

Work Package 1.1.4

**VICE ROS Review**

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| Vehicle Interaction Control Improvement Project |
| **WBS Parent** | 1. VI Control Baseline (Phase 1)
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| **WBS Reference** | 1.1 External Expectations |
| **Work Package** | 1.1.4 VICE Required Operating States Review |
| **Package Owner** | Project Manager |
| **Owner Organisation** | Your Company |
| **Participants** | Project Manager, Project Team, site and divisional HSE personnel, selected operations personnel. |
| **Capability Required** | Knowledge of site operating conditions, and industry good practice for vehicle interaction controls.Involvement with sector and industry initiatives and programs. |
| **Description** | Review the details for each of the 13 EMESRT Vehicle Interaction Control Framework's Required Operating States (ROS) using Appendix A.The output from this Work Package is that site leaders, the Project Manager and Project Team:* Understand how the Control Framework approach works and how it is used to review the effectiveness of site vehicle interaction controls.
* Review and confirm that the VICE Required Operating States (ROS) and their related Credible Failure Modes are site relevant.
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| **Completion State** | **Review and presentation by Project Team to Senior Managers.** |

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| **References** The Control Framework process is an approach that is aligned with Failure Modes and Effects Analysis, and consideration of Human Factors. It considers required business outcomes and then maps in the real-world inputs required to achieve them with a focus on answering:***‘What has to be in place for work to go right?’***Applying the CFw approach produces a cross-linked hierarchal structure made up of: The few **Required Operating States** (ROS) that deliver business outcomes;The **Credible Failure Modes** that can compromise the Required Operating States and interrupt the delivery of business outcomes;The many **Business Inputs** that support the establishment and maintenance of the Required Operating States by preventing or mitigating the Credible Failure Modes.The approach is particularly useful for understanding those Business Inputs that are wholly dependent or part-dependent on the decisions and actions of people. It also provides clarity in ongoing dynamic interactions between multiple Required Operating States e.g. safe and productive use of mobile equipment in mines requires operators to *maintain clearance, give way, operate at the correct speed, park correctly respond to alarms, remain alert etc.* **Sector Resources*** [EMESRT VI Control Improvement Industry Project](https://www.emesrt.org/vehicle-interaction-control-improvement/)
* [EMESRT VI Body of Knowledge](https://emesrt.org/vici-bok/)
* [EMESRT VICI Project Guide](https://emesrt.org/wp-content/uploads/EMESRT-VICI-Project-Guide-2023.pdf)
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**Appendix A**

Required Operating States and Credible Failure Modes

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| ROS Name | Required Operating State Detail | Credible Failure Modes that can compromise the ROS |
| ROS 01 - Operator maintains adequate clearances / distances | Minimise potentially hazardous interactions between vehicles, co-workers or other items / equipment / structure / environmental aspects when operating and travelling along roadways. Nil approach contact; vehicle to vehicle, vehicle to person(s), vehicle to equipment or environment.  | * CFM.1CP-02 Equipment operator or pedestrian mistake in estimating clearance distance
* CFM.1CS-01 Personnel do not manage heavy vehicle blind spots
* CFM.1CS-02 Operators or co-workers have required communications equipment but are not contactable
* CFM.1CS-05 Proximity and other alarms do not assist operator
* CFM.1CS-06 Operator fails to see signage installed to standard
* CFM.1CS-08 Operator fails to identify and act on changes in conditions - reduced visibility, road narrowing, road surface etc.
* CFM.1CT-02 Incorrect action taken on proximity alarm
* CFM.2ED-02 Mobile Equipment does not meet standards for lighting, signage and identification markings
* CFM.2EP-02 Equipment or component failure during operations e.g. brakes or steering or controlled functions
* CFM.2EP-03 Communication equipment absence, failure or poor reception
* CFM.2EP-08 CAS/PDS alarm failure to operate
* CFM.2EP-10 Work environment conditions impeded operation of technologies
* CFM.3VP-01 Inadequate implementation of site traffic management plan
* CFM.3VP-06 Obscured or missing signage
* CFM.3VP-07 Appropriate distances from fixed and overhead structures are not maintained
* CFM.3VP-09 Excessive water (Dust Control) is applied to road surface
* CFM.3VP-10 Inadequate work planning means that heavy vehicle operators approach fixed structures that are incidental to achieving operational outcomes
* CFM.3VS-01 Inadequate Inspection of Operating Environment
* CFM.3VT-01 Operations continue when operating environment is significantly compromised
* CFM.4TD-01 Access control infrastructure is inadequate
* CFM.4TD-02 Blind spots on heavy vehicles are not considered in workplace layout
* CFM.4TP-01 Operational access control (pedestrian and vehicle) is inadequate
* CFM.4TP-02 Vehicle operator does not check pathway after being parked
* CFM.4TP-03 Light vehicles stop or park in heavy vehicle blind spots
* CFM.4TP-04 Mobile equipment operator or pedestrian does not notify when entering a controlled work area
* CFM.4TP-06 Incorrect communication protocol
* CFM.4TP-07 Reducing vehicle interactions by maintaining clearances is inadequately considered routine work planning
* CFM.4TT-01 Operations continue when there are significant interaction threats
* CFM.5SD-04 Insufficient resources applied to minimise unwanted vehicle interactions
* CFM.5SS-02 Vehicle operator fails to comply with site requirements
* CFM.5ST-10 Regulator prosecution
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| ROS 02 - Vehicle operators give way appropriately to mobile plant and pedestrians  | Minimise potentially hazardous interactions between mobile plant and mobile plant and pedestrians in work areas - particularly at constructed intersections and where traffic flows come together. Nil contact; vehicle to vehicle, vehicle to people  | * CFM.1CP-01 Operators of heavy and light vehicles (or pedestrians) fail to follow the designated travel path
* CFM.1CP-03 Operators unaware of right of way and other general requirements
* CFM.1CP-04 Operators unaware of give way requirements for vehicles
* CFM.2ED-02 Mobile Equipment does not meet standards for lighting, signage and identification markings
* CFM.2EP-02 Equipment or component failure during operations e.g. brakes or steering or controlled functions
* CFM.2EP-08 CAS/PDS alarm failure to operate
* CFM.3VD-01 Inadequate mine traffic management plan (specification)
* CFM.3VD-02 Reducing vehicle interactions through intersection design and traffic rules is inadequately considered in mine design and routine work planning
* CFM.3VD-07 Poorly designed intersection/break-away
* CFM.4TP-08 Vehicle remains in heavy vehicle blind spot due to intersection approach speeds
* CFM.5SD-05 Failing to adequately communicate changes or consider impacts on site culture
* CFM.5SP-01 Inadequate management of change
* CFM.5SS-01 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained
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| ROS 03 - Operators drive vehicles at speeds which meet site rules and local conditions | Reduce the potential for loss of control of equipment due to incorrect speed for the conditions. Nil loss of control of equipment caused by incorrect speed for the conditions.  | * CFM.1CD-01 Operator unaware of correct speed
* CFM.1CS-03 No action taken on over speed alarm
* CFM.1CS-06 Operator fails to see signage installed to standard
* CFM.1CS-07 Operator ignores or bypasses alarm or safety device
* CFM.1CS-08 Operator fails to identify and act on changes in conditions - reduced visibility, road narrowing, road surface etc.
* CFM.2ED-01 Equipment or Component Design is not error tolerant
* CFM.2EP-01 Operator fails to conduct pre-start requirements
* CFM.2EP-04 Speed limiting device compromised
* CFM.2ES-04 Overload warning system fails is incorrect or absent
* CFM.2ES-05 Over speed warning alarm fails to operate
* CFM.2ES-06 Speedometer does not indicate actual speed
* CFM.3VD-03 Speed limits and over-speed management are inadequately considered in mine design and routine work planning
* CFM.3VD-05 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning
* CFM.3VD-06 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning
* CFM.3VD-07 Poorly designed intersection/break-away
* CFM.3VS-01 Inadequate Inspection of Operating Environment
* CFM.3VT-01 Operations continue when operating environment is significantly compromised
* CFM.5SD-05 Failing to adequately communicate changes or consider impacts on site culture
* CFM.5SP-02 Inconsistent application of performance management processes (Supervisors and Management)
* CFM.5SS-03 No aggregated monitoring and response to alarms
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| ROS 04 - Operators do not drive vehicles when impaired | Nil loss of control of equipment due to operator impairment through fatigue, stress, alcohol and other drugs, or work environment stressors. | * CFM.1CP-05 Impaired or inattentive operator operates mobile equipment
* CFM.1CS-04 Operators change behaviour after fatigue alerting system is fitted
* CFM.1CS-09 Distraction or Fatigue event not validated and communicated
* CFM.1CT-01 Supervisor does not identify or act when operator is fatigued or intoxicated
* CFM.2ED-05 Fatigue alarms not matched to CAS/PDS user requirements
* CFM.2ES-99 In vehicle fatigue monitoring and alerting system fails
* CFM.4TD-01 Access control infrastructure is inadequate
* CFM.5SD-02 Organisation Work Scheduling and Planning is inadequate
* CFM.5SD-03 Work Environment and Work Demands result in Fatigued Mobile Equipment Operators
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| ROS 05 - Operators park vehicles in positions that avoid unwanted interactions | Minimise potentially hazardous interactions between vehicles, co-workers or other items/equipment. No unintended movement of parked vehicles.  | * CFM.2ED-02 Mobile Equipment does not meet standards for lighting, signage and identification markings
* CFM.3VD-04 Vehicle parking, including emergency parking is inadequately considered in mine design and routine work planning
* CFM.4TP-03 Light vehicles stop or park in heavy vehicle blind spots
* CFM.4TP-05 Operator does not meet site requirements when parking
* CFM.4TS-01 Parked vehicles block view for pedestrians and other equipment operators
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| ROS 06 - Physical barriers provide separation | Physical barriers minimise interactions between vehicles, co-workers or other items/equipment. Nil normal operations contact; vehicle to vehicle, vehicle to person(s), vehicle to equipment or environment | * CFM.3VD-01 Inadequate mine traffic management plan (specification)
* CFM.3VD-05 Reducing vehicle interactions through segregation is inadequately considered in mine design and work planning
* CFM.3VP-01 Inadequate implementation of site traffic management plan
* CFM.3VP-03 Operational personnel do not maintain minimum standards for berms, windrows and other zone protection.
* CFM.5SS-01 Inadequate monitoring that mine traffic management requirements have been implemented and are being maintained
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| ROS 07 - Alarms alert operators to nearby hazards and operator takes appropriate action | Minimise potentially hazardous interactions between vehicles, co-workers or other items/equipment. Alerting alarms or laser barrier/fencing provides timely information on nearby hazards and the vehicle trips and/or vehicle operator responds appropriately. The goal is to achieve Nil approach contact; vehicle to vehicle, vehicle to person(s), vehicle to equipment | * CFM.1CD-02 Proximity alarms, area guards do not perform to specification (false negatives)
* CFM.2ED-04 Failing to adequately consider site requirements when specifying technology for mobile equipment
* CFM.2EP-01 Operator fails to conduct pre-start requirements
* CFM.2EP-10 Work environment conditions impeded operation of technologies
* CFM.2ES-07 Multiple vehicles system alarms overwhelm and confuse the operator
* CFM.2ET-03 Routine false positive alarms
* CFM.5SD-05 Failing to adequately communicate changes or consider impacts on site culture
* CFM.5SS-04 Equipment faults arising from poor standard of maintenance
* CFM.5SS-05 Unit key system alarms are not monitored
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| ROS 08 - When a Vehicle Component alarms the operator responds appropriately | Critical vehicle component e.g. brake or steering system warning alarms. Reduce the potential for loss of control of equipment due to loss or failure of brake or steering system. The vehicle operator responds appropriately to brake or steering system alarms. Nil loss of control of equipment caused by loss or failure of brake or steering system.  | * CFM.1CD-03 Incorrect action on vehicle system alarm - not understood
* CFM.2ED-03 Steering and brake alarms not fitted
* CFM.2ED-05 Fatigue alarms not matched to CAS/PDS user requirements
* CFM.2ES-02 Installed equipment system status alarms do not operate
* CFM.5SS-04 Equipment faults arising from poor standard of maintenance
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| ROS 09 - Loads are appropriate for vehicle type and site conditions, items are secured during travel.  | Vehicle operator / worker loads vehicle appropriately for site conditions including securing items. Low levels of harm caused loose objects or loading issues during any vehicle interactions.  | * CFM.2EP-05 Restraints or load securing devices fail causing an incident
* CFM.2EP-06 Loose objects in cabin remain unsecured
* CFM.2EP-07 Routine overloading of vehicles
* CFM.2ES-04 Overload warning system fails is incorrect or absent
* CFM.3VD-06 Loading requirements for vehicles inadequately considered in mine design, equipment selection and work planning
* CFM.3VP-05 Vehicles are operated outside specified tyre conditions
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| ROS 10 - Access Control - Vehicle operators limit movements / activities to designated areas | Access controls minimise potentially hazardous interactions (vehicle to vehicle, vehicle to pedestrian) in operational areas. | * CFM.1CP-08 Operator does not drive on available segregated roads or nominated routes/locations
* CFM.2EP-09 CAS/PDS fails to notify the operator
* CFM.3VD-01 Inadequate mine traffic management plan (specification)
* CFM.3VP-06 Obscured or missing signage
* CFM.4TD-01 Access control infrastructure is inadequate
* CFM.4TP-01 Operational access control (pedestrian and vehicle) is inadequate
* CFM.4TP-04 Mobile equipment operator or pedestrian does not notify when entering a controlled work area
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| ROS 11 - Seat belts are used by vehicle operators and occupants | To Minimise level of harm which results during a hazardous vehicle interaction - Workers travelling in vehicles fitted with restraints wear them when the vehicle is in motion.  Vehicle operator and passengers use seat belts / restraints. Maximum designed operator protection during any hazardous vehicle interaction.   | * CFM.1CP-06 Operators or passengers do not use fitted seatbelts or restraints
* CFM.1CS-07 Operator ignores or bypasses alarm or safety device
* CFM.2ES-01 Compromised vehicle cabin no longer meets OEM or site specific specifications
* CFM.2ES-03 Seat belt use indicators disabled or compromised
* CFM.2ET-01 OEM supplied seat belts are disabled or removed
* CFM.5SS-04 Equipment faults arising from poor standard of maintenance
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| ROS 12 - Cabin protection is in accordance to site standards  | Maximum designed operator protection during unwanted vehicle interactions. Maximum designed operator protection during unwanted vehicle interactions. For surface operations consider the use of airbags.  | * CFM.1CP-07 Operators or passenger has limb outside cabin while travelling
* CFM.2ES-01 Compromised vehicle cabin no longer meets OEM or site specific specifications
* CFM.2ET-02 Fitted airbags fail to deploy
* CFM.5SS-04 Equipment faults arising from poor standard of maintenance
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| ROS 13 - Emergency Responders manage injuries at the scene | Adequately resourced site emergency services respond in a timely manner to minimise the injuries / losses sustained at the accident scene. For major, ongoing situations external emergency services - who are familiar with site conditions - provide back up support to limit the extent of loss.  Timely response that removes people from danger, stabilises injuries and provides transport for further treatment.   | * CFM.5SD-01 Emergency response is inadequate through lack of skill or equipment
* CFM.5SD-04 Insufficient resources applied to minimise unwanted vehicle interactions
* CFM.5ST-01 Emergency response is significantly delayed
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| **Notes**...................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................... |
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