

Formula 1

Content placeholder

Formula 2

Content placeholder

Related Content

Title	Type	Slug
Blast Design Excel Template v4.2	resource	blast-design-excel-template
Drill Rig Maintenance Inspection Checklist	resource	drill-rig-maintenance-checklist
Rock Mass Rating (RMR) Field Survey Sheet	resource	rmr-field-survey-sheet
Drilling Energy Benchmarking Dashboard (Power BI)	resource	drilling-energy-dashboard
TBM Advance Rate Prediction Curve Library	resource	tbm-advance-rate-library

Detailed Explanation

The HMI Handover Procedure SOP is a cornerstone of safe human-autonomy collaboration in mining and heavy industrial environments deploying Autonomous Haulage Systems (AHS). Rooted in the risk-based design philosophy of AS/NZS 4024.1-2018, it treats handover not as a simple UI toggle but as a formal safety function requiring rigorous validation of preconditions — including vehicle kinematic state (e.g., speed ≥ 0 km/h, brake applied), environmental readiness (e.g., GPS integrity, obstacle clearance), and operator situational awareness (e.g., confirmed visual verification, HMI focus confirmation via biometric or interaction telemetry). Each handover event is time-stamped, logged with contextual diagnostics, and subject to dual-channel verification: one from the AHS control layer (e.g., autonomy stack status) and another from the safety-critical monitoring layer (e.g., SIL2-certified watchdog subsystem). The SOP further prescribes graded handover modes — 'supervised', 'semi-autonomous',

and 'full manual' — each with distinct authority boundaries, feedback modalities (e.g., haptic alerts, colour-coded status bars), and mandatory timeout/reversion protocols to prevent operator complacency or automation surprises. Compliance is verified through periodic third-party audits, functional safety assessments (per AS/NZS 61508), and integration testing against ISO 13849-1 PL requirements.

Key Components

#	Component
1	Pre-handover System Readiness Verification
2	Operator Acknowledgement & Situational Awareness Confirmation
3	Dual-Channel Authority Transfer Logging & Fail-Safe Reversion

Applications

#	Application
1	AHS fleet deployment in open-pit mining operations
2	Remote operations centre (ROC) shift handovers involving multiple operators
3	Emergency intervention scenarios during autonomy degradation or network partition

Related Concepts

#	Concept
1	Functional Safety (IEC 61508)
2	Human Factors Engineering (ISO 6385)
3	Autonomy Level Transition Integrity (SAE J3016 Level 4–5 handover protocols)

Tags

ToolFusion Engineering