



EXAMINATION REPORT | CERTIFICATE OF COMPETENCE

Deputy exam

July - November 2015

Summary of results and general comments

Written examination results

Date:	29 July 2015
Number of candidates:	30 (36 approved to sit)
Number who passed:	12 (40% success rate)
	(8 candidates passed from 16 candidates on 1st attempt = 50%)
Average overall mark:	53.2% (minimum pass mark 60%)
Highest mark obtained:	80.5/100

Question 1

Highest mark	Average mark
20/20	8.3/20

Question 1 a)

The term “reasonably practicable” is used in work health and safety legislation in New South Wales. The Work Health and Safety Act 2011 defines the terms “reasonably practicable” in section 18.

In your own words, state the matters that have to be taken into account in determining whether an action is “reasonably practicable”.

In this Act, reasonably practicable, in relation to a duty to ensure health and safety, means that which is, or was at a particular time, reasonably able to be done in relation to ensuring health and safety, taking into account and weighing up all relevant matters including:

- the likelihood of the hazard or the risk concerned occurring, and
- the degree of harm that might result from the hazard or the risk, and
- what the person concerned knows, or ought reasonably to know, about:
 - the hazard or the risk, and
 - ways of eliminating or minimising the risk, and
- the availability and suitability of ways to eliminate or minimise the risk, and
- after assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

Overall comment: As with past legislation questions candidates either had a good grasp of the information or were guessing.

Question 1 b)

Clause 21 of the Coal Mine Health and Safety Regulation 2006 imposes a requirement for ventilation arrangements, and clause 62 of the Work Health and Safety (Mines) Regulation 2014 refers to a duty to prepare a ventilation control plan.

Choose either one of the following parts to answer (do not answer both parts):

Either:

List five elements that are required to be included in the ventilation arrangements as specified in clause 21 Coal Mine Health & Safety Regulation 2006

- (a) the design, monitoring and control of the underground ventilation arrangements (including design, monitoring and control required to support gas management, spontaneous combustion management or other hazard management arrangements at the mine that are dependent on ventilation),
- (b) the supply to all accessible parts of the mine of sufficient ventilation:
 - (i) to provide air that contains by volume not more than 0.005 per cent carbon monoxide and not more than 1.25 per cent carbon dioxide, and
 - (ii) to render harmless any inflammable gases or other atmospheric contaminant, to the degree required to conform with the regulations made under the *Occupational Health and Safety Act 2000*,
- (c) the maintenance of the methane concentration in the general body of air:
 - (i) at not more than 0.25 per cent by volume in an intake airway at the start of a hazardous zone, and
 - (ii) at not more than 2 per cent by volume in a hazardous zone,
- (d) the action to be taken if the limits referred to in paragraphs (b) and (c) are found, or reasonably suspected, to be exceeded at a place at the mine,
- (e) the maintenance of return airways in a condition so that they are accessible to those who must inspect them or travel through them in an emergency,
- (f) the control of ventilation,
- (g) reporting procedures relating to ventilation,
- (h) the maintenance of ventilation records and plans,
- (i) the manner of sealing of parts of the mine and the precautions to be taken in sealing parts of the mine,
- (j) audits of the operation of the arrangements and for periodic reviews (at intervals not exceeding 2 years) of the effectiveness of the arrangements,
- (k) any matters required to put into effect the provisions of Division 3 of Part 4.

Or:

List five elements that are required to be described in the ventilation control plan as specified in clause 62 Work Health & Safety (Mines) Regulation 2014.

- (1) The mine operator of an underground mine must ensure that a ventilation control plan is prepared to provide for the management of all aspects of ventilation at the mine.
- (2) The ventilation control plan must describe all control measures implemented in relation to ventilation at the mine.

- (3) Without limiting subclause (2), the ventilation control plan must include a description of the following, if applicable to the mine:
- (a) the design and operation of the ventilation system, including the standards applying to the placement, operation, maintenance and monitoring of ventilation plant,
 - (b) arrangements for inspecting, monitoring, maintaining and testing the ventilation system,
 - (c) arrangements for managing risks to health and safety associated with potential inrush hazards and leakage into intake airways of atmospheric contaminants from goaf areas and abandoned sealed workings,
 - (d) arrangements for managing risks to health and safety associated with intake air travelling across the face of a permanent seal at the mine,
 - (e) arrangements, in the event of a loss of power supply, for an alternate and independent way of operating the main ventilation fans or for the withdrawal of persons from the mine,
 - (f) arrangements for managing risks to health and safety associated with ignition sources in the event that the main ventilation fans fail to adequately ventilate the mine,
 - (g) procedures to ensure the health and safety of persons at the mine in the event of a total or partial ventilation failure,
 - (h) in the case of an underground coal mine—arrangements for sealing all, or part of, the mine,
 - (i) procedures for ventilating the parts of the mine where persons work or travel,
 - (j) how close ventilation ducting and brattice lines must be to any face,
 - (k) arrangements for the installation of ventilation control devices,
 - (l) arrangements for signage in relation to regulators, fans and doors at the mine notifying persons that interference with those things by unauthorised persons is prohibited,
 - (m) arrangements to prevent workers from inadvertently entering inadequately ventilated parts of the mine,
 - (n) starting procedures for fans,
 - (o) modelling of the ventilation processes when a significant change is made to the ventilation arrangements,
 - (p) procedures to be followed in the event of the failure of the main ventilation system including details of the circumstances requiring the safe withdrawal of persons from the mine and the giving of an alarm at the surface if any main ventilation fan stops.

Overall comment: As with past legislation questions candidates either had a good grasp of the information or were guessing.

Question 2

Highest mark	Average mark
18/20	9.8/20

Question 2 a)

What is meant by the term “intrinsically safe” in relation to electrical equipment?

Intrinsically safe, in relation to a circuit or electrical apparatus, means explosion-protected in such a way that any spark or thermal effect produced in the circuit or apparatus is incapable of causing ignition of an explosive mixture of methane or other inflammable gases or vapours and air.

Overall comment: Many candidates had a very poor understanding of this term.

Question 2 b)

What is meant by the term “flameproof” in relation to electrical equipment?

The flameproof enclosure is designed so that hot gases generated during an internal explosion are cooled below the ignition temperature of the surrounding flammable atmosphere as they escape through the joints of the unit.

Overall comment: Generally well answered.

Question 2 c)

What is the purpose of a “scrubber” on underground diesel equipment?

The scrubber creates a flameproof system whereby the products of combustion from a diesel engine exhaust passes through a body of water to cool the exhaust gases and prevent these gases igniting a methane rich gas mixture external to the engine.

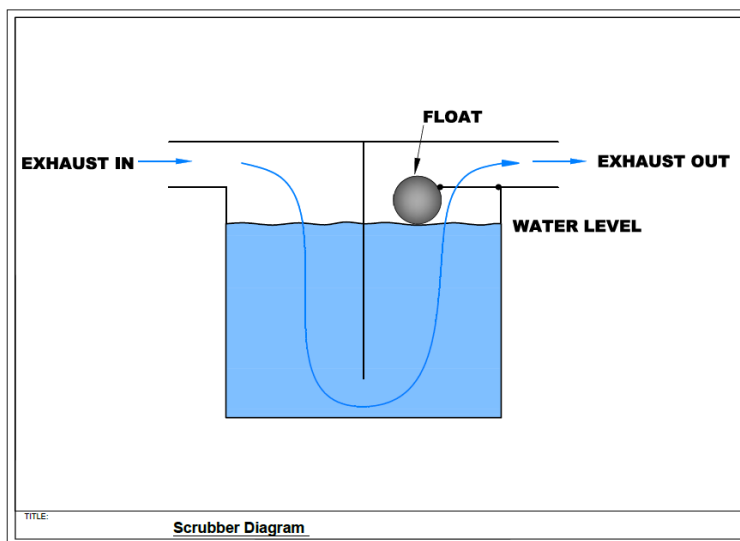
The scrubber may provide a minor improvement in the levels of airborne contamination from the exhaust, but this is not the purpose of the scrubber.

Overall comment: Most candidates had no concept that the scrubber is essentially a flametrap.

Question 2 d)

With the aid of a simple diagram, describe how a scrubber on underground diesel equipment works.

The scrubber has a flame trap created by the exhaust not having a direct path to atmosphere. The scrubber is designed so that the exhaust travels through the scrubber water with a baffle preventing the direct connection. The water cools the exhaust to ensure the temperature is below 150 degrees Celsius. There is a system to ensure the water level does not fall below the required level, either two floats or a float and a temperature probe.



Overall comment: Generally poorly answered with little recognition of the exhaust path through the scrubber.

Question 3

Highest mark

Average mark

20/20

14.2/20

Question 3 a)

You are a deputy of a panel, on production, developing the mains. You receive a PED message informing you that there is a fire on the longwall face and you are to immediately evacuate to an underground workshop at 80 cutthrough. You are at 140 cutthrough and the entrance to the longwall is at 120 cutthrough. What actions do you take?

Take steps to immediately gather your crew and return to the cribroom or point where emergency escape equipment is available.

If on return to the cribroom you pass the DCB, remove power from face equipment by activating emergency stop button.

Inform crew of direction from control to evacuate to 80c/t workshop due to fire on LW face.

Collect escape equipment to be taken during evacuation (test equipment only, do not don equipment – Deputy will instruct crew to don if conditions change (i.e. smoke is detected).

Have a crew member service machine (water) that the crew will travel in.

Make contact with control room and inform them of your intentions

- Who is accounted for
- Route of travel (i.e. SMV via primary egress)
- Inform that you will be taking emergency escape equipment with you
- Ask what additional information is available in addition to the PED message that may assist with escape (i.e. gas readings or conditions that may be encountered)
- Ask if assistance is required at the LW or any other location during escape
- Inform control when you will make contact again to confirm arrival (i.e. at 80c/t workshop)

Overall comment: Several candidates did not take any emergency equipment with them. Most candidates did not recognize that they would not expect to find contaminants from the fire on the way out as the contaminants would be entering the LW return.

Question 3 b)

You are a deputy fighting a fire on a drivehead. You have four men with you. All equipment is in place, there is no one inbye. The undermanager is on the surface and is the incident controller. What factors would cause you to cease fighting the fire and head to the surface?

The fire is increasing in intensity and efforts to control are not working

Reversal of ventilation is detected

You lose communication with the surface

Injury/ illness to personnel fighting the fire

Directed by the incident controller

Loss of water pressure

Overall comment: Generally well answered

Question 3 c)

What are the signs and symptoms of heat stroke? What is the recommended treatment for heat stroke?

Symptoms

- Throbbing headache
- Dizziness and light-headedness
- Lack of sweating despite the heat
- Red, hot, and dry skin
- Muscle weakness or cramps
- Nausea and vomiting
- Rapid heartbeat, which may be either strong or weak
- Rapid, shallow breathing
- Behavioral changes such as confusion, disorientation, or staggering
- Seizures
- Unconsciousness

Treatment

Organise medical assistance (this is a life threatening condition) and initiate first aid. Move the person to an air-conditioned environment -- or at least a cool, shady area -- and remove any unnecessary clothing.

Try these cooling strategies:

- Fan air over the patient while wetting his or her skin with water from a sponge or garden hose.
- Apply ice packs to the patient's armpits, groin, neck, and back. Because these areas are rich with blood vessels close to the skin, cooling them may reduce body temperature.
- Immerse the patient in a shower or tub of cool water, or an ice bath.

Overall comment: The key symptom of heatstroke is a lack of sweating and immediate cooling of the person is required. Several candidates missed these key factors.

Question 4

Highest mark	Average mark
16/20	10.8/20

Question 4 a)

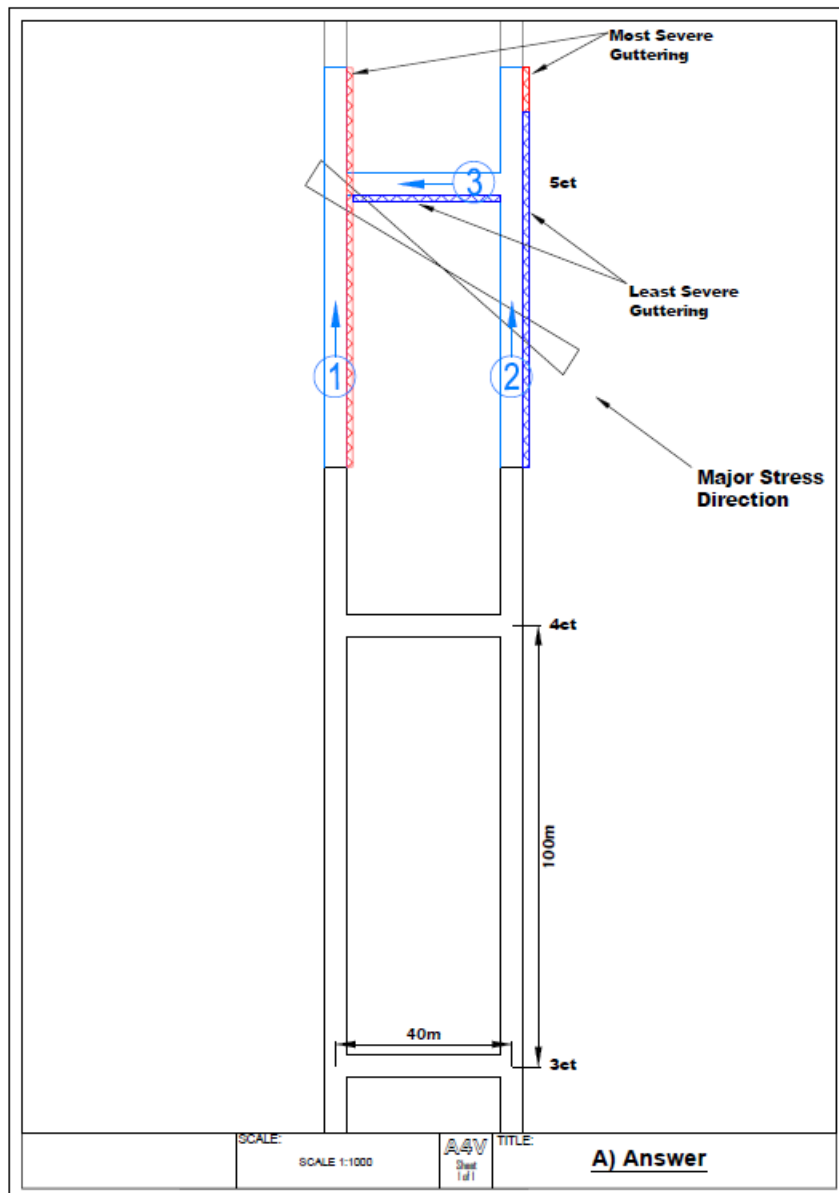
A 2 heading gate road panel is approaching a known high stress zone as shown on the accompanying plan. This zone has, in the past been associated with severe guttering.

On plan A on the following page, show the sequence for driving 4 to 5 cutthrough. Mark on the plan where you would expect to see guttering occurring for each drivage based on the stress direction indicated. Indicate where you would expect to see the most severe guttering.

The sequence will be dependent on which heading is the most important to protect and minimise damage to the roof. The first heading driven forward will suffer the most severe guttering, on the right hand side of the heading. The stress direction indicates which side the guttering will occur.

The second heading driven will have some stress relief from the first heading, it is in the "shadow" of the first heading. The cutthrough is commonly driven last in a high stress environment so that it gains maximum protection.

The cutthrough would normally be broken away from the right hand heading so that the breakaway occurs on the side of the roadway that has the least deformation. In this case any guttering would be concentrated on the outbye side of the cutthrough. If driven from the left hand heading the guttering would be concentrated on the inbye side.



Overall comment: The opposing triangles were an indicator of stress direction rather than the stress zone. Many candidates considered this to indicate the limit of the high stress zone. This was accepted as a reasonable assumption by the examiners and papers marked accordingly.

Most candidates did not correctly identify where the guttering would occur and did not seem to recognize the connection between stress direction and location of guttering. Very few candidates recognized the role of stress relief and the fact that the most severe guttering would be in the first heading driven.

Question 4 b)

What is meant by the term abutment loading in relation to strata in underground coal mines? What are the possible signs of abutment loading? Mark on plan B on the following page where you would expect to find the front, side and rear abutment loading.

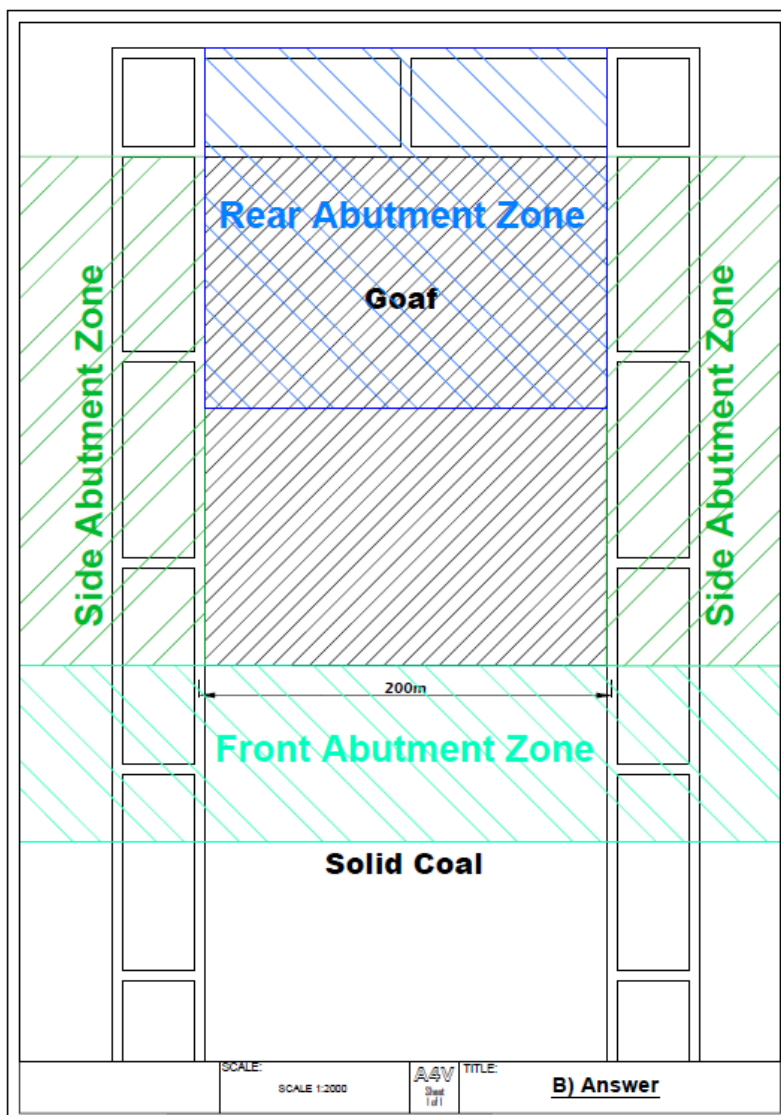
Abutment Loading – means the re-distribution of stress (or load) around an active mining area back onto the unmined areas (i.e. coal ahead of mining area or chain pillars and settling of the goaf)

Abutment Loading is - the weight of the strata above a goaf is transferred to the solid coal along the sides and in front of the working face and the back abutment is the goaf settling behind the face.

Signs of Abutment Loading include

- An acceleration in roof movement or roof deformation ahead of the face in gateroads
- Rib deformation ahead of face on adjacent chain pillars
- Floor heave

The side abutment is on the chain pillars and solid coal on either side of the longwall extraction. The front abutment is on the side pillars and solid coal on either side and the longwall block outbye the face. The rear abutment is on the goaf (where it has started to consolidate) and on the pillars and solid coal behind the longwall.



Overall comment: Most candidates gave only very basic descriptions of abutment loading.

Question 4 c)

How would the abutment loading associated with a longwall influence the installation of secondary support?

Secondary support needs to be installed ahead of potential or actual abutment loading to control strata movement prior to delamination (fracturing) of strata.

Where grouting is required with the installation of secondary support, the timeframe for grout to set and strengthen should occur outside the abutment zone (i.e. up to 28 days for a typical grout to reach full strength)

Standing support on intersections in the MG can be complete closer to the LW (normally due to operation reasons with access), however this would normally occur prior to the known length of abutment impacting the intersection (generally varies from 10 to 50m depending on individual mines and specific conditions at each mine, in extreme cases may be over 400m)

Standing support in a TG roadway (where used) meets a similar criteria

Bolting of the adjacent MG travel road should occur ahead of the LW where known structured ground exists, however in many mines this may occur behind the LW face.

Overall comment: Most candidates simply identified the need for secondary support and gave little or no thought of how the abutment loading would impact the installation of such support.

Question 5 (marked up plan on page 9)

Highest mark	Average mark
17/20	10.1/20

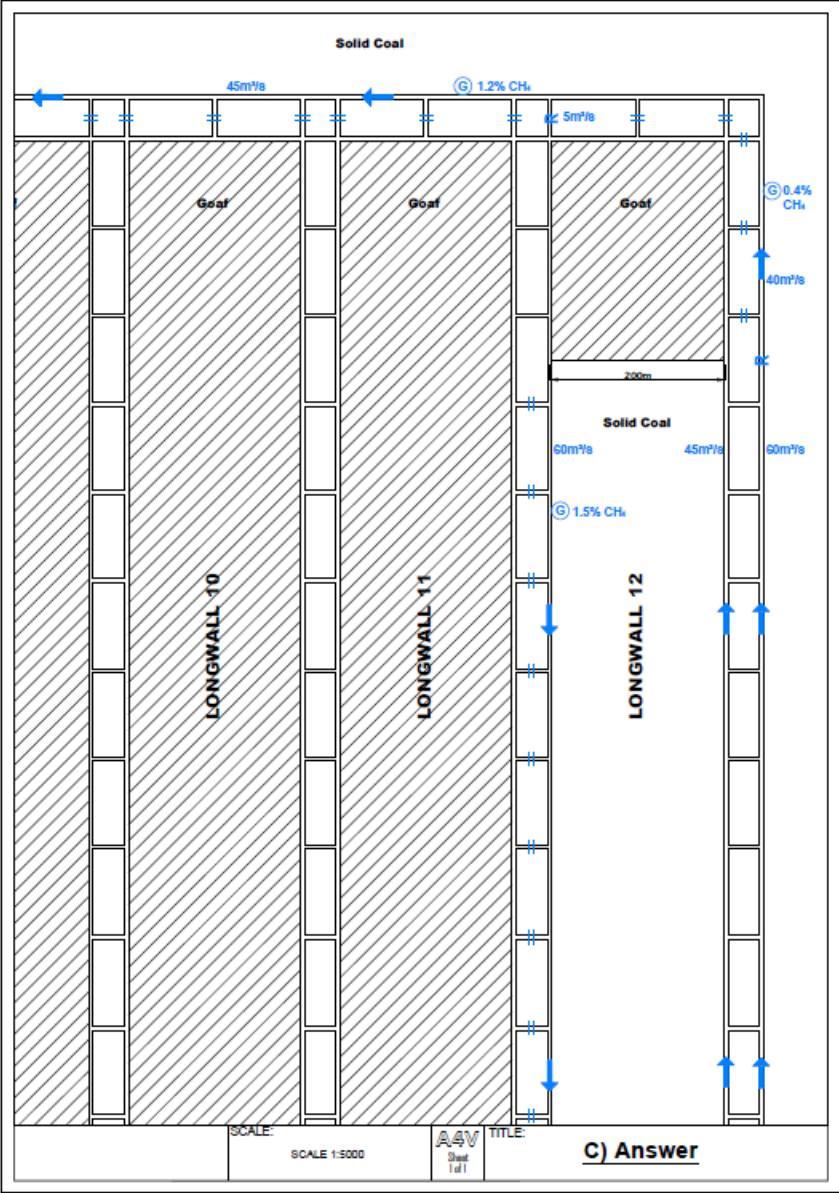
Question 5

Plan C on the following page shows a working longwall. The seam is very gassy and is not prone to spontaneous combustion.

- On the plan, show all ventilation devices.*
- On the plan, show the intake and return quantities. Give the quantities at each location the air path splits.*
- On the plan, show the expected methane concentrations in the returns.*

The key elements of this question are that the seam is very gassy and is not prone to spontaneous combustion. This means that the control of methane is the main requirement of the ventilation system. NSW mines with these seam characteristics typically install a maingate regulator and a regulator to control the flow of methane from the goaf to a bleeder system. Panel quantities are usually high to provide sufficient dilution of the methane in the return and bleeder roadway, keeping the methane concentrations to less than 2%.

Overall comment: There were several very poor attempts to answer this question with some candidates scoring 0/20 and demonstrating a total lack of understanding of the simplest aspects of longwall ventilation. Several candidates had quantities below 40m³/s which would be insufficient for the conditions described. Several candidates did not identify gas levels at all. Some candidates had gas levels falling along a roadway where there was no possibility of dilution and a probability of further contamination.



Oral examination results

Date:	11th & 12th November 2015
Number of candidates eligible to sit:	77
Number of candidates who sat:	42
Number of candidates deemed competent:	20

Convenors comments

An improved pass rate for this round of oral exams compared to the exams earlier in the year, but still under 50%. The major areas where candidates were found to be "not yet competent" were again ventilation and emergency management. These are two of the most basic areas for a candidate to demonstrate competence to be eligible for the awarding of a certificate of competence to be a deputy.

20 of the 22 candidates deemed not yet competent were unable to demonstrate competence in one or more elements of ventilation. 6 candidates were deemed to be not yet competent in emergency management. 5 candidates were found to be not yet competent in panel layout and 4 were found to be not yet competent in inspections.

16 of the candidates were found to be not yet competent in 3 or more areas.

Candidates need to spend more time on grasping the fundamentals of ventilation and being able to demonstrate their knowledge. They should have an excellent knowledge of the system at their mine and a good understanding of common systems used in other mines with differing conditions and hazards in NSW.

More information

Business Processes & Authorisations

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Acknowledgments

Deputy Examination Panel

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