



2020

## Plant Risk Assessment Report for: Cummins Generators

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## 1 Executive Summary

A risk review has been conducted for the Cummins generators. This report does not replace the safety advice given in the Operation Manual but is in addition to the safety advice in the Operation Manual. It is important that operators or users of the generator read the safety advice in the Operation Manual prior to starting or connecting the generator.

The Plant Risk assessment involved discussions with the operator of the Generator. Risks have been identified, categorised and assessed using PR Power's Risk Management Approach. Risks have been rated from low to high using five-point likelihood and five point consequence matrix. This risk review is to determine the risks associated with the use of the machinery in accordance with the National Plant Regulations and Code of Practice of 2011 and Australian Standards AS 4024 for Safe Guarding of Machinery and AS 31000 Risk Management Standards.

Operators of Generators should have received appropriate training in operating the generator to ensure they can operate the equipment competently and safely.

This report needs to be read in its entirety to understand all recommendations made. There is a summary of recommendations below.

## 2 Risk Management Approach

### **Risk Management Strategy**

The Strategy requires the analysis of maintenance activities to determine:

- Likelihood of the risk eventuating,
- Standards of mitigation in place,
- The residual or risk exposure remaining after the mitigation effort,

In essence, the aim of the Risk Profile is to provide a common risk management framework to assist Management determine the appetite for, and tolerance to risk, and to communicate this throughout the industry as an aid to decision making and as a driver for maintenance improvement.

### **A Definition of Risk**

Broadly speaking, risks are defined as uncertain future events that could influence the achievement of the organisation's strategic and operational goals and objectives. In practical terms, risk is the exposure to the threat of such things as economic, financial, reputational loss or gain, physical damage, injury or delay, as a consequence of pursuing or not pursuing a particular course of action.

### **Definition of Hazard**

A HAZARD is any situation with the potential for human injury, damage to property, damage to the environment or a combination of these.

**Risk is defined in two dimensions:**

- the likelihood of the risk occurring and
- the consequence to the business should that risk occur

Risk management is a management approach for identifying, analysing and treating risks so that industry operates in an environment where the risks are understood and are acceptable.

### 3 The Process

#### Identification of Risk

The underlying philosophy for the identification of risk exposure is to use directly the expertise of persons that have the responsibility for managing those risk exposures.

In practice this entailed structured discussions with individuals representing principle operator activities for the Generator.

Greater detail on the identification process for risks is detailed below.

### 4 Risk Analysis and Evaluation

The following risk data collection and analysis was undertaken for each risk issue identified:

- A description of the risk (as far as was practicable the risk was described in the context of a hypothetical scenario).
- A description of the impact of the risk, describing a range of potential impacts on the individuals should the risk eventuate.
- A description of the control environment and estimation of its effectiveness is provided
- An estimation of the likelihood of the risk occurring and rated against the criteria below:
- An estimation of the consequence of the risk should it eventuate. Ratings for consequence are determined according to the table below
- Determination of an overall risk rating based on the formula:

#### ***Risk Rating = Risk Likelihood X Risk Consequence***

- Actual ratings are determined using the matrix on the following page:
- Where information was readily available, a preliminary description of the control environment and estimation of its effectiveness is provided
- An estimation of the likelihood of the risk occurring and rated against the criteria below
- An estimation of the consequence of the risk should it eventuate. Ratings for consequence are determined according to the table below

### 5 Codes of Practice and Hazard Identification

Remember, Codes of Practice are part of a strategy to raise the awareness of workplace health and improve safety practice. They have been developed for particular hazards and provide guidelines to help employers identify, assess and control risks arising from these hazards.

Unless cited in a Regulation, they are not compulsory for employers to implement, but their implementation signifies the employer's commitment to comply with their legal obligation to provide a safe and healthy workplace.

Notwithstanding the above, a Code of Practice may be used as evidence of a breach of the Act, or as a defence

that all reasonably practicable steps were taken to prevent an injury or illness.

## Identification and Classification of Hazards

Once hazards have been identified, the next step is to assess their significance. In assessing the significance of a hazard there are a number of important factors that need to be considered.

**These factors include the following:**

- Probability of injury or illness, in considering the probability of injury or illness it is important to note that they can be caused either as a direct result of short term exposure to a hazard, or from long term exposure to a hazard. Injuries that may be a direct result of short-term contact with a hazard include cuts, burns, abrasions, fractures, crush and compression injuries. Long term exposure to some hazards can cause conditions such as deafness, cancers, respiratory damage and dermatitis.
- Potential severity of injury or illness.
- How often are people exposed
- Length of exposure.
- Level of exposure.
- Number of people exposed.
- Adequacy of existing control measures.
- Human differences:
  - skill level;
  - work experience;
  - training;
  - physical capabilities

As there are many types of workplaces and hazards (or combinations of hazards), the methods for assessing hazards will be quite different. The level of risk of a job or task may well have a number of contributing factors which also need to be considered.

The important factor to remember in assessing hazards is that this assessment will determine what priority is assigned to their elimination or control.

## Hazard Categories

CATEGORIES	EXAMPLES
<b>Physical</b>	Vibration, noise, temperature, lighting, radiation, manual handling, mechanical, electrical.
<b>Chemical</b>	Dust, fumes, vapours, gases, explosives, acids, solvents, flammable liquids/solids, oxidising agents.
<b>Biological</b>	Viruses, bacteria, mould, fungi, pollen, insect excrete, contaminated body fluids and contaminated air.
<b>Ergonomic</b>	Poor design of work, poor design of equipment, poor design of environment.
<b>Psychosocial</b>	Stress, poor training and communication, work overload/underload, inappropriate work assignments.

## 6 RISK RATING SYSTEM - PR POWER

Likelihood of Event	Consequence of occurrence				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
A Almost Certain	Medium	Medium	High	Extreme	Extreme
B Likely	Low	Medium	High	High	Extreme
C Possible	Low	Low	Medium	High	Extreme
D Unlikely	Low	Low	Medium	Medium	High
E Rare	Low	Low	Low	Medium	Medium

LIKELIHOOD OF EVENT						
A. ALMOST CERTAIN	Is expected in most circumstances	• Risk has a greater than 75% chance of occurring				
B. LIKELY	Will probably occur in most circumstances	• Risk has a 50% to 75% chance of occurring				
C. POSSIBLE	May occur at some time	• Risk has a 25% to 49% change of occurring				
D. UNLIKELY	Could occur at some time	• Risk has less than a 25% chance of occurring				
E. RARE	May occur in exceptional circumstances	• Not likely to occur				
CONSEQUENCE						
RATING	DESCRIPTION	FINANCIAL	SAFETY	REPUTATION	OPERATIONS	ENVIRONMENT
5. CATASTROPHIC	Major business failure, multiple deaths, huge financial loss	Asset destruction greater than \$10m Revenue loss or opportunity cost of more than \$10m.	Multiple fatalities, or significant irreversible effects to a number of people (employees and/or public)	Irreparable damage to the company name. Parliamentary inquiry. Major public concerns raised.	Significant interruption or cessation of activities for two weeks or more.	Catastrophic irreversible environmental harm. Community outrage – potential large-scale class action.
4. MAJOR	Loss of business functionality/capability, extensive injuries, situation not contained, but no detrimental effects, major financial loss.	Loss of assets totalling \$1.5m to \$10m Revenue loss or opportunity cost of \$1.5m to \$10m.	Single fatality and/or severe irreversible disability to one or more persons	Significant damage to the company name.	Total Service cessation for one week.	Major environmental hazard caused – long term recovery. High-profile community concerns raised – requiring significant rectification measures.
3. MODERATE	Moderate disruption to daily activities, medical treatment required, high financial loss, situation contained with outside assistance	Loss of assets totalling \$150,000 to \$1.5m Revenue loss or opportunity cost of \$150,000 to \$1.5m.	Irreversible disability or impairment to one or more persons	Moderate damage to the company name.	Total service cessation for several days.	Measurable environmental harm – medium term recovery. Community complaints voiced privately – minor rectification measures.
2. MINOR	Minor disruption to day to day activities, first aid treatment required, situation immediately contained, medium financial loss.	Loss of assets totalling \$15,000 to \$150,000. Revenue loss of \$15,000 to \$150,000.	Transient health impact on staff or public	Minimal damage to the company name.	Business interruption over several days.	Medium term immaterial effect on environment/ community – required to inform EPA.
1. INSIGNIFICANT	Will not affect day to day performance, low financial loss, no injuries.	Loss of assets less than \$15,000. Revenue loss of less than \$15,000.	No health impact on staff or public	Reputation intact, internal knowledge only.	Negligible operational impact.	Short term transient environmental or community impact – negligible action required.

## 7 HAZARD HIERARCHY OF CONTROL

When developing solutions for identified hazards the risk assessment team members applied the Hierarchy of Controls. A hierarchy of hazard control measures has been established which is used on the basis that, the higher the control strategy is in the hierarchy, the more preferable and effective it is.

**The hierarchy of hazard control in order of priority is:**

### 1. Design

Before moving into new premises, or introducing new equipment or work process, all reasonably practicable steps should be taken to have the workplace plant, equipment and task designed and constructed so that potential hazards are removed or reduced to their lowest level. It is easier, and less costly to change a drawing or specification than it is to make changes after construction or installation.

### 2. Elimination/Substitution

Completely removing the hazard or substituting, that is, replacing the material, work process or machine with a less hazardous one is a very desirable strategy. This eliminates the risk of exposure to that hazard. For example:

- removing a noisy machine from the work area;
- substituting equipment that is ergonomically designed;
- jobs can be redesigned to remove the need for staff to maintain the same posture or carry out constant repetitive work

### 3. Isolation

When the above steps have been tried and have proved to not be the best solution for minimising the risk, then the separation of the hazard from employees, by use of guards on machines, enclosing noisy machines, relocating noisy portions of the plant or the use of remote handling devices should be considered. This allows for the physical separation of the hazard from the workplace.

### 4. Engineering Controls

Engineering control measures include such things as:

- modification of furniture, machinery and equipment;
- the use of controls such as local exhaust ventilation; and
- the provision of mechanical aids to assist staff with lifting and carrying tasks

### 5. Administrative Controls

Administrative procedures can also be introduced to reduce risk. Changing work procedures, for example, by introducing job rotation to reduce the exposure time to hazardous work processes or conditions is a common administrative control measure.

Administrative controls can also include education, adequate housekeeping procedures and supervision of employees in safe work practices.

### 6. Personal Protective Equipment (PPE)

If engineering and other controls are not practical or feasible, then PPE may be required. PPE, which is appropriate to the hazards and properly fitted, is often used in the following situations:

- As a temporary measure till a more effective control can be established;
- If other controls are impossible or not as effective or efficient as personal protective equipment;
- During routine maintenance or emergency clean up procedures.

PPE is also sometimes required even when other control measures have been introduced, e.g. when handling hazardous substances.

### Applying Control Measures

The higher the control strategy is on the hierarchy order, the more preferable and effective it is. Control measures can be used to reduce or eliminate the identified hazard.

Often, more than one control option may be used to minimise risk, e.g. exhaust ventilation plus the wearing of gloves and goggles.

In many cases there will be a number of control options available. The decision about the control measures to be used should be made in consultation with the affected employees, taking into account the hierarchy of control measures.

When considering control measures it is sometimes necessary to apply a control measure which is at the bottom of the hierarchy, for example PPE, as a short term solution until a more effective control measure can be instituted. However PPE may still be required even though control measures are in place e.g. construction item such as hard hat and boots.



## 8 SUMMARY OF RISK PROFILE

A Risk assessment has been conducted for the Generator. A total of 7 risks have been identified.

Rating	Profile	As a % of Total	Definition
<b>Extreme</b>			Life Threatening or permanent Disability
<b>High</b>	3	33%	Serious Injury
<b>Medium</b>	4	67%	Minor to moderate injury
<b>Low</b>			Minor to no injury
<b>7</b>		<b>100%</b>	

Risk ratings of hazards include the application of current controls. Risks can be further reduced with the implementation of the recommended controls.

Risk No.	Risk Rating	Risk Description
2	High	Refueling
5	High	Significant voltage generated when in operation
7	High	Lifting Generator
1	Medium	Hot parts from generator, exhaust etc
3	Medium	Maintenance
4	Medium	Noise levels exceeding 85DbA
6	Medium	Exposure to fumes in restricted area

The reduction in risks identified below include recommended controls

Y- Risk has been reduced as far as practicable.

X - Risk has **not** been reduced as far as practicable

Category	HAZARD	X	Y
	<b>Entanglement</b>		
	Can anyone's hair, clothing, gloves, necktie, jewellery, cleaning brushes, rags or other materials become entangled with moving parts of the plant, or materials in motion?		Y
	<b>Crushing</b>		
	<i>Can anyone be crushed due to:</i>		
	(a) material falling off plant?		
	(b) uncontrolled or unexpected movement of the plant or its load?		
	(c) lack of capacity for the plant to be slowed, stopped or immobilised?		
	(d) the plant tipping or rolling?		
	(e) parts of the plant collapsing?		
	(f) coming in contact with moving parts of the plant during testing, inspection, operation, maintenance, cleaning or repair?		
	(g) being thrown off or under the plant?		
	(h) being trapped between the plant and materials or fixed structures?		
	(i) other factors not mentioned?		
	<b>Cutting, stabbing and puncturing</b>		
	<i>Can anyone be cut, stabbed or punctured due to :</i>		
	(a) coming in contact with sharp or flying objects?		
	(b) coming in contact with moving parts of the plant during testing, inspection, operation, maintenance, cleaning or repair?		
	(c) the plant, parts of the plant or work pieces disintegrating?		
	(d) work pieces being ejected?		
	(e) the mobility of the plant?		
	(f) uncontrolled or unexpected movement of the plant?		
	(g) other factors not mentioned?		
	<b>Shearing</b>		
	Can anyone's body parts be sheared between two parts of the plant, or between a part of the plant and a work piece or structure?		
	<b>Friction/Abrasion burn</b>		
	Can anyone be burnt due to contact with the moving parts of surfaces of the plant, or material handled by the plant?		Y
	<b>Striking</b>		
	<i>Can anyone be struck by moving objects due to:</i>		
	(a) uncontrolled or unexpected movement of the plant or material being handled by the plant?		
	(b) the plant or parts of the plant or work pieces disintegrating?		
	(c) work pieces being ejected?		
	(d) mobility of the plant?		
	(e) other factors not mentioned?		
	<b>High pressure fluid</b>		
	Can anyone come into contact with fluids under high pressure, due to plant failure or misuse of the plant?		
	<b>Electrical</b>		
	<i>Can anyone be injured by electrical shock or burnt due to:</i>		
	(a) the plant contacting live electrical connections?		Y
	(b) the plant working in close proximity to electrical connections?		Y
	(c) overload of electrical circuits?		Y
	(d) damaged or poorly maintained electrical leads and cables?		
	(e) damaged electrical switches?		
	(f) water near electrical equipment?		
	(g) lack of isolation procedures?		Y
	(h) other factors not mentioned?		

	<b>Explosion</b>		
	Can anyone be injured by explosion of gases, vapours, liquids, dust or other substances, triggered by the operation of the plant or by the material handled by the plant?		Y
	<b>Slipping, tripping or falling</b>		
	<i>Can anyone using the plant or in the vicinity of the plant, slip, trip or fall due to:</i>		
	(a) uneven or slippery work surfaces?		
	(b) poor house keeping?		
	(c) obstacles being placed in the vicinity of the plant?		
	(d) other factors not mentioned?		
	<i>Can anyone fall from a height due to:</i>		
	(a) lack of work platform?		
	(b) lack of proper stairs or ladders?		
	(c) lack of guard rails or other suitable edge protection?		
	(d) unprotected holes, penetrations or gaps?		
	(e) poor floor or walking surfaces, such as, the lack of a slip resistant surface?		
	(f) steep walking surfaces?		
	(g) collapse of the supporting structure?		
	(h) other factors not mentioned?		
	<b>Ergonomic</b>		
	<i>Can anyone be injured due to:</i>		
	(a) poorly designed seating?		
	(b) repetitive body movement?		
	(c) constrained body posture or the need for excessive effort?		
	(d) design deficiency causing mental or psychological stress?		
	(e) inadequate or poorly placed lighting?		
	(f) lack of consideration given to human behaviour?		
	(g) mismatch of the plant with human traits and natural limitations?		
	(h) other factors not mentioned?		
	<b>Suffocation</b>		
	Can anyone be suffocated due to lack of oxygen, or atmospheric contamination?		Y
	<b>High temperature or fire</b>		
	Can anyone come into contact with objects at high temperature?		Y
	Can anyone be injured by fire?		Y
	<b>Temperature (thermal comfort)</b>		
	Can anyone suffer ill-health due to exposure to high or low temperatures?		
<b>1.15</b>	<b>Other hazards</b>		
	<i>Can anyone be injured or suffer ill-health from exposure to:</i>		
	(a) chemical?		
	(b) toxic gases or vapours?		
	(c) fumes?		Y
	(d) dust?		
	(e) noise?		Y
	(f) vibration?		Y
	(g) radiation?		
	(h) other factors not mentioned?		

# GENERATOR



## PLANT RISK ASSESSMENT GENERATOR

**Risk No. 1****RATINGS:**

Likelihood: C Impact: 3 Total: **Medium**

**RISK DESCRIPTION:**

Hot parts from generator, exhaust etc

**IMPACT DESCRIPTION**

Risk of burns to body

**CURRENT CONTROLS**

- Only trained and competent staff are allowed to operate the generator
- Decals in place warning for hot surfaces

**RECOMMENDED CONTROLS**

- Ensure all doors and covers are closed and locked prior to starting the generator

Likelihood	Consequence	Overall risk rating
Possible	Moderate	Medium

## PLANT RISK ASSESSMENT GENERATOR

**Risk No. 2****RATINGS:**Likelihood: C Impact: 4 Total: **High****RISK DESCRIPTION:**

Refueling

**IMPACT DESCRIPTION**

Fire and explosion

**CURRENT CONTROLS**

- Only trained and competent staff are allowed to operate the generator

**RECOMMENDED CONTROLS**

- Ensure correct fuel is used
- Use appropriate decanting techniques and attachments
- Wear appropriate additional PPE where required
- Ensure engine is cold prior to refueling
- Smoking or use of mobile phone is not permitted while refueling
- When refueling ensure nozzle is in contact with the machinery (grounded)
- When refueling with jerry cans ensure funnels are used
- Always carry first aid facilities.



Likelihood	Consequence	Overall risk rating
Possible	Major	High

## PLANT RISK ASSESSMENT GENERATOR

### Risk No. 3

#### RATINGS:

Likelihood: C Impact: 3 Total: **High**

#### RISK DESCRIPTION:

Conducting maintenance

#### IMPACT DESCRIPTION

Burns and entanglement

#### CURRENT CONTROLS

- Only trained and qualified maintenance personnel are allowed to conduct maintenance on the generator
- Decal warning for moving parts on the engine compartment
- Battery isolator
- Starter isolator



#### RECOMMENDED CONTROLS

- Install guard over drive belt and fan according AS4024 avoiding any contact with rotating components of the engine
- Develop a Safe Work Method Statement for conducting maintenance.
- Isolate all equipment prior to conducting maintenance work.
- Ensure that all equipment is fully de-energised prior to work

Likelihood	Consequence	Overall risk rating
Possible	Major	High

## PLANT RISK ASSESSMENT GENERATOR

### Risk No. 4

#### RATINGS:

Likelihood: C Impact: 3 Total: **Medium**

#### RISK DESCRIPTION

Noise levels exceeding 85DbA

#### IMPACT DESCRIPTION

Damage to hearing

#### CURRENT CONTROLS

- Sound insulated covers
- Hearing protection is mandatory when working on a permanent basis near the generator.

#### RECOMMENDED CONTROLS

- All doors and covers are to be closed and locked prior to operating the generator



Likelihood

Consequence

Overall risk rating

Possible	Moderate	Medium
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## PLANT RISK ASSESSMENT GENERATOR

### Risk No. 5

#### RATINGS:

Likelihood: C Impact: 4 Total: **High**

#### RISK DESCRIPTION

Significant voltage generated by the generator when in operation

#### IMPACT DESCRIPTION

Risk of electrocution

#### CURRENT CONTROLS

- Only trained and competent staff are allowed to operate the generator
- The generator is RCD protected
- Decal warning for electrical hazard on generator

#### RECOMMENDED CONTROLS

- Ensure all electrical connections including RCD device is tested and tagged on a regular basis
- Generator is not to be used in wet areas
- Ensure earth stake is used at all times
- All doors and covers are to be closed and locked prior to operating the generator
- Prior to connecting the generator to an external electrical system, an isolation switch must be installed by a licensed electrician



Likelihood	Consequence	Overall risk rating
Possible	Major	High

## PLANT RISK ASSESSMENT GENERATOR

### Risk No. 6

#### RATINGS:

Likelihood: D Impact: 4 Total: **Medium**

#### RISK DESCRIPTION

Exposure to fumes in restricted area

#### IMPACT DESCRIPTION

Suffocation due to lack of oxygen

#### CURRENT CONTROLS

- Machine is generally only used in open space areas

#### RECOMMENDED CONTROLS

- The Generator is not to be used in confined or restricted areas without detailed risk assessments being carried out in line with Confined Spaces Code of Practice



Likelihood	Consequence	Overall risk rating
Unlikely	Major	Medium

## PLANT RISK ASSESSMENT GENERATOR

**Risk No. 7****RATINGS:**

Likelihood: C Impact: 4 Total: **High**

**RISK DESCRIPTION:**

Lifting the generator

**IMPACT DESCRIPTION**

Generator falling down

**CURRENT CONTROLS**

- Lifting lugs or points provided

**RECOMMENDED CONTROLS**

- Ensure that the lifting equipment is rated to take the weight of the generator.
- Only ever lift the generator using the approved lifting points or lugs.
- Person lifting the generator is to be trained in safe lifting procedure
- Ensure that lift straps, ropes or chains are weight rated and regularly tested

Likelihood	Consequence	Overall risk rating
Possible	Major	High