RISKGate: How can an Inspector use this tool?

Queensland Mining Industry Health & Safety Conference - Townsville

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A/Regional Inspector of Mines

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The Incident

Do you remember this event?

What have you done to prevent a similar occurrence at your site?

What was the task?

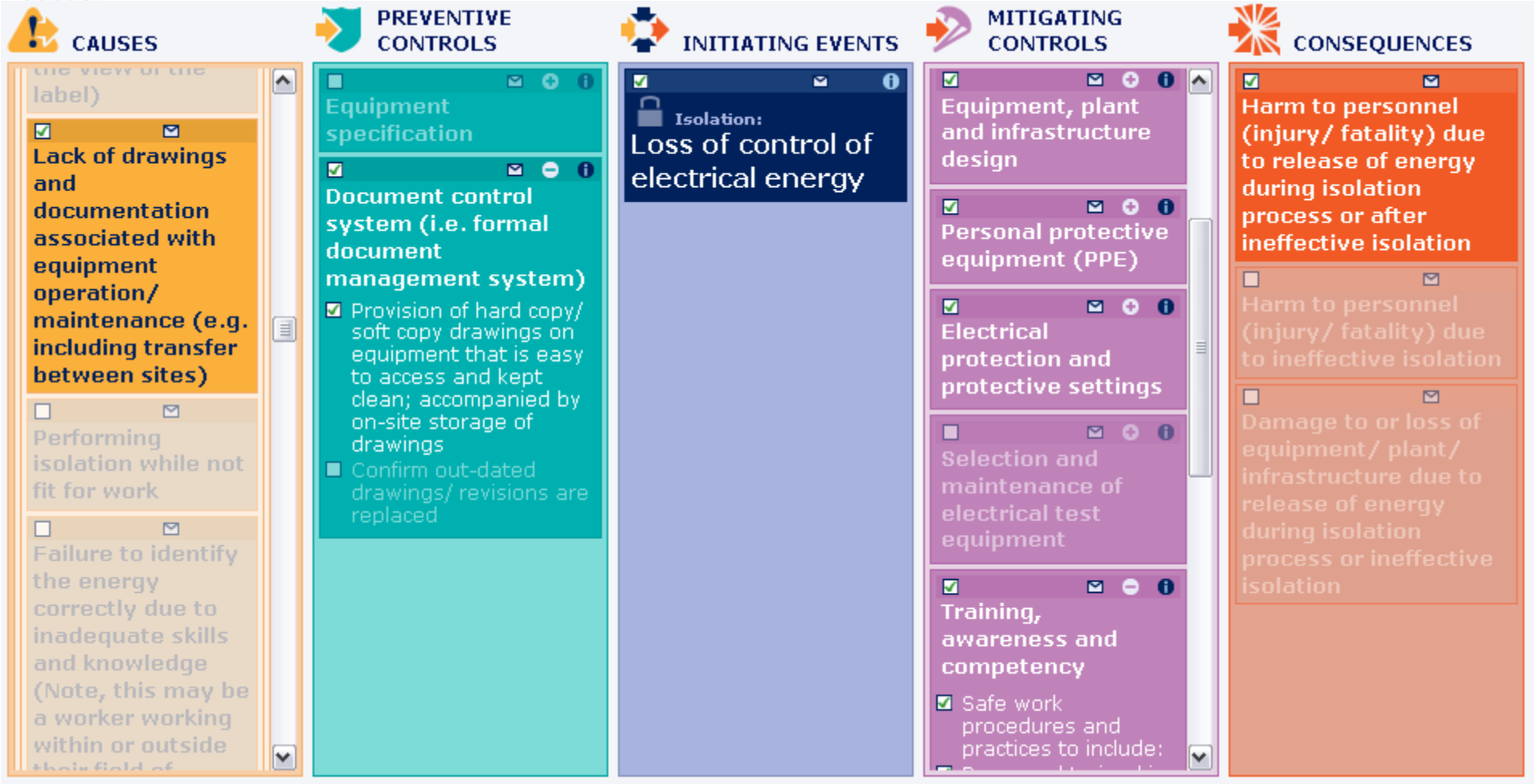
Contributing factors

- Maintenance manual that was available did not cover this task. A search of the internet did not find reference to the task.
- Failed to follow site procedures associated with;
  - access to high voltage conductors
  - Risk management practices
  - Permits and authorisation.
- Taking short cuts.
- Defeat of an interlock.

RISKGATE in the investigation

- Can RISKGATE be used to assist in the investigation?
- By considering the various life cycle elements, you can look at where things may have gone of the rails.
- Within the isolation topic, sub categories associated with the phase of isolation can be considered.
- Based on you selection, check sheets can be developed.

Maintenance manual



The checklist

RISKGATE **Topic: Isolation**
Loss of control of electrical energy

OPERATION/ MAINTENANCE

IDENTIFICATION: Operation/ Maintenance

CAUSE Lack of drawings and documentation associated with equipment operation/ maintenance (e.g. including transfer between sites)

- ☐ Document control system (i.e. formal document management system)
  - ☐ Provision of hard copy/ soft copy drawings on equipment that is easy to access and kept clean; accompanied by on-site storage of drawings

CAUSE Failure to identify the energy correctly due to inadequate skills and knowledge (Note, this may be a worker working within or outside their field of expertise)

- ☐ Appointment of isolation officers and effective procedures for isolation of electrical energies
  - ☐ Develop systems or procedures that enable isolation officers to effectively isolate a system, plant or equipment for other workers
  - ☐ Systems in place so that all workers know when and how to contact an isolation officer
  - ☐ Isolation officer available at all times to implement and manage isolation procedures for scheduled tasks being undertaken by other workers
  - ☐ Develop isolation schematics (e.g. matrix) for plant equipment that visually documents tasks and associated isolation points
- ☐ Design and install systems to prevent unauthorised or inadvertent operation for specialised tasks (i.e. hard controls, barriers)
  - ☐ Lock on high voltage (HV) switches, key issue protocols, etc.
  - ☐ Secured switch rooms, fencing, ropes with signage
  - ☐ Lock box for more complicated or complex isolation (e.g. group isolation, prior to maintenance to confirm safety of unauthorised personnel)
  - ☐ Electronic barriers - future capacity to create links to personnel card, etc. that prevents access to high risk areas
- ☐ Design and implement procedures to prevent unauthorised or inadvertent operation for specialised tasks (i.e. soft controls)
  - ☐ Competency based authorisation procedures to control access to electrical systems, plant or equipment
  - ☐ High voltage (HV) competency authorisation
  - ☐ Develop and implement isolation procedures that are machine specific and detailed (e.g. pictorial, location of labels and standard of labels, isolation schematics)
  - ☐ Work procedures to list details of isolation points
  - ☐ Site induction to include awareness of electrical system hazards
- ☐ Design to reduce the complexity of the isolation process

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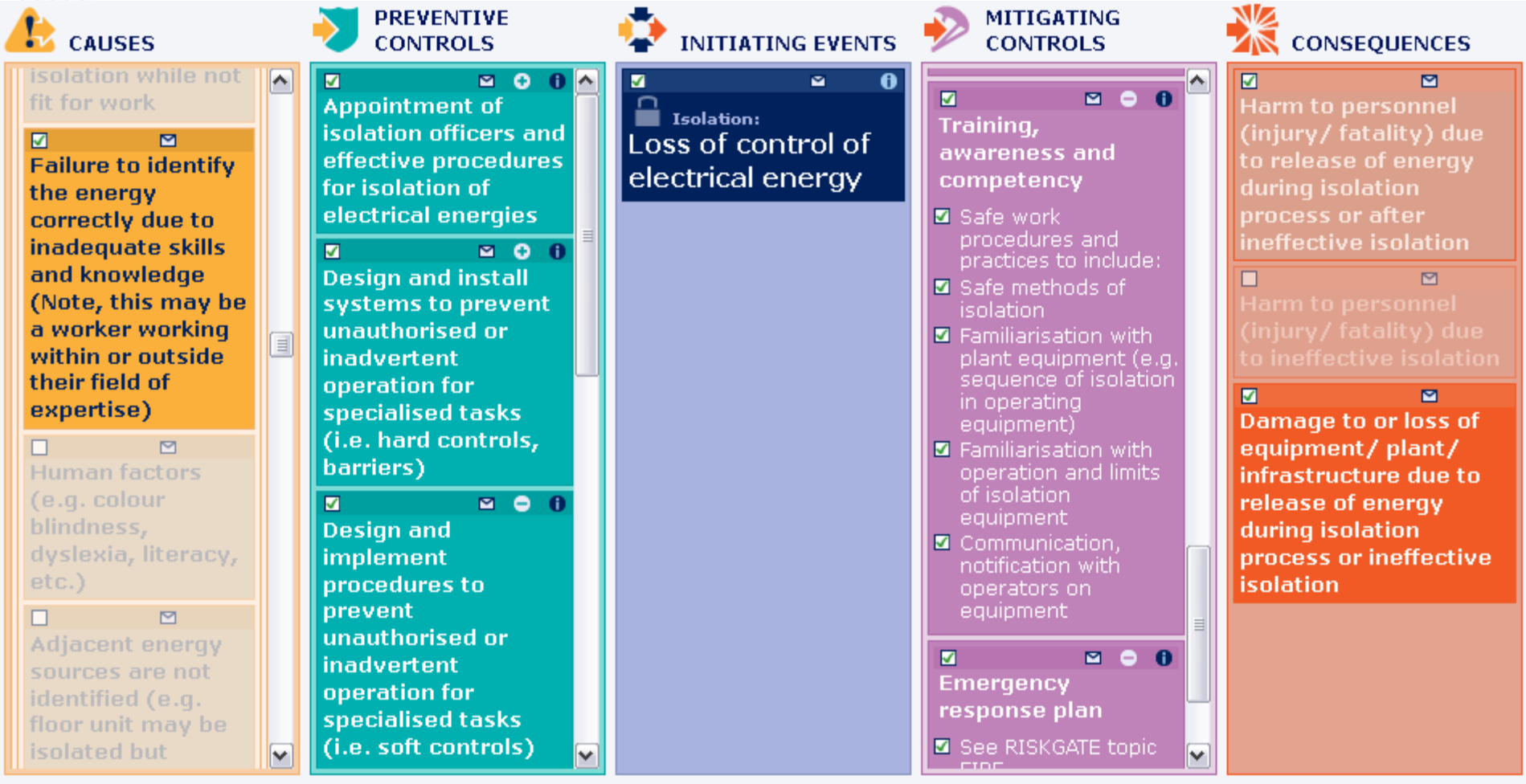
CONSEQUENCE Harm to personnel (injury/ fatality) due to release of energy during isolation process or after ineffective isolation

- ☐ Establish electrical energy levels as a baseline to determine protection settings and personal protective equipment (PPE) where appropriate
  - ☐ Engineering study during mine design to establish protection coordination, fault level, arc flash energy, arc fault control (containment, venting, fast acting switch gear to reduce energy level)
  - ☐ Periodic review of engineering studies, and update the electrical safety management plan/ electrical engineering management plan
  - ☐ Implement identified controls from the engineering study
- ☐ Equipment, plant and infrastructure design
  - ☐ Continuous improvement feedback and revision/ updating of site specifications
- ☐ Personal protective equipment (PPE)
  - ☐ Appropriate use of PPE (incl. safety glasses, overalls, gloves, boots, etc.) when working around electrical systems
  - ☐ PPE is non-flammable or flame resistant, non-conductive (e.g. flame-retartant treated cotton)
  - ☐ Undertake risk assessment (RA) to assess effectiveness of PPE relevant to the task
  - ☐ Note, PPE may not prevent injury in all circumstances
  - ☐ PPE maintained so that protective qualities are not imparied (e.g. to maintain flame retardance, items contaiminated by flammable fluids not used)
- ☐ Electrical protection and protective settings
  - ☐ Verification that protective settings match the engineering study
  - ☐ Protection coordination, fault level, arc flash energy, arc fault control (contain, vent, fast acting switch gear to reduce energy level)
  - ☐ Arc flash detection to trigger automatic disconnection of electrical supply
- ☐ Training, awareness and competency
  - ☐ Safe work procedures and practices to include:
  - ☐ Personnel trained in responding to an electrical incident
  - ☐ Access to low voltage (LV) and high voltage (HV) conductors



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  - [ ] Secured switch rooms, fencing, ropes with signage
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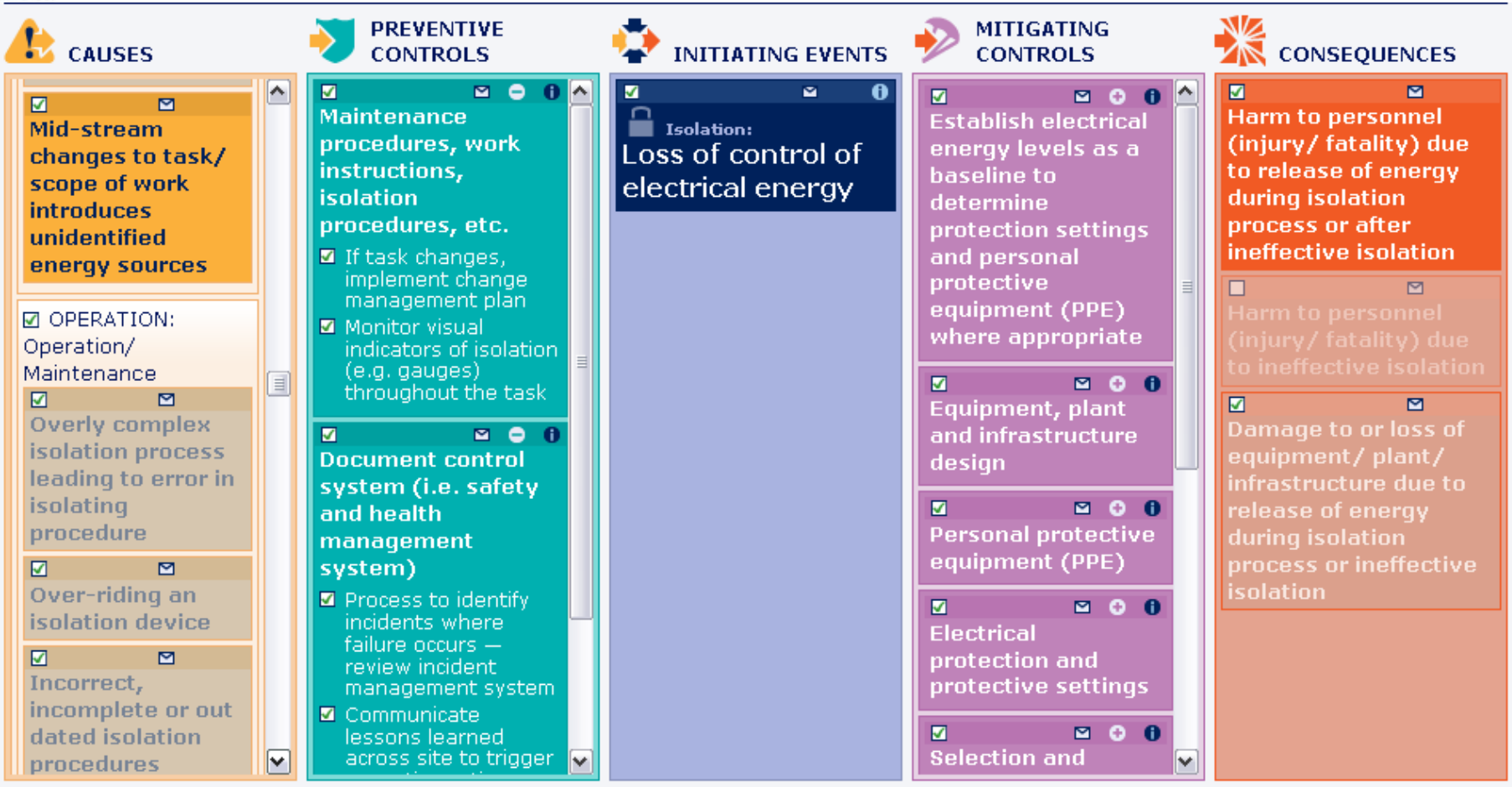
  - [ ] Electronic barriers - future capacity to create links to personnel card, etc. that prevents access to high risk areas
- [ ] Design and implement procedures to prevent unauthorised or inadvertent operation for specialised tasks (i.e. soft controls)
  - [ ] Competency-based authorisation procedures to control access to electrical systems, plant or equipment
  - [ ] High voltage (HV) competency authorisation
  - [ ] Signage for authorised access (when not locked)
  - [ ] Develop and implement isolation procedures that are machine specific and detailed (e.g. pictorial, location of labels and standard of labels, isolation schematics)
  - [ ] Work procedures to list details of isolation points
  - [ ] Site induction to include awareness of electrical system hazards
- [ ] Design to reduce the complexity of the isolation process
  - [ ] Single point isolation

CONSEQUENCE Harm to personnel (injury/ fatality) due to release of energy during isolation process or after ineffective isolation

- [ ] Establish electrical energy levels as a baseline to determine protection settings and personal protective equipment (PPE) where appropriate
  - [ ] Engineering study during mine design to establish protection coordination, fault level, arc flash energy, arc fault control (containment, venting, fast acting switch gear to reduce energy level)
  - [ ] Periodic review of engineering studies, and update the electrical safety management plan/ electrical engineering management plan
  - [ ] Implement identified controls from the engineering study
- [ ] Equipment, plant and infrastructure design
  - [ ] Compliance with relevant Australian Standards e.g. 600mm clearance around switchboards (AS/NZS 3000 2007 Wiring Rules, sections 2.9.2.2, 4.2.2.6)
  - [ ] Site electrical and plant specifications to include panic bars on doors, reliable communication systems, first aid equipment (e.g. water gel blankets, defibrillators, etc.)
  - [ ] Continuous improvement feedback and revision/ updating of site specifications
  - [ ] Remote operation of electrical switch gear to separate personnel from electrical hazard
  - [ ] Explosion risk zones (underground, liquefied petroleum gas (LPG), flammable liquids)
- [ ] Personal protective equipment (PPE)
  - [ ] Appropriate use of PPE (incl. safety glasses, overalls, gloves, boots, etc.) when working around electrical systems
  - [ ] PPE is non-flammable or flame resistant, non-conductive (e.g. flame-retartant treated cotton)
  - [ ] Undertake risk assessment (RA) to assess effectiveness of PPE relevant to the task
  - [ ] Note, PPE may not prevent injury in all circumstances
  - [ ] PPE maintained so that protective qualities are not imparied (e.g. to maintain flame retardance, items contaiminated by flammable fluids not used)
- [ ] Electrical protection and protective settings
  - [ ] Verification that protective settings match the engineering study
  - [ ] Injection test circuit breakers and relays and mining engineers for trip current and trip time
  - [ ] Protection coordination, fault level, arc flash energy, arc fault control (contain, vent, fast acting switch gear to reduce energy level)
  - [ ] Arc flash detection to trigger automatic disconnection of electrical supply
- [ ] Selection and maintenance of electrical test equipment
  - [ ] Electrical test equipment to match the engineering study
  - [ ] Confirm installation category rating (e.g. AS 61010.1-2003 Safety requirements for electrical equipment for measurement, control and laboratory use — General Requirements section 6.7.4)
  - [ ] Fused test leads
  - [ ] Regular testing and calibration of electrical test equipment
- [ ] Training, awareness and competency
  - [ ] Safe work procedures and practices to include:
  - [ ] Personnel trained in responding to an electrical incident
  - [ ] Access to low voltage (LV) and high voltage (HV) conductors
  - [ ] First aid associated with an electrical incident
  - [ ] Low voltage (LV) switchboard rescue and resuscitation (including LV rescue kit)
  - [ ] Competent assistant to effect rescue
- [ ] Confirm emergency response plan has procedures to deal with injuries from electrical energy release
  - [ ] See RISKGATE topic FIRE
  - [ ] Low voltage (LV) rescue training to recover person from potentially live conductors

CONSEQUENCE Damage to or loss of equipment/ plant/ infrastructure due to release of energy during isolation process or ineffective isolation

- [ ] Establish electrical energy levels as a baseline to determine protection settings and personal protective equipment (PPE)
  - [ ] Engineering study during mine design to establish protection coordination, fault level, arc flash energy, arc fault control (containment, venting, fast acting switch gear to reduce energy level)
  - [ ] Periodic review of engineering studies, and update the electrical safety management plan/ electrical engineering management plan
  - [ ] Implement identified controls from the engineering study
- [ ] Equipment, plant and infrastructure design
  - [ ] Compliance with relevant Australian Standards e.g. 600mm clearance around switchboards (e.g. AS/NZS 3000 2007 Wiring Rules, section 4.2.2.6)
  - [ ] Site electrical and plant specifications to include panic bars on doors, reliable communication systems, first aid equipment (e.g. water gel blankets, defibrillators, etc.)
  - [ ] Continuous improvement feedback and revision/ updating of site specifications
  - [ ] Means of fire detection, suppression and evacuation selected or designed to function reliably under expected operating conditions (see RISKGATE topic FIRE)
  - [ ] Fire prevention systems (e.g. slow propagation)
- [ ] Electrical protection and protective settings
  - [ ] Verification that protective settings match the engineering study
  - [ ] Injection test circuit breakers and relays and mining engineers for trip current and trip time
  - [ ] Protection coordination, fault level, arc flash energy, arc fault control (contain, vent, fast acting switch gear to reduce energy level)
  - [ ] Arc flash detection to trigger automatic disconnection of electrical supply
- [ ] Selection and maintenance of electrical test equipment
  - [ ] Use of non-contact testing device to validate electrical energy
  - [ ] Electrical test equipment to match the site design engineering study, and revisions/ updates
  - [ ] Confirm installation category rating (e.g. AS 61010.1 2003 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use — General Requirements, section 6.7.4)
  - [ ] Fused test leads
  - [ ] Regular testing and calibration of electrical test equipment
- [ ] Training, awareness and competency
  - [ ] Safe work procedures and practices to include:
  - [ ] Safe methods of isolation
  - [ ] Familiarisation with plant equipment (e.g. sequence of isolation in operating equipment)
  - [ ] Familiarisation with operation and limits of isolation equipment
  - [ ] Communication, notification with operators on equipment
- [ ] Emergency response plan
  - [ ] See RISKGATE topic FIRE
  - [ ] Redundancy plan for critical equipment



How helpful can RISKGATE be?

- Based on the events from the complete animation, when RISKGATE is applied, there are 19 pages of checks that could be considered during the incident investigation.
- For your next investigation, how much additional information can you gather to assist you?
- What are all the underlying causes?

Other uses – What could they be?

Used in developing MDG2007 – Selection of a Collision management System

It did fall short in areas, but the RISKGATE team sat with me to run through the issues, and to correct them.

RISKGATE is alive, it changing and the uses have an influence in its the content.