APPENDIX R – Signals, Switches and Crossings

Dunlap Crossing



Camelback Flashers



Audubon



Victory



51 St



Center Parkway Flashers



Mayco's



Mission Palms



University



Horne



CROSSING GATES RISK ASSESSMENT

To identify, evaluate, and control hazards associated with the use, operation, or temporary alteration of crossing gates while conducting works on or adjacent to the Valley Metro Light Rail system.

This assessment applies to all contractors, subcontractors, and Valley Metro personnel who operate gates, escort vehicles across the right-of-way, or manage site access at grade crossings under OCC authorization.

HAZARD IDENTIFICATION

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
CG-1	Unexpected opening of gate	Medium	High	High	Gate operations only under valid Track Access Permit; PIC confirms protection with OCC; two-person verification before opening.
CG-2	Poor sightlines or visual obstruction when crossing	Medium	High	High	Use additional lookouts, stop boards, or temporary flaggers; postpone work if sightlines inadequate.
CG-3	In case gate left open or unsecured after use	Medium	High	High	Implement lock-and-tag procedure; PIC verifies closure and records in site log before releasing track.
CG-4	Vehicle or plant fouling the crossing (beyond foul point)	Medium	High	High	Mark foul limits; use banksman or ground guide; apply

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
					physical barriers; pre-move briefing required.
CG-5	Mechanical or electrical failure of gate / warning system	Medium	Medium	Medium	Suspend operations; notify OCC and Signals; use temporary traffic control and lookouts until repaired.
CG-6	Slip, trip, or fall around uneven crossing surface	Medium	Medium	Medium	Maintain clear walking path; use proper footwear; deploy portable lighting at night.

RISK CONTROL EVALUATION

Control Type	Description	Implementation
Procedural Control	OCC-issued Track Access Permit and verbal authorization before any gate operation.	Required per 49 CFR 214.321 (Exclusive Track Occupancy).
Engineering Control	Physical lock-and-tag devices, foul-limit markers, and temporary barricades.	Applied at all controlled crossings.
Administrative Control	Job briefing defines roles of PIC, gate operator, lookout, and banksman.	Documented on RWP Daily Log.
Communication Control	Continuous radio contact with OCC; read-back verification of gate status and time of operation.	Mandatory per OCC SOP.
PPE Control	Class 3 vest, safety boots, (may be situationally required: hard hat, hearing protection, and eye protection.)	Always required within ROW

Supporting Documentation

- FTA 49 CFR 214.321: Exclusive Track Occupancy Protection
- FRA 49 CFR 234: Grade Crossing Signal System Safety
- Valley Metro Track Access Permit Procedure
- Valley Metro SOP 600.4

CVS- 23 Spring Switch



CVS 24 T-Rail



CVS 24 K-Rail



CVS 24 T-Rail Yard



M-3



SYM-10 Yard Lead



Yard Manual Switch



SWITCH MAINTENANCE AND INSPECTIONS RISK ASSESSMENT

To identify, evaluate, and control hazards associated with inspection, adjustment, and maintenance of power and manual switch machines on the Valley Metro mainline, yard, and streetcar systems.

This assessment applies to all maintenance staff, signal technicians, and roadway workers performing work within switch limits or adjacent track zones under OCC protection.

HAZARD IDENTIFICATION

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
S-1	Unexpected switch movement during work (powered switch not blocked or locked out)	Medium	High	High	OCC applies signal block; and tagged out before entry.
S-2	Contact with energized components inside power switch machine (electrical hazard)	Low	High	Medium	De-energize power supply when practical; lockout/tagout; verify zero voltage prior to maintenance.
S-3	Pinch or crush injury from moving switch rods or points	Medium	High	High	Nobody parts in point gap; communicate before power throw.
S-4	Slip, trip, or fall near switch pit or ballast edge	Medium	Medium	Medium	Maintain clear footing; provide portable lighting; remove debris before start.
S-5	Struck-by hazard from train movement	Medium	High	High	Establish Exclusive Track Occupancy (ETO); designate

Hazard ID	Description	Likelihood	Severity	Risk Rating	Mitigation / Control
	through adjacent track				watchperson; maintain safe zone
S-6	Failure to restore switch to proper correspondence after testing	Low	High	Medium	Perform dual verification (field + OCC indication); record confirmation in work log; post-work test train if required.

RISK CONTROL EVALUATION

Control Type	Description	Implementation
Procedural Control	Exclusive Track Occupancy (ETO) or “Switch Block” issued by OCC; no movement authorized until work released.	Required under RWP 214.327(a).
Engineering Control	Blocking of switch points when practical to prevent pinch point	Used on all powered machines.
Administrative Control	Job briefing conducted prior to work; roles for lookout, flagger, and supervisor defined.	Documented on RWP Daily Log.
Communication Control	Continuous radio contact with OCC; read-back verification of switch ID, location, and status.	Mandatory per OCC SOP.
PPE Control	Safety boots, Class 3 vest, insulated gloves, hearing protection, and eye protection. (situational)	Always Worn

Supporting Documentation

- SOP 600.13: Mainline Switch Repair
- SOP 400.7: Adverse Weather Operations (frozen/heat-expanded switches)
- FTA 49 CFR 674.27 & FRA 214.327: RWP Protection of Workers on or Near Switches

RED SIGNAL OVERRUN (RSO)

S2 Dorsey



S6 Guthrie



S2 Guthrie



Jackson S2



Jackson S6



RISK ASSESSMENT

A Red Signal Overrun (RSO) occurs when an operator fails to stop the LRV at a red signal aspect, resulting in the train entering a protected block, interlocking, or crossover without authorization. RSOs present a critical risk to roadway workers, especially when maintenance crews, inspectors, or equipment occupy the track under Exclusive Track Occupancy (ETO) or Work Zone Limits (WZL) protection.

RSOs may result from operator distraction, misinterpretation of aspects, inadequate braking distance, low visibility (sun glare, curve alignment, portals), or delayed route confirmation from OCC.

HAZARD CAUSES

Category	Potential Causes
Human Factors	Operator distraction, misjudged braking, fatigue, unfamiliar route conditions, inattention to signal status.
Technical / Equipment	Signal lamp failure, switch correspondence error, or signal system latency.
Environmental	Glare, fog, rain, low lighting, or obstructed signal visibility due to adjacent traffic or infrastructure.
Procedural / Organizational	Inconsistent operator refresher training, unclear OCC communication, or ineffective safety audits in high-risk interlocks. (unless otherwise specified in Job Safety Briefing)

RISK EVALUATION

Likelihood	Severity	Risk Rating
Medium	Catastrophic	High

An RSO can directly result in collision with personnel, work equipment, or other trains, especially in interlockings or adjacent work limits. Even near misses erode safety culture and may violate FTA reporting thresholds under 49 CFR Part 674.33.

EXISTING CONTROLS

Control Type	Description
Engineering Controls	Automatic signal enforcement (where applicable), track circuit interlocking protection.
Administrative Controls	OCC-issued ETO limits, RWP briefings emphasizing “Red Aspect Awareness,” operator training on signal approach distances.

Control Type	Description
Procedural Controls	Flagging and lookout positions placed prior to red aspects; verbal confirmation with OCC before entering signal territory; periodic RSCP audits.
Monitoring & Reporting	Daily OCC Red Signal Log, Safety Event Review Board (SERB) tracking, SCADA signal aspect analytics.

RECOMMENDED MITIGATIONS

Action Type	Mitigation Measure	Responsible Party
Engineering	Evaluate feasibility of automatic stop enforcement or audible “Signal Ahead” alerts in high-RSO zones (e.g., Guthrie, Jackson, Dorsey).	Signal/ATP Engineering
Procedural	Enforce mandatory stop-and-hold until OCC grants authority after RSO event; introduce “RSO Red Zone Audit” protocol in work areas.	OCC / Safety
Training	Implement periodic “Red Aspect Awareness” module for operators; simulate RSO prevention in CORYS simulator scenarios.	ACI / Operations Training
Administrative	Include RSO locations in RWP safe-zone mapping	RWP Coordinators / Field Supervisors

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Quick Reference

CROSSING GATES

PURPOSE

To define the hazard controls and procedures required when operating or temporarily altering any crossing gate (road, pedestrian, or private access) within the Valley Metro Light Rail right-of-way during RWP activities as well as to define mandatory protections and controls when work is performed within or affecting Valley Metro grade crossings, where rail vehicles and the public intersect.

SCOPE

Applies to all workers, contractors, and Valley Metro personnel responsible for operating, maintaining, or securing crossing gates while performing work that affects train movement or public access.

APPLICABILITY

This section applies to all roadway workers, contractors, and authorized personnel performing work that:

- Occurs on or adjacent to a grade crossing
- Involves vehicular or pedestrian movements across track
- Impacts crossing warning systems (XWS: gates, flashers, bells)
- Requires manual gate operation, testing, or adjustment

FOUR STANDARD HAZARD CATEGORIES

- Access Limitation – Restricted approach zones and adjacent live tracks.
- Braking Distance – Train approach speeds require extended clearance.
- Visibility – Curved approaches and glare reduce sightlines.
- Environmental – Heat, dust, and rainfall affect visibility and braking.

HAZARDS & CONTROLS (SUMMARY)

Hazard Category	Examples at LRT Crossings	Required Controls
Public Interaction	Pedestrians bypassing arms, distraction from mobile devices	Stewarding, channelization, cones/barriers, clear pedestrian path
Vehicle Clearance	Limited space for vehicles/equipment near foul point	Ground guide, foul point markers, one vehicle at a time

Train Approach Direction	Bi-directional train movement, near-side signals	Lookout posted; enhanced audible + visual alerting
Warning System Alteration	Gates/lights/bells timing adjusted or out-of-service	Treat crossing as unprotected until PIC verifies performance
Slips/Trips/Falls	Flangeway gaps, uneven road surface or platform transitions	Walkway maintenance; night lighting; proper footwear

ROLES AND WORKFORCE ACTIONS

Role	Responsibility at Grade Crossings
PIC / RWIC	Obtains OCC authority; leads job briefing; verifies restoration
Lookout	Monitors train approach and provide continuous warning
Ground Guide	Manages vehicle/equipment movements; protects foul point
Pedestrian Steward	Directs public through safe zones near platforms

Note: Minimum staffing is PIC + Lookout when any public hazard exists.

OCC COMMUNICATION REQUIREMENTS

Before any work affecting a grade crossing:

- Confirm location, track, limits, and gates/signals impacted
- Read-back authority type and duration (e.g., TAW, ETO, TOOS)
- Report all status changes including when returned to service

Rail vehicle detection is never the only form of protection (FTA §671.39).

RISK MATRIX

- Likelihood: Medium | Severity: High | Risk Rating: High
- Residual Risk (after mitigation): Low / Acceptable

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REQUIRED RWP CONTROLS

- Obtain OCC authorization before raising gates.
- Lock/tag procedures.
- Maintain lookout protection and foul-limit markings.
- Report all faults to Signals and OCC immediately.

VERIFICATION & MONITORING

PIC logs gate operations and verifies closure before releasing track. Monthly audits by Safety & Signals.

REFERENCES

FTA 49 CFR 214.321 • FRA 49 CFR 234 • Valley Metro Track Access Manual

SWITCH MAINTENANCE & INSPECTION

PURPOSE
To control hazards associated with inspection, adjustment, or maintenance of power and manual switch machines on the Valley Metro system.

SCOPE
Apply to signal technicians, track maintainers, and RWP workers within switch limits or adjacent live tracks.

FOUR STANDARD HAZARD CATEGORIES
- Access Limitation – Tight clearances at interlocks.
- Braking Distance – Short approach distances.
- Visibility – Obstructions from cabinets or structures.
- Environmental – Heat, noise, and poor lighting.

RISK MATRIX
- Likelihood: Medium | Severity: High | Risk Rating: High
- Residual Risk: Low / Acceptable.

REQUIRED RWP CONTROLS
- Obtain Exclusive Track Occupancy (ETO) from OCC.
- Maintain lookout protection and PPE compliance.
- Verify correspondence before restoring service.

TRACK CIRCUIT FAULTS & SIGNAL COORDINATION

PURPOSE
To define safe response and coordination procedures when track circuit faults or signal system alarms occur.

SCOPE
Applies to PICs, RWP staff, and Valley Metro Signal Maintainers during field troubleshooting.

FOUR STANDARD HAZARD CATEGORIES
- Access – Confined track areas.
- Braking – Trains may approach unprotected.
- Visibility – Night or glare conditions.
- Environmental – Weather exposure and electrical hazards.

RISK MATRIX

- Likelihood: Medium | Severity: High | Risk Rating: High
- Residual Risk: Medium / Acceptable with monitoring.

REQUIRED RWP CONTROLS

- Treat all failed circuits as occupied track.
- Only qualified Signal Maintainers may perform testing.
- Establish OCC protection and communication log.
- Stop working if unsafe indication is observed.

VERIFICATION & MONITORING

Signal Maintainer verifies restoration at field and OCC, PIC records protection release.

REFERENCES

FTA 49 CFR 214.321

RED SIGNAL OVERRUN (RSO)

PURPOSE

To identify and mitigate hazards related to unauthorized train movement past a red signal aspect.

SCOPE

Applicable to all interlocks, crossovers, and mainline operations within Valley Metro LRT and Streetcar systems.

FOUR STANDARD HAZARD CATEGORIES

- Access – Limited safe zones in medians.
- Braking – Short approach blocks reduce margin.
- Visibility – Glare, clutter, and low light.
- Environmental – Weather and lighting distortion.

RISK MATRIX

- Likelihood: Medium | Severity: Catastrophic | Risk Rating: High
- Residual Risk: Medium / Acceptable.

REQUIRED RWP CONTROLS

- OCC-issued ETO before entering red aspect zones.
- Dual confirmation of signal hold and route lock.
- Establish red aspect safe zones.
- Conduct simulator-based training on RSO prevention.

VERIFICATION & MONITORING
Weekly OCC–Safety review of interlocks; quarterly RSO trend reporting.

REFERENCES
FTA 49 CFR 674.33 • FRA 49 CFR 214.335 • Valley Metro SOP 500.4

HIGH DECIBEL NOISE EXPOSURE

PURPOSE
To protect workers from hazardous noise exposure during RWP and maintenance operations. Valley Metro currently does not have any location with this exposure.

SCOPE
Applies to all staff working near plant, track equipment, or high-noise environments.

FOUR STANDARD HAZARD CATEGORIES
- Access – High traffic and confined zones.
- Braking – Reduced hearing of warnings.
- Visibility – Dust and poor lighting reduce awareness.
- Environmental – Prolonged high decibel exposure.

RISK MATRIX
- Likelihood: Likely | Severity: Major | Risk Rating: High
- Residual Risk: Low / Acceptable with PPE and monitoring.

REQUIRED RWP CONTROLS
- Conduct noise risk assessment and demarcate high-noise zones.
- Provide and enforce hearing protection.
- Use visual and radio-based communication systems.
- Limit exposure duration via rotation.

VERIFICATION & MONITORING
Periodic sound level monitoring; review of PPE compliance and exposure records.

REFERENCES
OSHA 29 CFR 1910.95 • RIS-3119-TOM • Valley Metro Safety Plan

SWITCH & RAIL PROFILES
- CSV-34 – Manual trail switch for short-turns and Streetcar interface.
- CVS-24 – Standard powered crossover for mainline interlocks.
- M-3 – Power switch for direct-fixation interlocks (Longmore, Date, Hibbert, Edgemont).

- SYM-10 – Electric switch used in yard lead (low-speed routing).
- T-Rail: Used in ballasted, direct-fixation, and yard tracks.
- K-Rail: Grooved rail used between Montebello–Dobson for embedded sections.
- Track Structures: Embedded slab (urban), direct-fixation (interlocks), ballasted (yard and Mountain View).

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