

VERSION CONTROL					
Ver	Date	Description	Prepared by	Checked by	Approved by
0.1	21/11/2019	Draft - Issued for EAG review	EMcD, DC	DC	EAG
0.2	3/12/2019	Draft revised by working group during meeting 3/12	EMcD, DC	DC	WG
1.0	21/01/2020	Published version 1.0	EMcD, DC	DC	WG

1. CONTEXT

In 2007, EMESRT published Design Philosophy 4 (DP-4) focusing on Fire with the aim of providing information to assist OEMs in designing equipment to reduce the risks of potential unwanted equipment fire events. This project is an extension of the original work carried out by EMESRT and the industry in developing DP-4. The industry's depth of understanding that surrounds how to build, operate and maintain equipment to sustain the desired outcomes is acknowledged but we need to do more. However, the industry acknowledges that significant fatality/injury risk still exist for surface mining and the potential for a catastrophe for underground mining is real.

Statistics obtained from the Queensland Mine Inspectorate in November 2019 showed that there were 365 fire events recorded that cause, or have the potential to cause, a significant adverse effect on the safety or health of a person in mining.

In early 2019, EMESRT reached out to key stakeholders and started the conversation. This resulted in the formation of an EMESRT Equipment Fires Working Group. The primary focus of the group is to identify design inadequacies, review and link industry work to date on equipment fires to prepare a relevant Control Framework (CFw) document resulting in the development of an industry self-assessment tool with accompanying guidance notes (user guide).

2. INTRODUCTION

BACKGROUND - EMESRT BASELINE CONTROL FRAMEWORK (CFW) FOR EQUIPMENT FIRES

In two workshops in 2019, the Earth Moving Equipment Safety Round Table invited experienced mining industry personnel to contribute to the development of a Control Framework for Mobile Equipment Fires in Mining.

At the workshops, more than 20 people representing: six mining companies, a fire detection and suppression consultancy supported by two expert facilitators worked for three days to review, amend and validate a CFw ver1 Baseline for Mobile Equipment fires.

The contributing organisations to this work were:

- Alcoa
- Anglo American
- BHP Billiton
- Glencore
- Hitachi
- Peabody
- Rio Tinto
- Risk Mentor
- South32
- DNRME
- Wormald

A draft CFw was prepared before the first workshop from multiple information sources about preventing and mitigating equipment fires:

- EMESRT Design Philosophy 4 – Equipment Fires
- Regulator information from multiple jurisdictions - incident reports, bulletins, publications analysis, position papers etc
- Operating site, company and industry documents
- Research and technical information e.g. incident taxonomies
- Relevant Standards and Guidelines e.g. ISO 19296 Mining - Mobile machines working underground - Machine Safety First edition 2018-11

Working from this draft the workshop participants reviewed, amended and validated the CFw content working iteratively through this cycle multiple times over two days:

1. Review the **Required Operating States (ROS)**
2. For each ROS identify the **Credible Failure Modes (CFM)**, amend as required, support with real world scenarios, cross check against incident experience
3. Use control sheets to identify the **Business Inputs** that prevent or mitigate the CFM from compromising the ROS.
 - a. For each business input capture how it is *specified, implemented and monitored*
 - b. Add industry level detail based on participant knowledge and experience
4. Continually update the CFw for Mobile Equipment Fires.
5. This content was again reviewed during a one-day workshop in July and EMESRT coordinated industry level projects commenced.

During the workshops, it was recognised that fire prevention and mitigation approaches across operating mining fleets are not integrated or consistent and that OEM equipment design for fire prevention is not clear. It was also noted that fire detection and suppression systems design and installation is not well coordinated between OEM and third-party suppliers and compounded by having multiple company specifications.

At the conclusion of the July workshop it was decided to:

- Gain commitment from workshop participants to be a part of the working group
- Scheduling monthly working group teleconferences
- Develop a Draft Stakeholder Management Plan
- Adopting the agile Trello board online project management tool to manage the project

Influence the course for change in not only the design and installation consistencies but in developing a self-assessment tool and guidance notes that end users can use to determine if they have controls in place to mitigate a fire event

3. PURPOSE

To prevent harm related to equipment fires to as low as reasonably practical, including consideration in design for foreseeable human error.

4. DELIVERABLES

This group is focusing on delivering two outcomes:

1. Consolidating and sharing current industry good practices

Developing and delivering industry projects that deliver design change that provide improvements in preventing and mitigating mobile equipment fires

Industry enabling process

- Self-assessment and guidance tool that end users can use to determine if they have controls in place to mitigate a fire event
- Clearly articulate the immediate operational requirements to sustain healthy equipment fire systems
- Engage OEM’s, fire system suppliers and providers to clearly articulate the design problems that need to be solved
- Publish the self-assessment tool and guidance notes (user guide) to the EMESRT Knowledge Hub

Industry definition of the problems

Design – Elimination aspects

- Isolate heat sources from fuel sources

Design – Mitigation aspects

- Automatic suppression of fire
- Protection of the operator should fire occur
- Automatic engine shutdown and isolation of fuel sources, should fire occur
- Manual activation of fire suppression
- Protection of the operator should fire occur
- Automatic engine shutdown and isolation of fuel sources
- Identify the functional design requirement for emergency exit gates
- Identify functional/ practical fire extinguisher locations designed into assets
- Well positioned, easy to operate and light weight firefighting and safety equipment

Maintaining the design

- Standardised training for operators and maintainers

Note: Please see *Appendix A – Work Breakdown Structure* for a detailed project schedule.

5. BOUNDARIES, ASSUMPTIONS AND CONSTRAINTS

In scope	Out of scope
Engagement with industry representatives, OEM’s, equipment suppliers and service providers to clearly articulate the design problems that need to be solved and to provide input into maintenance processes	Research and development of new technological innovations around equipment design improvements
Assumptions	Constraints
Industry trial self-assessment and guidance tool to determine whether current business inputs have adequate operational processes in place to mitigate equipment fires	Requirement to clearly articulate the immediate operational requirements and future design changes to prevent and mitigate equipment fires

6. PROJECT RISKS

Risk	Mitigation
Scope creep	Scope agreement upfront, process agreed for scope approval (<i>refer to project change management form</i>)
Misalignment of key external stakeholders	Communication of Project Scope and Stakeholder Management Plan
OEM confusion with the transition from Design Philosophies to a broader approach that integrates operational process with the hard design issues	Communication of Project Scope

7. KEY STAKEHOLDERS

Project lead	Mark Geerssen, Rio Tinto
Project sponsor	
Working group	Alcoa, Anglo American, BHP, DNRME Qld, Glencore, Hitachi, Peabody, Rio Tinto, South32, Wormald, Risk Mentor, Total Fire plus any other new member companies not covered here
Other stakeholders	Industry representative, OEMs, equipment suppliers and service providers

8. RESOURCE REQUIREMENTS

Role	Person	Responsibilities
Lead	Mark Geerssen	The project lead for the project is EMESRT Advisory Group representative Mark Geerssen, Rio Tinto. The duties of this role are to manage the project plan, the project scope, the resourcing and the budget. The role also involves engaging in dialogue with the working group regularly on project progress and any issues that may arise
Sponsor		
Support resource	Eve McDonald	Support staff on the project is EMESRT Coordinator Eve McDonald. Eve is responsible for supporting the project activities as set by the working group, coordinating teleconference and future workshops, generating project updates, and assisting in maintaining the project Trello board
Student	TBA	
External resources	TBA	External consultants will be engaged as/when required. Responsibilities are dependent on the scope of work at the time of engagement

9. MILESTONES

2020				2021			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
<ul style="list-style-type: none"> • Publish Stakeholder Management Plan • Form smaller interest working groups • Literature review – compelling story presentation to support/ summarise white paper • Gap analysis – Passive fire protection • White paper • Table and prioritise OEM design initiatives 	<ul style="list-style-type: none"> • Follow up workshop • Develop discussion paper (CFw, related documentation/information) • Review Design Philosophy 4 • Industry / OEM engagement workshop 	<ul style="list-style-type: none"> • Compile industry data (business case) – standard classification system – make/model category • Establish future state based on data 	<ul style="list-style-type: none"> • 				

10. BUDGET

The 2020 project budget will be tabled for discussion and approval following the first follow workshop scheduled for Quarter 2 of 2020.

11. NEXT STEPS

What	Who	When
Draft problem definition overview statement	Pat Hurley	Completed
Scope approved and resource commitment gained	Working Group	Completed
Scope and expectations communicated to stakeholders	Eve McDonald	Completed
Scope communicated to the wider EMESRT community via media release	Eve McDonald	Completed

12. PROJECT COMPLETION AND CLOSEOUT

10.1 Definition of project completion

The decision as to whether the project is complete is primarily the responsibility of the project lead in consultation with the advisory and working group. The Advisory Group has power of veto over the decision if they believe the project has not been completed as scoped out by the working group.

The project is deemed to be complete when the allocation of time has passed, the budget is spent and the project objectives have been met and all agreed deliverables delivered.

The project close-out procedure is to be completed once agreement has been reached.

10.2 Reporting process

All key stakeholders will be formally informed of project completion and provided with a project close-out document (case study, report). An appropriate communique is to be circulated to the EMESRT wider community, posted on the website and LinkedIn page.

10.3 Lessons learnt

Upon project close-out, the project lead will schedule an Advisory Group “lessons learnt” debrief teleconference where findings, both positive and negative, will be documented and retained for future reference in the dedicated project folder on the EMESRT server maintained by Mining3.