seam.

In-seam copper or steel stand pipes are 100 mm diameter x 6 metres in length when made up. Cross-measure stand pipe are 80 mm nominal diameter and 3 metres in length.
The standpipe, whether copper or steel, is encased in high strength grout to hold the standpipe in place so it can effectively seal the hole from the working environment.

Cingrout is the generic name for a variety of expansive grouts developed to meet the special problems associated with methane and carbon dioxide drainage programs.

The Material Safety Data Sheet has been incorporated to give employees information about the grout used to secure standpipes as illustrated on page 167. (Figure 61).

When positioning the drill rig to drill a hole for the standpipe, consider the final position of the standpipe when it is set in place.

**REMEMBER**

Remember that the standpipe will become a hazard if it extends into the travelling road or walkway.

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**Procedure for installing a standpipe**

1. Drill and ream out a hole 200 mm shorter than the standpipe; (this allowing easy fitting of valve).
   - 145mm reamer is used for 100mm standpipe.
   - 130mm reamer is used for 80mm standpipe.

2. First flush hole clean with water and then with compressed air.

3. Cover the inbye end of the standpipe with brattice secured by tape or ensure a soft cap is fitted to inbye end of standpipe.

4. If the standpipe is for an in-seam hole then secure conduit grouting and breather tubes to standpipe with tape. Use:
   - Short breather tube and long grout tube going to the back of the hole if the standpipe is installed dipping downwards.
• Long breather tube going to the back of the hole and short grout tube if the standpipe is installed inclined upwards, however,
• No breather or grout tubes are required for cross-measure holes.

5. Insert standpipe into hole leaving 100-200mm protruding to enable stuffing box or valve to be fitted.
6. Push drill rod & bit into standpipe.
7. Wedge or pack standpipe central to rod.
8. With safety glasses on, mix plaster and use a collar to seal the hole;
• No collar is required for a cross-measure hole.

9. With safety glasses on, mix grout according to the instruction on the bag, with a rib borer and mixing wand.
10. With safety glasses on, pump in grout until it emerges from the breather tube and bend conduit to seal both tubes.
11. With safety glasses, pump fresh water and small amount of L5 oil through grout pump until thoroughly cleaned.

12. Allow sufficient time for grout to set.
13. Clean up the work site and store equipment neatly.
Applying suction by use of a stuffing box

Once the standpipe is installed a stuffing box can be fitted to the standpipe which will allow suction to be applied to the hole whilst drilling. The suction should be limited to balance the gas pressure created by the drill hole. This minimises the pollution of the suction range by air and water.

(Figure 62). "N" Size Stuffing Box.

Additionally, a flexible hose should be fitted to the stuffing box. This will carry the drilling water and tailings to the water/limes separator to manage the waste water.

Suction after the hole is drilled

At a cross-measure hole,
Suction to the cross-measure site is available from 75 mm BSP sockets in the main branch line in the Longwall gate road.

A 75mm female camloc fitting is threaded into the socket, a 75mm flexible suction hose is used to span this point to a 75mm valve threaded onto the cross measure standpipe.

At this point it should be remembered that one hose is used for one hole. This maintains the suction at its most efficient level. This is especially important due to the peak flows produced by cross-measure holes. With improved practices, the aim is that each cross-measure hole will produce in excess of 100 l/s during its peak. Thus it is important that there is as little resistance as possible.
Examples of how resistance is created are:

- Kinked hoses.
- Inappropriate fittings, i.e. such as small hoses.
- Water in hoses and suction range.
- Two hoses connected to a T-piece.
- Hoses longer than necessary.

At an in-seam hole

Suction to the in-seam hole after it is drilled is applied through a 50 mm suction hose. It connects to the standpipe by a 50 mm valve. Fitting to the stand pipe is facilitated by a reducer (100 mm - 50 mm).

Since the flow rate of in-seam holes is lower and more consistent, the suction fittings can be smaller. A lot of water is produced from in-seam holes, therefore it is important to constantly check the site suction for blockages even after the drill rig has moved on.

(see Figure 54 on next page)
Operator Maintenance & Repair

For each shift of machine operation, checks need to be carried out. These checks are detailed in the Job Instruction:

- QS-AME-JI 210 for Hydraulic drill rigs
- QS-AME-JI 231 for Pro Ram drill rigs

From this inspection, or from observations by the machine operators, defects may be detected and steps taken to rectify problems by:

- Reporting the defect to the supervisor or control.
- Filling out the work order/drilling report.
- Repairing the defect immediately to allow safe drilling operations to continue.

Servicing and Repair for a Pro Ram

Servicing and repair is to be carried out, where applicable, in conjunction with pre-start checks.

Repairs to a machine should only be undertaken provided the operator is trained and confident to carry out such a repair. An operator may find it helpful to consult a Standard Job Instruction for a given repair or task.

An outline of repairs or tasks that operators can accomplish for a Pro ram are:

- Remove and replace rod holder.
- Check rod holder reservoir level.
- bleed rod holder.
- Remove and replace chuck assembly.
- Check chuck to gripper clearance.
- Remove and replace rotation assembly.
- Change feed tube assembly.
- Replace damaged air/water hoses.
- Adjust feed cable to correct tension.
- Lubricate chuck.
- Lubricate Stingers.
- Lubricate chuck - remove chuck air inlet hose and pour approximately 50ml of oil into inlet fitting and reconnect hose.
- Lubricate stingers - remove inlet hose from stinger, pour 50-100ml of oil into the fitting & reconnect hose. Wipe the stinger inner down with an oil soaked cloth. Extend and retract the stinger until it operates smoothly.

**WARNING**

Isolate air pressure and bleed remaining air in system before carrying out the above.

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**Servicing and repair for a hydraulic rig**

An outline of repairs or tasks that operators could accomplish for hydraulic drill rigs are:

- Grease all points on feed bed.
- Adjust feed chains to correct tension.
- Change damaged hydraulic hoses.
- Check oil level in rotation unit gear box and top up if necessary.
- Check oil level in water pump and reduction box and top up if necessary.
- Remove rotation unit from the feed bed if required and prepare for transport.
- Assist tradespersons in further repairs as required.

(Figure 65)