BRITISH COLUMBIA

Ministry of Transportation and Infrastructure

TRAFFIC CONTROLLER DESIGN MANUAL

Section 400

SIGNAL COMMISSIONING GUIDELINES

Transportation Systems and Road Safety Engineering

July 2024

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401 SIGNAL COMMISSIONING PROCESS

401.1 INTRODUCTION

.1 This section describes the processes involved in commissioning a Ministry Traffic Signal which includes:

.1 Traffic and Pedestrian Signals

.2 Temporary One-way Bridge Signals

.3 Fire Signals

.2 Only the Ministry's EMC shall perform the commissioning work for the above-mentioned signals.

.3 Special signals such as draw/swing bridge signals and lane control signals will require specific instructions and commissioning procedures. Where these types of signals are encountered, contact the Electrical Services Coordinator.

401.2 COMMISSIONING PROCESS

.1 The commissioning process for a signalized intersection applies to the following conditions:

.1 New Signal Construction (see Chapter 402)

.2 Existing Signal Modification (see Chapter 403)

.3 Existing Controller Cabinet Upgrade or Replacement (see Chapter 404)

.2 In addition to ITS Ops and Traffic Engineering, other parties in the commissioning process will typically include the following:

.1 Electrical Service Coordinator (see Clause 102.2)

.2 Project Manager (see Clause 102.2)

.3 Electrical Maintenance (see Clause 102.2)

.4 Electrical Installation (see Clause 102.2)

.3 It is critical that the Project Manager coordinate with the Electrical Installation Contractor and Electrical Maintenance Contractor (if not the same) to determine the start-up date of the signal being constructed. The Electrical Services Coordinator must be notified in advance of the start-up date to ensure all required traffic controller equipment, documentation and signal commissioning can be scheduled appropriately.

.4 The Electrical Services Coordinator and/or ITS Operations shall be contacted for clarification regarding the commissioning process of a traffic signal.

.5 Any deviations from this document regarding signal commissioning must be requested in writing, to the Electrical Services Coordinator for the applicable Electrical Service Area for approval.

402 NEW SIGNALS

402.1 INTRODUCTION

.1 This section details the processes required for commissioning a traffic signal controller for a new signalized intersection.

402.2 SIGNING

.1 In accordance with the Ministry of Standards Traffic Signs and Pavement Markings, permanent W-012 signs may be required to warn motorists of the signals ahead.

.1 The sign requirement is typically shown on the Signing and Pavement Markings Plan for the project.

.2 The EIC shall confirm where the permanent W-012 signs will be installed.

.3 Not all approaches will warrant the permanent W-012 signs.

.2 Where permanent W-012 Signal Ahead signs or W-012-XXX Advance Warning Flashers are not installed as part of the design, temporary C-112 Signal Ahead signs shall be installed.

.3 Temporary W-329 New tabs shall be installed under each permanent W-012 or temporary C-112 sign.

.4 Temporary signs shall be installed in advance of the signal stop bar at the intersection; exact location as determined from the posted speed, in accordance with the Manual of Standard Traffic Signs and Pavement Markings.

.5 Temporary signs shall be mounted on luminaire poles with temporary banding; where no poles are present, the temporary signs shall be mounted on wooden or telespar posts.

.6 In compliance with Section 142 of the BC Motor Vehicle Act, all temporary C-112 and W-329 signs not part of the permanent installation shall be removed by the EMC after 90 days unless otherwise directed by the Ministry Traffic Engineer.

.7 Where support posts are used for Temporary signs, the area where the posts were installed shall be backfilled and restored to its original condition.

402.3 PROCESS

	Project Manager (PM)	Electrical Services Coordinator (ESC)	ITS Ops	Traffic Engineering	Electrical Installation Contractor (EIC)	Electrical Maintenance Contractor (EMC)
Pre-Construction	• Coordinate project construction dates with ESC and EIC • Request controller design documents from Traffic Engineering • Request controller equipment from ITS Ops (10-12 weeks lead-time required for cabinet procurement) • Confirm with Traffic Engineering if a 72-hr signal flash at startup is required and notify the EMC.	• Confirm signal installation and start-up date with PM • Coordinate signal commissioning and startup requirements with EMC • Schedule signal commissioning date with EMC • Issue Work Order to EMC for controller shop testing and signal commissioning.	• Review and process controller request form • Review controller design documents • Coordinate with EMC to assign equipment	• Senior Traffic Operations Engineer to determine and notify the PM of the 72-hr flash and flash colour requirement for the Signal Startup Phase • Develop and issue signal design documentation required (STS and TEC)	• Coordinate and schedule with EMC for traffic controller equipment installation	• Review signal design and commissioning requirement • Review preliminary controller design documents (if available) • Prepare estimate for commissioning work
Controller Shop Testing	• Coordinate with Traffic Engineering to issue draft controller design documents.	-	-	-	-	• Assemble cabinets per design • Program controller per design • Operate test program for 24-hrs (error free) • Coordinate with Traffic Engineering to resolve any operation issues • Update ITS Ops, Traffic Engineering and ESC upon completion of successful shop testing
Signal Installation	• Communicate signal installation progress by EIC to ESC and EMC	-	-	-	• Coordinate with EMC for signal commissioning	• Coordinate with EIC for signal controller equipment installation and commissioning activities
Pre-Startup	• Communicate signal commissioning progress by EMC to project team • Coordinate deficiency corrections by EMC	• Review Pre-startup Inspection sheet completed by EMC • Notify PM of any deficiencies requiring correction to be performed by EIC	-	-	• Resolve signal installation deficiencies if reported by EMC	• Perform the Pre-startup Inspection in accordance with Appendix 400A • Notify the PM, EIC and ESC of any signal installation deficiencies requiring corrections • Install signal controller equipment as per design.

Startup	-	• Review Startup Inspection sheet completed by EMC
		• Issue approval to proceed with new signal startup to EMC
			-	• Review signal operational issues if reported by EMC and issue revised design documentation for correction as required	• Confirm signal operation with EMC
					• Uncover signal heads
					• Communicate signal operational status to PM, ESC and Traffic Engineering
						• Perform the Startup Inspection in accordance with Appendix 400B
						• Notify the ESC, Traffic Engineering and ITS Ops for any signal operational issues requiring a change in design
						• Place signal in flash for 72Hrs, if required (noted in TEC)
						• Place signal in 3-colour if:
						  • Signal is a pedestrian signal
						  • Advance warning signs are present on major (Highway) movements
						  • Signal is within a corridor, with other signals within 2km on both sides of the new signal
						• Install temporary signs as per Section 402.3

Post Startup	• Communicate final electrical inventory added to ESA from project to ESC	• Confirm final electrical inventory added to ESA from project to ESC	• Receive and file TSR submitted by EMC • Draft controller record drawings and issue to EMC	• Review signal operation and performance • Revise and issue STS to EMC within the first two weeks of new signal operation for final implementation if required	• Confirm final electrical inventory added to an ESA from a project with PM and EMC	• Complete TSR and submit to ITS Ops and ESC • Provide controller drawing markups for ITS Ops; hard copies to be stored in cabinet • Implement revised STS (if issued) • Remove all temporary signs 90-days after new signal operation (if no issues reported) • Confirm final electrical inventory added to ESA

403 MODIFICATIONS TO EXISTING SIGNALS

403.1 GENERAL

.1 This section describes the processes for commissioning a traffic signal controller at an existing signalized intersection and shall apply to the following circumstances:

.2 The existing traffic controller equipment remains and only programming updates to the traffic controller are required to operate the new timing plan.

.3 The existing traffic controller equipment must be replaced in order to operate the new timing plan

.4 Either the traffic controller or traffic controller equipment is replaced as part of an electrical rehabilitation initiative

403.2 SIGNING

.1 Temporary C-064 Signal Operation Changed signs shall be installed in advance of each approach at an existing signalized intersection where the signal phasing has been changed.

.2 Temporary C-063 Traffic Pattern Changed signs may be used instead of C-064 if the signal operation remains the same and there are only geometric changes to the intersection (i.e. adding a right-turn slot; converting a through-lane to a shared and through, etc.)

.3 Temporary C-064 or C-063 signs shall be installed in advance of the signal stop-bar at the intersection; exact location to be determined based on the posted speed at the same distance identified for the W-012 signs in the Manual of Standard Traffic Signs and Pavement Markings

.4 Temporary signs shall be mounted on luminaire poles with temporary banding; where no poles are present, the temporary signs shall be mounted on wooden or perforated square steel posts.

.5 In compliance with Section 142 of the BC Motor Vehicle Act, all temporary C-063, C-064 and W-329 signs not part of the permanent installation shall be removed by the EMC after 90 days unless otherwise directed by a Ministry Traffic Engineer.

.6 Where support posts were installed for the temporary signs, the area where the posts were installed shall be backfilled and restored to its original condition

403.3 PROCESS

	Project Manager (PM)	Electrical Services Coordinator (ESC)	ITS Ops	Traffic Engineering	Electrical Installation Contractor	Electrical Maintenance Contractor
Pre-Construction	• Coordinate project construction dates with ESC and EIC • Request controller design documents from Traffic Engineering • If required, request traffic controller equipment from ITS Ops (10-12 weeks lead-time required for cabinet procurement)	• Confirm signal modification and anticipated startup date with PM • Coordinate signal commissioning and Startup requirements with EMC • Schedule signal commissioning date with EMC • Issue Work Order to EMC for controller shop testing and commissioning	• Review controller design documents • If new controller equipment is required, review and process controller request form and coordinate with EMC	• Develop and issue signal design documentation, as required (STS and TEC)	• Coordinate with ESC and EMC for required modifications to existing traffic signal	• Review signal documentation and commissioning requirements • Prepare estimate for commissioning work
Controller Shop Testing	• Coordinate with Traffic Engineering to issue draft controller design documents	-	-	• Provide feedback and resolution to controller operation issues reported by EMC		• Assemble cabinets per design • Program controller per design • Operate test program for 24Hrs (error free) • Coordinate with Traffic Engineering to resolve and signal operation issue(s) • Update ITS Ops, Traffic Engineering and ESC upon completion of successful shop testing
Signal Modification	• Communicate signal modification progress to ESC	-	-	-	• Coordinate with EMC for signal modification and commissioning activities required	• Coordinate with PM and EIC for signal modification and commissioning activities required

Pre-Startup	-	• Review Pre-startup Inspection sheet completed by EMC • Provide feedback to EMC and PM on any issues reported requiring further action(s)	-	-	-	• Perform the Pre-startup Inspection in accordance with Appendix 400A • Notify the ESC of any issues requiring further action(s)
Startup	-	• Review Startup Inspection sheet completed by EMC • Issue approval to proceed with new signal startup to EMC	-	• Review signal operational issues if reported by EMC and issue revised design documentation for correction as required		• Perform the Startup Inspection in accordance with Appendix 400B • Notify the ESC, Traffic Engineering and ITS Ops for any signal operational issues requiring a change in design • Place signal in 3-colour • Install temporary signs in accordance with Section 403.3
Post Startup	• Communicate final electrical inventory added to or removed from ESA to the ESC	• Confirm final electrical inventory added to or removed from ESA with PM and EMC	• Receive and file TSR submitted by EMC • Draft controller record drawings and issue to EMC	• Review signal operation and performance • Issue revised STS to EMC within first two weeks of the modified signal operation for final implementation if required	• Confirm final electrical inventory added to or removed from ESA	• Complete TSR and submit to ITS Ops and ESC • Provide controller drawing markups to ITS Ops; hard copies to be stored in cabinet • Implement revised STS (if issued) • Remove all temporary signs 90-days after modified signal operation • Confirm final electrical inventory added to or removed from ESA with ESC

404 CONTROLLER REPLACEMENT DUE TO MVI

404.1 GENERAL

.1 This section describes the processes for commissioning a traffic signal controller at an existing signalized intersection in the event of a Motor Vehicle Incident (MVI) causing damage to the existing traffic controller equipment.

	Project Manager (PM)	Electrical Services Coordinator (ESC)	ITS Ops	Traffic Engineering	Electrical Installation Contractor (EIC)	Electrical Maintenance Contractor (EMC)
Pre-Construction	-	• Review details provided by EMC and coordinate claims documentation • Process replacement controller documentation and coordinate with ITS Ops	• Review details provided by EMC and coordinate with the ESC for replacement • coordinate with Traffic Engineering to issue to STS (if damaged cabinet is a TS1 type)	• Develop and issue updated STS for cabinet replacement if required	-	• Notify the ESC, ITS Ops and Traffic Engineering of incident • Respond in accordance to the EMSA and provide details regarding damaged equipment to the ESC and ITS Ops • Gather supporting evidence of damaged equipment and prepare documentation for Claims • Prepare replacement controller equipment for immediate replacement •
Controller Shop Testing	-	-	-	• Provide feedback for signal operation issues as required	-	-
Pre-Startup	-	-	-	-	-	• Remove damaged controller equipment in accordance to EMSA Specification E-900 • Install and configure replacement controller equipment
Startup	-	-	-	-	-	• Test and confirm signal operation and functions are in accordance with the issued/current STS • Place signal in 3-colour and observe operation for at least 10 minutes
Post Startup	-	• Review claims documentation submitted by EMC	• Review claims documentation from EMC and provide feedback or clarification as required	• Review signal operational issues if reported by EMC and issue revised design documentation for correction as required	-	• Develop TSR and submit to ITS Ops • Provide mark-ups to controller drawings and submit to ITS Ops to produce Record Drawings • Produce Record Drawing prints and store in new controller cabinet document pouch • If MVI, submit completed claims documentation package to the Electrical Services Coordinator and ITS Ops

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TRAFFIC CONTROLLER DESIGN MANUAL

Appendix 400A

PRE-START UP INSPECTION

Electrical and ITS Engineering

July 2024

Signal Pre-Start Up Inspection Sheet

Location _____

Project No._____ Drawing No. _____

Company_____ Date_____Time _____

Electrician _____

Checked	Inspection Item	Pass	Fail	Initials
	Luminaire, Signal and Sign Poles			
	.1 Check signal pole shafts are plumb and for proper arm rises (2 to 5 degrees from horizontal)			
	.2 Check for double nuts as per SP635 drawings			
	.3 Check any scratches in the galvanized surfaces are repaired with cold galvanizing compound			
	.4 Check nut covers are installed			
	.5 Check hand hole covers are installed			
	Traffic Signal and Pedestrian Heads			
	.1 Check all signal and pedestrian heads are properly oriented as per SP635 drawings.			
	.2 Check all signal and pedestrian heads and mounting hardware are securely attached to the pole using approved mounting hardware.			
	.3 Check all signal and pedestrian heads are bonded.			
	.4 Check signal heads are sacked (new signals)			
	Pedestrian Pushbuttons			
	.1 Check pedestrian pushbuttons and signs are securely attached to the pole.			
	.2 Check pushbuttons and signs are installed at the correct elevation and display the correct messaging.			
	.3 Check pushbutton signs are sacked			

Signal Pre-Start Up Inspection Sheet

	Luminaires and Photocells			
	.1 Check flat glass lenses are level			
	.2 Check luminaires are securely attached to the poles			
	.3 Check all photocells are aimed north			
	.4 Check all luminaires are operational			
	Signs and Pavement Markings			
	.1 Check signing and pavement markings are installed as per the design drawings			
	.2 Check all signs are installed, level and securely attached			
	.3 Check signs are visible to oncoming motorist a minimum of 100m from the sign			
	Service Equipment			
	.1 Check all service panels and conduits are securely attached to the pole			
	.2 Check wiring inside the panel is neat, correctly terminated and conforms to the requirements of the wiring diagram on the plans			
	.3 Check that ground plate or rod is installed			
	.4 Check all service connections have been made and the panel is fully operational			
	.5 Check drain screws in the bottom of the panel are removed			
	Wiring			
	.1 Check all conductors are the proper sizes and correctly color coded as indicated on the plans			
	.2 Check all conductor splices are securely connected and sealed with tape or sealant			
	.3 Check all bond conductors are green			

Signal Pre-Start Up Inspection Sheet

	.4 Check all conductors are RW90 (XLPE) stranded copper			
	.5 Check all lighting circuits are correctly fused (check fused line and load sides are correctly oriented)			
	.6 Check all conductors are neatly coiled and bundled in all junction boxes, vaults, poles hand holes, controller cabinet and service panels (conductors shall be attached to conduit support bars in junction boxes and vaults).			
	.7 Check conductors are properly tagged in all junction boxes, vaults, and controllers			
	.8 Check all signal and pedestrian phases have been flashed out			
	Detector Loops			
	.1 Update loop assignment sheet as needed and check for accuracy (detector units are correctly assigned to the appropriate loops)			
	.2 Check all loops are color coded and labeled in the junction boxes			
	.3 Check loop slots in asphalt are properly sealed			

TRAFFIC CONTROLLER DESIGN MANUAL

Appendix 400B

START UP INSPECTION

Electrical and ITS Engineering

July 2024

Signal Start-up Inspection Sheet

Location _____

Project No._____Drawing No. _____

Company_____ Date_____Time _____

Electrician _____

Task	Yes	No	Initials
.1 Approval to start-up signal obtained from Ministry			
.2 Temporary traffic control is in place			
.3 Temporary Signs (W-12 / W-329 or C-64) installed at each approach			
.4 Uncover all signal heads and pushbuttons and check final aiming required in accordance with SP635 drawings			
.5 Confirm field connection per connection sheet			
.6 Install controller equipment and test run in full 3 color operation for 10 minutes with proper timing sheet (Record date of timing sheet here:_____)			
.7 During 10-minute test run, observe every signal head for proper operation and alignment, including pre-empt indicator lights, if installed			
.8 During 10-miniute test run, check advance warning signs			
.9 If all above items complete, go into 3 color operation or turn signal into flash operation at police door (refer to Section 402.2.1.5)			
.10 If signal is in flash wait 72 hours and put into 3 color operation (refer to Section 402.2.1.5)			
.11 Remove stop signs when signal is in 3 color operation			
.12 Provide required file documentation to Ministry Traffic Engineering, Electrical and ITS Engineering, and Electrical Services Coordinator.			