



City of Tacoma

Public Works Engineering

ADDENDUM NO. 2

DATE: 2/11/2026

REVISIONS TO:

Request for Bids Specification No. TR25-0051F

Lincoln Ave and Port of Tacoma Road Railroad Crossings Signal Installation

NOTICE TO ALL BIDDERS:

This addendum is issued to clarify, revise, add to or delete from, the original specification documents for the above project. This addendum, as integrated with the original specification documents, shall form the specification documents. The noted revisions shall take precedence over previously issued specification documents and shall become part of this contract.

REVISIONS TO THE SUBMITTAL DEADLINE:

The submittal deadline remains the same.

REVISIONS TO THE GENERAL INFORMATION AND REQUIREMENTS:

Remove Special Reminder noted Addendum No. 1 and replace with Special Reminder noted Addendum No.2. (Item 8 has been revised to clarify the Statement of Qualifications).

Remove Statement of Qualifications for Rail Contractor noted Addendum No. 1 and replace it with Statement of Qualifications for Prime Rail Contractor noted Addendum No.2.

REVISIONS TO THE SPECIAL PROVISIONS:

Remove section 1-02.14 Option C noted Addendum No.1 and replace it with section 1-02.14 Option C noted Addendum 2 (Item 8 has been revised to read Statement of Qualifications for Prime Rail Contractor)

Remove section 8-20 Illumination, Traffic Signal System, Intelligent Transportation System, and Electrical in its entirety and replace it with section 8-20 Illumination, Traffic Signal System, Intelligent Transportation System, and Electrical marked Addendum No. 2.

Remove section 9-29 Illumination, Signals, and Electrical in its entirety and replace it with section 9-29 Illumination, Signals, and Electrical marked Addendum No. 2.

REVISIONS TO THE SUBMITTAL PACKAGE:

Remove Bid Submittal Package noted Addendum No. 1 and replace it with Bid Submittal Package noted Addendum No. 2.



City of Tacoma

NOTE: Acknowledge receipt of this addendum by initialing the corresponding space as indicated on the signature page. Vendors who have already submitted their bid may contact the Purchasing Division at 253-502-8468 and request return of their bid for acknowledgment and re-submittal. Or, a letter acknowledging receipt of this addendum may be submitted in an envelope marked Request for Bids Specification No. TR25-0051F Addendum No. 2. The City reserves the right to reject any and all bids, including, in certain circumstances, for failure to appropriately acknowledge this addendum.

cc: Jon Kulju, Public Works Engineering

ADDENDUM NO. 2

SPECIAL REMINDER TO ALL BIDDERS

HEALTH & SAFETY: Be sure to comply with all City of Tacoma health and safety requirements.

PLEASE NOTE: Be sure you have complied with all specifications and requirements and have signed all required documents.

YOUR ATTENTION IS PARTICULARLY CALLED to the following forms, which must be executed in full and submitted with your bid response:

1. BID PROPOSAL: The unit prices bid must be shown in the space provided. Check your computations for omissions and errors.
2. BID PROPOSAL SIGNATURE SHEET: To be filled in and executed by a duly authorized officer or representative of the bidding entity. If the bidder is a subsidiary or doing business on behalf of another entity, so state, and provide the firm name under which business is hereby transacted.
3. BID BOND: The Bid Bond must be executed by the person legally authorized to sign the bid, and must be properly signed by the representatives of the surety company unless the bid is accompanied by a certified check. If Bid Bond is furnished, the form furnished by the City must be followed; no variations from the language thereof will be accepted. The amount of the Bid Bond must be not less than 5% of the total amount bid.
4. NON-COLLUSION DECLARATION: Must be returned by the bidder and included with the submittal.

FAILURE TO RETURN THE AFOREMENTIONED NON-COLLUSION DECLARATION AND TO SUBMIT SAID DECLARATION WITH THE BID SHALL BE DUE CAUSE FOR REJECTION OF BID.

5. CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2017).
6. STATE RESPONSIBILITY AND RECIPROCAL BID PREFERENCE INFORMATION: Bidder shall complete this form in its entirety to ensure compliance with state legislation (SHB 2010).
7. SUBCONTRACTOR LIST: Bidder shall list all subcontractor(s) proposed to perform the work of heating, ventilation and air conditioning, plumbing, as described in Chapter 18.106 RCW, and electrical as described in Chapter 19.28 RCW. Bidder shall also list all subcontractor(s) proposed to perform the work of structural steel installation and/or rebar installation.

FAILURE TO LIST SUBCONTRACTORS WILL RESULT IN THE BID BEING NON RESPONSIVE AND THEREFORE VOID.

ADDENDUM NO. 2

8. **STATEMENT OF QUALIFICATIONS:** The Prime Contractor shall fill out this form in its entirety proving they meet the requirements as outlined in these specifications. It shall be the sole determination of the Engineer to determine if the Prime Contractor does in fact meet the requirements. This is a condition of award of the contract.
9. **BIDDER QUESTIONNAIRE:** Bidders must include a Bidders Questionnaire (WSDOT form 272-022) in accordance with special provisions section 1-02.6. Bids that do not include this form at the time of bid will be rejected in accordance with Section 1-02.13 of the special provisions.
10. **ACKNOWLEDGEMENT:** Must be signed by the bidder and be subscribed and sworn to before a Notary Public. Be sure all parties whose signatures are legally necessary have signed, whether the bidder be an individual, partnership or corporation.

POST AWARD FORMS EXECUTED UPON AWARD:

- A. **CONTRACT:** Must be executed by the successful bidder.
- B. **PAYMENT BOND TO THE CITY OF TACOMA:** Must be executed by the successful bidder and his/her surety company.
- C. **PERFORMANCE BOND TO THE CITY OF TACOMA:** Must be executed by the successful bidder and his/her surety company.
- D. **CERTIFICATE OF INSURANCE:** Shall be submitted with all required endorsements.
- E. **GENERAL RELEASE.**

CODE OF ETHICS: The successful bidder agrees that its violation of the City's Code of Ethics contained in TMC Chapter 1.46 shall constitute a breach of the contract subjecting the contract to termination.

STATEMENT OF QUALIFICATIONS FOR PRIME RAIL CONTRACTOR

This form shall be completed in its entirety and submitted to the Contracting Agency by 12:00 P.M. (noon) of the second business day following the bid submittal deadline. **Failure to submit and meet the requirements as stated in Section 1-02.1 of the Special Provisions may be grounds for rejection of the bid.**

The City of Tacoma will evaluate and determine if the prospective prime contractor meets the minimum experience requirements based on criterion as listed in 1-02.14 Option C.

The successful prime rail contractor shall have completed at least three self-performed rail projects of similar scope and purpose within the past three years. The prime contractor on-site supervisor shall have at least three years of railroad construction experience. Complete the prime contractor project experience summary below and identify the on-site supervisors, one or more of which will be assigned to the project.

Prime Rail Contractor:

Name: _____

Address: _____

Phone: _____ Contact Person: _____

Project Experience

#1 Project Name: _____

Owner: _____ Contact Person: _____

Description of Work (including value of the project): _____

Completion Date: _____

#2 Project Name: _____

Owner: _____ Contact Person: _____

Description of Work (including value of the project): _____

Completion Date: _____

ADDENDUM NO. 2

T OF QUALIFICATIONS FOR PRIME RAIL CONTRACTOR

#3 Project Name: _____

Owner: _____ Contact Person: _____

Description of Work (including value of the project): _____

Completion Date: _____

On-Site Supervisor:

The on-site supervisor shall have at least three years of railroad construction experience. Provide the name of the project on-site supervisor.

Name _____ Years employed by contractor: _____

#1 Project Name/Date: _____

Owner: _____ Contact Person: _____

Description of Work: _____

#2 Project Name/Date: _____

Owner: _____ Contact Person: _____

Description of Work: _____

Completion Date: _____

Alternate On-Site Supervisor:

Name _____ Years employed by contractor: _____

#1 Project Name/Date: _____

Owner: _____ Contact Person: _____

Description of Work:

ADDENDUM NO. 2

1-02.14 Disqualification of Bidders

(May 17, 2018 APWA GSP, Option C)

Delete this section and replace it with the following:

A Bidder will be deemed not responsible if the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended; or does not meet Supplemental Criteria Statement of Qualifications in this Section:

The Contracting Agency will verify that the Bidder meets the mandatory bidder responsibility criteria in RCW 39.04.350(1), and Supplemental Criteria 1-2. Evidence that the Bidder meets Supplemental Criteria Statement of Qualifications shall be provided by the Bidder as stated later in this Section.

1. Delinquent State Taxes

- A. Criterion: The Bidder shall not owe delinquent taxes to the Washington State Department of Revenue without a payment plan approved by the Department of Revenue.
- B. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Contracting Agency) that the Bidder does not owe delinquent taxes to the Washington State Department of Revenue, or if delinquent taxes are owed to the Washington State Department of Revenue, the Bidder must submit a written payment plan approved by the Department of Revenue, to the Contracting Agency by the deadline listed below.

2. Federal Debarment

- A. Criterion: The Bidder shall not currently be debarred or suspended by the Federal government.
- B. Documentation: The Bidder shall not be listed as having an "active exclusion" on the U.S. government's "System for Award Management" database (www.sam.gov).

3. Subcontractor Responsibility

- A. Criterion: The Bidder's standard subcontract form shall include the subcontractor responsibility language required by RCW 39.06.020, and the Bidder shall have an established procedure which it utilizes to validate the responsibility of each of its subcontractors. The Bidder's subcontract form shall also include a requirement that each of its subcontractors shall have and document a similar procedure to determine whether the sub-tier subcontractors with whom it contracts are also "responsible" subcontractors as defined by RCW 39.06.020.
- B. Documentation: The Bidder, if and when required as detailed below, shall submit a copy of its standard subcontract form for review by the

ADDENDUM NO. 2

1 Contracting Agency, and a written description of its procedure for
2 validating the responsibility of subcontractors with which it contracts.
3

4 **4. Claims Against Retainage and Bonds**

- 5
- 6 A. Criterion: The Bidder shall not have a record of excessive claims filed
7 against the retainage or payment bonds for public works projects in the
8 three years prior to the bid submittal date, that demonstrate a lack of
9 effective management by the Bidder of making timely and appropriate
10 payments to its subcontractors, suppliers, and workers, unless there are
11 extenuating circumstances and such circumstances are deemed
12 acceptable to the Contracting Agency.
13
- 14 B. Documentation: The Bidder, if and when required as detailed below, shall
15 submit a list of the public works projects completed in the three years
16 prior to the bid submittal date that have had claims against retainage and
17 bonds and include for each project the following information:
18
- 19 • Name of project
 - 20 • The owner and contact information for the owner;
 - 21 • A list of claims filed against the retainage and/or payment bond for any
22 of the projects listed;
 - 23 • A written explanation of the circumstances surrounding each claim and
24 the ultimate resolution of the claim.
25

26 **5. Public Bidding Crime**

- 27
- 28 A. Criterion: The Bidder and/or its owners shall not have been convicted of a
29 crime involving bidding on a public works contract in the five years prior to
30 the bid submittal date.
31
- 32 B. Documentation: The Bidder, if and when required as detailed below, shall
33 sign a statement (on a form to be provided by the Contracting Agency)
34 that the Bidder and/or its owners have not been convicted of a crime
35 involving bidding on a public works contract.
36

37 **6. Termination for Cause / Termination for Default**

- 38
- 39 A. Criterion: The Bidder shall not have had any public works contract
40 terminated for cause or terminated for default by a government agency in
41 the five years prior to the bid submittal date, unless there are extenuating
42 circumstances and such circumstances are deemed acceptable to the
43 Contracting Agency.
44
- 45 B. Documentation: The Bidder, if and when required as detailed below, shall
46 sign a statement (on a form to be provided by the Contracting Agency)
47 that the Bidder has not had any public works contract terminated for
48 cause or terminated for default by a government agency in the five years
49 prior to the bid submittal date; or if Bidder was terminated, describe the
50 circumstances.
51

ADDENDUM NO. 2

7. Lawsuits

- A. Criterion: The Bidder shall not have lawsuits with judgments entered against the Bidder in the five years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, unless there are extenuating circumstances and such circumstances are deemed acceptable to the Contracting Agency.
- B. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Contracting Agency) that the Bidder has not had any lawsuits with judgments entered against the Bidder in the five years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, or shall submit a list of all lawsuits with judgments entered against the Bidder in the five years prior to the bid submittal date, along with a written explanation of the circumstances surrounding each such lawsuit. The Contracting Agency shall evaluate these explanations to determine whether the lawsuits demonstrate a pattern of failing to meet of terms of construction related contracts.

8. Statement of Qualifications for Prime Rail Contractor

- A. Criterion:
- a. The successful prime rail contractor shall have completed at least three self-performed rail projects of similar scope and purpose within the past three years.
 - b. The on-site supervisors shall have at least three years of railroad construction experience.
- B. Documentation: Statement of Qualifications for Prime Rail Contractor form. This form shall be completed in its entirety.
- a. Complete the prime contractor project experience summary and identify the on-site supervisors, one or more of which will be assigned to the project.

As evidence that the Bidder meets the Supplemental Responsibility Criteria stated above, the apparent low Bidder must submit to the Contracting Agency by 12:00 P.M. (noon) of the second business day following the bid submittal deadline, a written statement verifying that the Bidder meets the Supplemental Criteria together with supporting documentation (sufficient in the sole judgment of the Contracting Agency) demonstrating compliance with the Supplemental Responsibility Criteria. The Contracting Agency reserves the right to request further documentation as needed from the low bidder and documentation from other Bidders as well to assess Bidder responsibility and compliance with all bidder responsibility criteria. The Contracting Agency also reserves the right to obtain information from third-parties and independent sources of information concerning a Bidder's compliance with the mandatory and supplemental criteria, and to use that information in their evaluation. The Contracting Agency may consider mitigating

ADDENDUM NO. 2

1 factors in determining whether the Bidder complies with the requirements of the
2 Supplemental Criteria.

3
4 The basis for evaluation of Bidder compliance with these mandatory and
5 Supplemental Criteria shall include any documents or facts obtained by
6 Contracting Agency (whether from the Bidder or third parties) including but not
7 limited to: (i) financial, historical, or operational data from the Bidder; (ii)
8 information obtained directly by the Contracting Agency from others for whom the
9 Bidder has worked, or other public agencies or private enterprises; and (iii) any
10 additional information obtained by the Contracting Agency which is believed to be
11 relevant to the matter.

12
13 If the Contracting Agency determines the Bidder does not meet the bidder
14 responsibility criteria above and is therefore not a responsible Bidder, the
15 Contracting Agency shall notify the Bidder in writing, with the reasons for its
16 determination. If the Bidder disagrees with this determination, it may appeal the
17 determination within two (2) business days of the Contracting Agency's
18 determination by presenting its appeal and any additional information to the
19 Contracting Agency. The Contracting Agency will consider the appeal and any
20 additional information before issuing its final determination. If the final
21 determination affirms that the Bidder is not responsible, the Contracting Agency will
22 not execute a contract with any other Bidder until at least two business days after
23 the Bidder determined to be not responsible has received the Contracting Agency's
24 final determination.

25
26 Request to Change Supplemental Bidder Responsibility Criteria Prior To Bid:
27 Bidders with concerns about the relevancy or restrictiveness of the Supplemental
28 Bidder Responsibility Criteria may make or submit requests to the Contracting
29 Agency to modify the criteria. Such requests shall be in writing, describe the
30 nature of the concerns, and propose specific modifications to the criteria. Bidders
31 shall submit such requests to the Contracting Agency no later than five (5)
32 business days prior to the bid submittal deadline and address the request to the
33 Project Engineer or such other person designated by the Contracting Agency in the
34 Bid Documents.

ADDENDUM NO. 2

1 **8-20 ILLUMINATION, TRAFFIC SIGNAL SYSTEMS, INTELLIGENT TRANSPORTATION** 2 **SYSTEMS, AND ELECTRICAL** 3 **(August 24, 2023 Tacoma GSP)**

4 5 **8-20.1 Description**

6 *(Special Provision)*

7 *This section is to be supplemented with the following:*

8
9 Work includes furnishing and installing all materials necessary to provide:

- 10 • Illumination system modification along Lincoln Ave
- 11 • Traffic signal system modifications at the intersection of Port of Tacoma Rd and
12 Lincoln Ave
- 13 • Traffic signal system modifications at the intersection of Thorne Rd and Lincoln Ave
- 14 • Intelligent Transportation System (ITS) installation along Lincoln Ave

15
16 The work involves, but shall not be limited to, the supply, testing and installation of the following:

- 17 • Signal Poles and Foundations
- 18 • Signal Pole Span Wire System
- 19 • Signal Controller Cabinet with Battery Backup and Foundation
- 20 • Traffic Signal Heads
- 21 • Pedestrian Signal Heads
- 22 • Pedestrian Push Buttons
- 23 • Video Vehicle/Bicycle Detection/Pedestrian Detection and Counting Features
- 24 • Junction Boxes
- 25 • Conduit and Wire
- 26 • Signs

27 28 **8-20.1(1) Regulations and Code**

29 *This section is modified as follows:*

30
31 All electrical equipment shall conform to the Standards of the National Electrical Manufacturer's
32 Association (NEMA). In addition to the requirements of these Specifications, all materials and
33 methods required under this section, unless otherwise superseded herein, shall conform to the
34 2025 edition of the Washington State Department of Transportation Standard Specifications for
35 Road, Bridge, and Municipal Construction (herein referred to as Standard Specifications); to all
36 current amendments to the Standard Specifications; to the State of Washington Standard Plans;
37 to the State of Washington Sign Fabrication Manual; the American Standards Association
38 (ASA); American National Standards Institute (ANSI); to the City of Tacoma Right-of-Way
39 Design Manual; to the current National Electric Code (NEC), Laws, Rules & Regulations for
40 Installing Electrical Wires & Equipment, of the Department of Labor and Industries, State of
41 Washington; and to the current Manual on Uniform Traffic Control Devices (MUTCD) as
42 adopted by the State of Washington.

43
44 Safe wiring labels required by the Department of Labor and Industries shall be required for this
45 project. Persons performing electrical work shall be certified in accordance with RCW
46 19.28.161. Proof of certification shall be supplied to the Engineer prior to the performance of
47 the work.

48 49 **8-20.1(2) Industry Codes and Standards**

50 *This section is supplemented with the following:*

ADDENDUM NO. 2

1
2 National Electrical Safety Code (NESC)
3 PO Box 1331, 445 Hoes Lane
4 Piscataway, New Jersey

5 6 **8-20.1(3) Permitting and Inspections**

7 *The third paragraph is revised to read:*

8
9 All new services require a Tacoma Public Utilities Permit and inspection by Tacoma Power. All
10 work on the load side of the service will be inspected by the Signal and Streetlight Shop
11 Inspector.

12 13 **8-20.2 Materials**

14 *This section is supplemented with the following:*

15
16 The Contractor shall warranty all electrical and mechanical equipment described in this section
17 for satisfactory in service operation for one year following project acceptance. Warranty shall
18 include troubleshooting, labor, materials and all other costs to bring the equipment to a
19 satisfactory level of service. Normal maintenance is not included in the warranty.

20 21 **8-20.2(1) Equipment List and Drawings**

22 *This section is revised to read:*

23
24 Within 20 days following execution of the Contract, the Contractor shall submit to
25 the Engineer a completed "Request for Approval of Material" that describes the material
26 proposed for use to fulfill the Plans and Specifications.

27
28 The Contractor shall submit Type 2 Working Drawings consisting of supplemental data, sample
29 articles, or both, of the material proposed for use. Supplemental
30 data includes such items as catalog cuts, product Specifications, shop drawings, wiring
31 diagrams, etc.

32
33 The Contractor shall submit Type 2 Working Drawings consisting of the following information for
34 each different type of luminaire required on the Contract:

- 35
- 36 1. Isocandela diagrams showing vertical light distribution, vertical control limits, and
37 lateral light distribution classification.
 - 38 2. Details showing the lamp socket positions with respect to lamp and refractor for each
39 light distribution type. This requires that the Contracting Agency know what the light
40 pattern available are and the light distribution.

41
42 Additional submittals for proposed alternate LED Roadway Luminaires shall be in conformance
43 with section 9-29.10.

44
45 The Contractor shall submit for approval Type 3E Working Drawings in accordance with [Section](#)
46 [1-05.3](#) for each type of light standard and each type of signal standard called for on this project.

47
48 The Engineer's acceptance of any submitted documentation shall in no way relieve the
49 Contractor from compliance with the safety and performance requirements as specified herein.

50

ADDENDUM NO. 2

1 Submittals required shall include but not be limited to the following:
2

- 3 1. A Type 2 Working Drawing consisting of a material staging plan, should the
4 Contractor propose Contracting Agency-owned property for staging areas.
- 5 2. A Type 2 Working Drawing consisting of a cable vault installation plan showing the
6 exact proposed installation location by Roadway station, offset and the scheduled
7 sequence for each cable vault installation.
- 8 3. A Type 2E Working Drawing consisting of a pit plan, for each boring pit, depicting the
9 protection of traffic and pedestrians, pit dimensions, shoring, bracing, struts, walers,
10 sheet piles, conduit skids, and means of attachment, casing type, and casing size.
- 11 4. A Type 2E Working Drawing consisting of a boring plan depicting the boring system
12 and entire support system.

13
14 Manufacturer's data for all materials proposed for use in the contract which require approval
15 shall be submitted in one complete package.

16 **8-20.3 Construction Requirements**

17 18 **8-20.3(1) General**

19 *This section is supplemented with the following:*
20

21 The Contractor shall call 24 hours prior for inspection before covering any underground conduit,
22 prior to installing any detection loops, or placing concrete for foundations. For inspections,
23 notify Traffic Signal/Streetlighting at (253) 255-2443.
24

25 Work shall be sequenced such that after the new signal is placed in operation, the Contractor
26 shall remove any equipment not required for the operation of the new signal. The Contractor
27 shall remove the old vehicle and pedestrian signal heads immediately after the new system is
28 operational.
29

30 For new or modified signals, the contractor shall provide a Portable Changeable Message Sign
31 (PCMS) in each direction and operate the PCMS or static signs for a minimum of two weeks
32 and a maximum of one month after activating the new or modified signal. This work shall be
33 paid for in accordance with Section 1-10.
34

35 **Mast Arm Erection**

36 Mast arms should not be erected more than 14 calendar days prior to the signal system being
37 turned on. Vertical signal poles may be installed earlier with no limiting days prior to signal being
38 placed into operation.
39

40 **Signal Head Installation**

41 For the new Signal, the vehicle and pedestrian signal heads and push buttons shall be covered
42 immediately upon installation and shall remain covered until the signal is turned on. A small hole
43 shall be created in the cover that aligns with each signal lens or pedestrian legend for the
44 purpose of final field testing.
45

46 The following existing and temporary equipment shall be deconstructed/removed by the
47 Contractor and delivered to the City of Tacoma Signal/Streetlight Shop located at 3401A South
48 Orchard Street. Care shall be exercised in removing and salvaging the equipment. Any
49 equipment damaged during removal, hauling, and stockpiling shall be repaired or replaced by
50 the Contractor at no expense to the City.

ADDENDUM NO. 2

- 1 • All signal heads and mounting hardware
- 2 • Flashing beacons and flasher control panel
- 3 • Steel poles, mast arms, and hardware
- 4 • Aluminum poles, mast arms, and hardware
- 5 • Controller cabinets and all internal hardware and wiring
- 6 • Vehicle detection systems, including video, microwave, and infrared systems, and
- 7 associated hardware; including counting features
- 8 • All Opticom equipment or other preemption and priority equipment.
- 9 • LED luminaries, LED retrofit kits, and LED lamps
- 10 • Ornamental/Decorative fixtures and poles/posts
- 11 • Pedestrian signals, poles, and pushbuttons.
- 12 • Signs, brackets, and hardware
- 13 • Locking junction box security lids, security bolts, and all other wire theft deterrent
- 14 security hardware

15
16 All other equipment shall be removed of and disposed of by the Contractor, including but not
17 limited to the following:

- 18 • Wood poles
- 19 • All wiring outside of the controller cabinet
- 20 • Loops
- 21 • Non-LED cobra-head fixtures

22

23 **8-20.3(4) Foundations**

24 *This section is supplemented with the following:*

25

26 All pedestrian pushbutton post (Type PPB) foundations shall be constructed in accordance with
27 WSDOT Standard Plan J-20.15-04. The anchor bolt template shall match base called for in
28 Section 9-29.6(1). Anchor bolts shall be in accordance with Section 9-29.6(5).

29 Anchor bolts for streetlight standards and for strain poles shall extend a minimum of two threads
30 and a maximum of six threads above the top heavy-hex-nut. A minimum of three threads shall
31 remain between bottom of the leveling hex-nut and the top of the foundation.

32

33 Anchor bolts for streetlight standards and for strain poles shall extend a minimum of two threads
34 and a maximum of six threads above the top heavy-hex-nut. A minimum of three threads shall
35 remain between bottom of the leveling hex-nut and the top of the foundation.

36

37 Foundations shall be excavated using an auger and poured against undisturbed material unless
38 otherwise approved by the Engineer. Vacuum excavation should be used where there is a
39 possibility of conflict with utilities or other facilities.

40

41 Forming the foundation with galvanized culvert pipe or similar forming methods will only be
42 allowed when soil conditions or other factors make this method of construction necessary and is
43 approved by the Engineer. Biodegradable forming tubes shall be fully removed from the cured
44 concrete prior to backfilling. When using culvert or tubes, the following backfill requirements will
45 apply. The area between the form and undisturbed material shall be filled with CDF. For lightly
46 loaded installations and only with the approval of the Engineer, Crushed Surfacing Top Course
47 meeting the requirements of Section 9-03.9(3) may be used. Placement shall be in accordance
48 with Section 2-09.3(1)E and shall be backfilled and compacted in the presence of the Engineer.

49

ADDENDUM NO. 2

1 Where foundations for the signal and streetlight poles are located within the new sidewalk area,
2 each foundation shall be constructed in a single pour to the bottom of the new sidewalk
3 elevation. The sidewalk shall be constructed in a separate pour. Where no sidewalk is present,
4 the foundation elevation shall be set in the field by the Engineer.

5
6 Location of all concrete foundations shall be approved by the Engineer prior to excavation.

7 8 **8-20.3(5) Conduit**

9 10 **8-20.3(5)A General**

11 *This section is supplemented with the following:*

12
13 Unless otherwise specified in the plans and specifications, standard conduit sizes shall be as
14 follows:

- 15 • Underground Streetlight Conduit: 2 inch diameter
- 16 • Pole Riser Service Installations: 1-1/2 inch diameter
- 17 • Traffic Signal Conduit: 3 inch diameter
- 18 • Traffic Signal Communication: 3 inch diameter
- 19 • All other conduit: 2 inch diameter, unless otherwise specified.

20
21 As soon as the mandrel has been pulled through, both ends of the conduit shall be sealed in an
22 approved manner. Location wire, in conformance with 9-29.3(2)A3, green insulated, No. 8
23 AWG copper minimum and Pull Tape, in conformance with 9-29.1(10), shall be installed in all
24 empty conduits. Minimum three (3) feet of slack of the location wire and pull tape shall be
25 neatly coiled and secured to the conduit in the same manner as is shown in Washington State
26 Department of Transportation Standard Plan J-28.70-04, Details A and B.

27 28 **8-20.3(5)B Conduit Type**

29 *This section is supplemented with the following:*

30
31 Conduit under driveways and other vehicular access ways shall be Schedule 80 high-density
32 polyethylene (HDPE), Schedule 80 PVC, or rigid metal conduit (RMC)

33
34
35 Pole riser conduit material types shall be in accordance with applicable City of Tacoma standard
36 plans and Tacoma Power requirements.

37 38 **8-20.3(5)D Conduit Placement**

39 *This Section is supplemented with the following:*

40
41 Conduit terminating in pole foundations shall extend to 3 inches below the pole handhole.

42
43 Conduit terminating in controller foundations shall terminate 3 inches above the foundation.

44 45 **8-20.3(5)E1 Open Trenching**

46 *Subsection 5 is revised to read:*

- 47
48 5. Trenches located within the paved roadway shall be backfilled with 3 inches of sand over
49 the conduit, followed by material meeting the requirements of Section 9-03.12(3).

ADDENDUM NO. 2

1 Compaction shall be in conformance with Section 2-09.3(1)E. All street cuts shall be
2 repaired in accordance with the City of Tacoma standard plans.

3
4 *This section is supplemented with the following new Subsections:*

- 5
6 7. Where multiple conduit are installed in the same trench, the trench shall be of sufficient
7 width to accommodate all conduit, with a minimum 3-inch separation between each
8 conduit, and a minimum clearance of 1-inch on the sides of the trench. When conduit is
9 laid horizontal to one another, the conduit shall be laid at the same elevation, parallel
10 with one another. When conduit is laid vertically in the same trench, conduit spacers
11 shall be used to maintain the 3-inch separation. Spacers shall be installed in
12 accordance with the manufacturer's recommendations for conduit of that size and type.
13 Additional spacers shall be required where the supported conduit is sagging more than
14 20% of the nominal diameter of the conduit.
- 15 8. In all conduit trenches, metallic, detectible, utility warning tape shall be placed at twelve
16 (12) inches below final grade.

17 18 **8-20.3(6) Junction Boxes, Cable Vaults, and Pull boxes**

19 *This section is supplemented with the following:*

20
21 Unless otherwise specified in the plans, or as otherwise directed by the engineer, all junction
22 boxes exposed to vehicular traffic shall be Heavy-Duty. Field adjustment of junction boxes,
23 which cause junction boxes to be installed within an intersection radius and within four feet of
24 the curb face may be required to be Heavy-Duty. Final placement and type of all junction boxes
25 within an intersection shall be as directed by the Engineer.

26
27 Adjacent junction boxes shall be separated by a minimum of three-inches.

28
29 Concrete meeting the requirements of 6-02.3(2)B shall be placed surrounding all junction boxes
30 except as otherwise provided for below. Concrete shall be flush with the top of the junction box
31 and the adjacent improvements. Concrete shall be cast in place. Junction boxes shall be
32 secured with the concrete border (per City of Tacoma Standard Plan TS-08) as follows:

- 33
- 34 1. When the junction box is located within a concrete or asphalt section and is located a
35 minimum of 12-inches from the edge of the section, a concrete border will not be
36 required.
 - 37 2. Where junction boxes are located within 12-inches from the edge of the concrete or
38 asphalt section, the junction box shall secured on all sides with a minimum 12-inch wide,
39 6-inch deep concrete section. Concrete shall be finished in the same manner as the
40 adjacent concrete where applicable.
 - 41 3. Where junction boxes are located within a planter strip, a landscaped area, or other non-
42 hardened surface, the junction box shall be bordered on all sides with a minimum 6-inch
43 wide, 12-inch deep concrete section flush with the top of the junction box.
- 44

45 When setting a new junction box on an existing streetlight circuit where no equipment ground is
46 present, a non-conductive junction box and lid shall be utilized.

47
48 All junction box lids for illumination systems shall be welded in place using one, 2 inch weld on
49 each short side and one, 4 inch long weld on each long side of the junction box lid and frame.

ADDENDUM NO. 2

1 Welding shall occur after inspection and testing of the illumination system and confirmation from
2 the Engineer. An Illumination System may consist of a separate illumination service or circuit.

3
4 All junction boxes shall have slip resistant lids which meet the requirements of Americans with
5 Disabilities Act (ADA) and Public Right-of-Way Accessibility Guideline (PROWAG) and comply
6 with Section 9-29.2(1)A of these Special Provisions.

7
8 All junction boxes shall have 3/8-inch premolded joint filler (full depth) between concrete and
9 junction boxes.

10 **8-20.3(7) Messenger Cable, Fittings**

11 *The second paragraph of this section is deleted.*

12
13 *This section is supplemented with the following:*

14
15
16 Cable ties shall be used to neatly secure the signal cable to the span wire at 10-inch centers
17 and shall be tightened at top. Excess tie material shall be completely cut off. The signal control
18 cable shall be below the span wire and shall be straight with no twisting or spiraling.

19
20 A maximum 5% sag shall be provided in the span wire when fully loaded with all vehicular signal
21 heads, unless otherwise directed by the Engineer.

22 **8-20.3(8) Wiring**

23
24 *The sixth paragraph is revised to read:*

25
26 Signal wiring shall be in conformance with the following:

- 27 1. All termination for traffic signal control systems shall be in accordance with City of
28 Tacoma Standard Plan TS-15.
- 29 2. All signal wiring shall be 14 gauge 5-conductor or 12 gauge 2-conductor stranded
30 copper wire unless otherwise shown in the plans.
- 31 3. All pedestrian pushbutton wiring shall be 12 gauge 2-conductor shielded (2CS)
32 stranded copper wire unless otherwise shown in the plans.
- 33 4. For 5-section heads, 2-5c-14 gauge conductors shall be utilized.
- 34 5. 5c wire shall not be split between high voltage and low voltage. Where a pedestrian
35 head and a pedestrian pushbutton share a common pole, a separate 2c shall be
36 pulled for the pushbutton.
- 37 6. A single 5c may be split between two pedestrian heads on a common pole with a
38 jumper across the neutral.
- 39 7. Opticom and detection wiring shall be per manufacturer's recommendations.

40
41
42 All wiring entering the cabinet shall be gathered across the conduits to the right front of the
43 cabinet, neatly tied, and circle the base of the cabinet counterclockwise as further described
44 below:

- 45 1. Communication cables shall circle the base of the cabinet, counterclockwise from
46 front right, one full circle, and around to the back of the right panel. Cables shall
47 follow up the back of the right panel and terminate on the terminal strip identified by
48 the Engineer. Unless otherwise directed by the Engineer, cable outer jacket
49
50

ADDENDUM NO. 2

- 1 sheathing shall be removed from a point two (2) inches below the terminal strip.
2 Cables shall be uniform in length, with sufficient slack to reach any terminal on the
3 terminal strip. Individual wire slack shall be neatly looped back and tied. A
4 bolt/flanged nut alligator jaw shield bond connector shall be utilized.
- 5 2. Power service conductors shall circle the base of the cabinet, counterclockwise from
6 front right, one full circle, and back around to the front right of the base.
 - 7 3. Detection cables shall circle the base of the cabinet, counterclockwise from front
8 right, to the back of the left panel. Cables shall follow up the back of the left panel
9 and terminate as directed in the field.
 - 10 4. Vehicle and pedestrian signal head conductors shall circle the base of the cabinet,
11 counterclockwise from front right, to back left. Cable outer jacket sheathing shall be
12 removed from the point that the conductor reaches the back left of the cabinet to the
13 ends of the conductors. All vehicle and pedestrian signal head conductors in the
14 cabinets shall be uniform in length, with sufficient slack to reach any terminal on the
15 load bay. Individual wire slack shall be neatly looped back and tied.
 - 16 5. Pushbutton conductors shall circle the base of the cabinet, counterclockwise from
17 front right, to front left. Cable outer jacket sheathing shall be removed from the point
18 that the conductor reaches the front left of the cabinet to the ends of the conductors.
19 All pushbutton conductors in the cabinets shall be uniform in length, with sufficient
20 slack to reach any terminal on the terminal strip. Individual wire slack shall be neatly
21 looped back and tied.
 - 22 6. Interconnect fiber cable shall circle the base of the cabinet with 50 feet of coiled
23 cable.

24
25 *The eighth paragraph is revised to read:*

26
27 Illumination cable in light standards shall be #10 AWG USE or "Pole and Bracket" cable, as
28 specified in Section 9-29.3(2)D of the Standard Specifications.

29
30 *The ninth paragraph is revised to read:*

31 Fifteen (15) feet of slack cable shall be provided at the controller end of all cables terminating in
32 the controller cabinet. A minimum of three (3) feet of slack cable shall be left at all strain poles
33 and junction boxes. Interconnect fiber optic cable shall have fifty (50) feet of slack cable in the
34 controller cabinet and 20 feet of slack cable in each junction box between terminated signal
35 cabinets.

36
37

38 **8-20.3(8)A Splices**

39

40 *The second and third paragraph are deleted.*

41

42 *The fifth paragraph is revised to read:*

43

44 Splices and taps on underground and overhead circuits shall be made with solderless crimp
45 connectors, installed with an approved tool designed for the purpose, to securely join the wires
46 both mechanically and electrically. Splices and taps will be sealed in accordance with this
47 section.

48

49 *The seventh paragraph is revised to read:*

50

ADDENDUM NO. 2

1 Aerial illumination splices shall be taped with thermoplastic electrical insulating tape equivalent
2 to the original wire insulation rating and thickness. It shall be well lapped over the original
3 insulation.

4
5 *This section is supplemented with the following:*

6
7 All splices in junction boxes and handholes shall be taped and sealed with an electrical coating.
8 Tape splice insulation shall consist of thermoplastic electrical insulating tape equivalent to the
9 original wire insulation rating and thickness. It shall be well lapped over the original insulation
10 and moisture resistant electrical coating shall be applied and allowed to dry. Two layers of
11 thermoplastic tape will then be applied, followed by a second layer of moisture resistant
12 electrical coating.

13 14 15 **8-20.3(9) Bonding, Grounding**

16 *The third paragraph shall be supplemented with the following:*

17
18 Equipment grounding shall be minimum #8 AWG unless otherwise shown in the plans. When
19 the ground is pulled through a conduit, the wire shall be insulated. Color tape marking shall not
20 be acceptable for marking the ground.

21 22 23 **8-20.3(10) Service, Transformer, and Intelligent Transportation System (ITS) Cabinets**

24 *The second, third, and fifth paragraphs are deleted.*

25 26 **8-20.3(11) Testing**

27 28 **8-20.3(11)B Traffic Signal System Turn-On**

29 *The fourth paragraph is revised to read:*

30
31 Unless approved by the Engineer no change to signal stop and go operation will be allowed
32 between 6:00 a.m. to 9:00 a.m. and 2:00 p.m. to 7:00 p.m. on Tuesday through Thursday, nor
33 will signal operation changes be allowed on Fridays, weekends, holidays, or the day preceding
34 a holiday. Signal operation changes will be allowed on Monday with prior coordination with the
35 City of Tacoma Traffic Signal Electricians.

36 37 **8-20.3(13) Illumination Systems**

38 39 **8-20.3(13)A Light Standards**

40 *The sixth, seventh, and eighth paragraphs (regarding pole identification numbers) are deleted.*

41
42 *This section is supplemented with the following:*

43
44 Conventional Base installation shall conform to the following:

45
46 The light standards shall be assembled and mounted complete on foundations perfectly straight
47 and in good alignment. Proper leveling of the standards shall be accomplished by means of
48 four leveling nuts that are to be employed with the anchor bolts. Standards shall be plumb
49 within 1/50-inch per foot.

50

ADDENDUM NO. 2

1 Luminaires shall be securely attached to the mast arm in a straight and level position. The
2 luminaires shall be installed at a specified number of degrees from level if directed by the
3 Engineer. After the poles are plumbed, grout shall be neatly placed between the pole base and
4 the concrete. The Contractor shall install a 3/8-inch diameter plastic drain tube in the grout.
5 The nuts and bolts required for this foundation shall be furnished by the Contractor.
6

7 All above grade signal and streetlight infrastructure, including streetlight standards, traffic signal
8 poles, pushbutton poles, cabinets, and enclosures, shall not be installed closer than three (3)
9 feet from face of curb to the nearest part of the pole or structure and no closer than five (5) feet
10 from fire hydrants and utility poles.
11

12 Relocation of street light standards and luminaires shall include all labor and materials
13 necessary to disconnect and remove the existing street light standard, base, and attached
14 luminaire from its foundation, reconnect it to the electrical wiring and install it on the new
15 foundation. The Contractor shall take care to protect the street light standard and luminaire from
16 damage during removal, storage, relocation, and reinstallation. New conduit and junction box
17 shall be installed adjacent to the relocated pole as shown in the Plan and street light wiring shall
18 be spliced at the existing junction box where the new conduit is extended from per Plan.
19

20 **8-20.3(13)B Vacant**

21 *This vacant section is renamed and replaced with the following:*
22

23 **8-20.3(13)B Temporary Lighting**

24 *This section is supplemented with the following*

25 The Contractor shall schedule the work to minimize the outage between any existing lights
26 and new lights. The temporary lighting shall be installed and operational before the existing
27 lighting is removed from service. Temporary lighting shall be provided by the Contractor.
28 City Signal/Streetlight Maintenance Crews will hot splice the final connection or connections.
29 The Contractor shall provide 72 hours notice to schedule the City crews for the hot splicing.
30

31 **8-20.3(13)C Luminaires**

32 *This section is supplemented with the following:*
33

34 All luminaires supplied by the project shall be identified with a green "H-1" label on the bottom of
35 the luminaire. H-1 labels can be obtained at the Signal and Streetlight shop or through the
36 Signal and Streetlight Inspector.
37

38 **8-20.3(14) Signal Systems**

39 **8-20.3(14)A Signal Controllers**

40 *This section is revised to read:*
41

42
43 The fully wired control cabinet, the controller, the MMU, and detection hardware for the cabinet
44 shall be delivered to the City of Tacoma Traffic Signal Shop for configuration, programming,
45 testing, and certification prior to installation. At the Contractor's request, the City will off load the
46 equipment. The Contractor shall notify the City 24 hours in advance of the equipment delivery.
47

48 A minimum of two weeks shall be required for the City to configure and test the cabinet and
49 controller for each intersection. If multiple cabinets and controllers are delivered, the Contractor

ADDENDUM NO. 2

1 shall identify the sequence for configuration and allow one additional week for each additional
2 cabinet and controller delivered.

3

4 The Contractor shall be responsible for transporting the controller cabinet from the
5 Signal/Streetlight Shop site to the jobsite, and for installation of the cabinet and all field wiring.
6 Field wiring shall be performed in accordance with 8-20.3(8) and as directed by City of Tacoma
7 Signal and Streetlight personnel in the field.

8

9 **8-20.3(14)B Signal Heads**

10 *This section is supplemented with the following:*

11

12 Relocation of signal heads shall include all labor and materials to disconnect and remove the
13 existing signal head from the signal pole or mast arm and to reconnect it in the new location with
14 appropriate mounting hardware for the new location shown on the plans.

15

16 Removed signal heads shall be inspected by City of Tacoma Signal and Streetlight operations
17 staff for possible salvage. Contractor shall be responsible for delivery of the signal heads to the
18 City of Tacoma Signal and Streetlight operations shop or shall dispose of the items if the City
19 chooses not to salvage the equipment.

20

21 For span wire installation, the red indications shall be leveled to within 1 inch for each direction
22 as approved by the City. The height to the bottom of the lowest head shall be 17 feet, plus or
23 minus 3 inches. Height to the bottom of the lowest four-section or five-section head shall be a
24 minimum of 16 feet-3 inches, plus or minus 3 inches.

25

26 For span wire installation, the signal stem (drop pipe) shall be 1 to 3 feet long unless otherwise
27 approved by the Engineer.

28

29 **8-20.3(14)C Induction Loop Vehicle Detectors**

30 *Subsections 2, 4, 9, and 10 are deleted.*

31

32 **8-20.3(14)E Signal Standards**

33 *This section is supplemented with the following:*

34

35 Unless otherwise shown in the plans, a terminal cabinet shall be installed on all new traffic
36 signal strain poles and traffic signal mast arm standards. Where modifications to existing signal
37 systems include replacement, addition, or modifications to existing signal head wiring, a terminal
38 cabinet shall be added to the existing strain pole or mast arm standard.

39

40 For strain poles and mast arm poles supporting signal indications for one leg of the intersection,
41 an 8" deep, 16" high, and 12" wide terminal cabinet shall be installed. For strain poles and mast
42 arm poles supporting signal indications for two or more legs of the intersection an 8" deep, 24"
43 high, and 18" wide terminal cabinet shall be installed.

44

45 Terminal cabinets shall be in conformance with Section 9-29.25.

46

47 *Section 8-20.3(14) is supplemented with the following new section:*

48 **8-20.3(14)F Thermal, Microwave, Fish-Eye, and LED Optical Vehicle Detection**

49

ADDENDUM NO. 2

1 A representative from the City of Tacoma Signal and Streetlight operations shop shall be on site
2 during all work within the signal cabinet. The Contractor shall notify the Engineer two working
3 days in advance of work within the cabinet.

4
5 The Contractor shall install and test the detection system in accordance with the manufacturer's
6 recommendations and these special provisions. Detection units shall be mounted and all
7 cabling shall be in accordance with the manufacturer's recommendations. The installation shall
8 include all field equipment as well as all equipment required in the controller cabinet.

9
10 Detection unit locations as shown on the plans are approximate. Detection units shall be
11 mounted at a sufficient height to prevent occlusion from cross traffic. Detection units shall be
12 field adjusted as directed by the Engineer and equipment manufacturer for maximum coverage.
13 A factory-certified representative of the equipment manufacturer shall inspect and provide a
14 written verification that the installation has been performed in accordance with the
15 manufacturer's requirements.

16
17 The factory-certified representative of the equipment manufacturer shall supervise all testing of
18 the equipment and shall provide written documentation showing acceptance of the testing and
19 verification that the system is a complete, fully functional system.

20
21 All equipment shall be warranted against manufacturing defects in materials and workmanship
22 for a period of 3 years from the date of signal turn-on.

23 24 **8-20.3(17)B "As Built" Plans**

25 *This section is supplemented with the following:*

26
27 These drawings shall show the routing of all underground conduits. The locations of the conduit
28 shall be dimensioned with a precision and accuracy of 1 foot.

29 30 **8-20.4 Measurement**

31 *This section is supplemented with the following:*

32
33 When a bid item is shown as "lump sum" in the proposal, no specific unit of measurement will
34 apply, but measurement will be for the sum total of all items for a complete system to be
35 furnished and installed in accordance with approved methods, the Plans, and the Special
36 Provisions, and these Specifications. Removal, relocation and salvage of existing traffic signal
37 and illumination equipment and signs where required shall be incidental to the lump sum items
38 and no separate measurement will be made.

39
40 All excavation necessary for the construction, within areas labeled on the Plans or in the
41 Appendix as contaminated, including but not limited to conduit trenches, foundations, junction
42 boxes, vaults and any other items in accordance with Section 8-20 shall be measured and paid
43 in accordance with Structure Excavation, Section 2-09 of these Special Provisions and no
44 additional measurement shall be made in this Section.

45
46 Junction Boxes will be measure per each replaced junction box regardless of the type specified
47 use, unless the junction box is included in an illumination system, traffic signal system,
48 intelligent transportation system, or other type of electrical system lump sum Bid item.

49

ADDENDUM NO. 2

1 Surface restoration (regardless of surfacing type) for areas disturbed by activities associated
2 with installing equipment per this Section and not otherwise called out for replacement or in
3 excess of the limits shown in the Plans, shall be included in the respective lump sum price and
4 no additional measurement shall be made.

5
6 All potholing associated with the bid items herein shall be considered included in the bid items
7 included in this section and no additional compensation will be made.

8
9 Restoration of facilities destroyed or damaged during construction shall be considered incidental
10 to the bid items included in this section and no additional compensation will be made.

11
12 Use of a vacuum truck for excavation, including potholing associated with installation of
13 equipment specified herein, shall be considered included in the bid items included herein and no
14 additional compensation will be made.

15
16 Conduit zone bedding shall be incidental to the lump sum items and no separate measurement
17 will be made.

18
19 Concrete 'collars' around junction boxes and luminaire foundations shall be considered
20 incidental to the bid items included herein and no additional compensation will be made.

21 22 **8-20.5 Payment**

23 *This section is supplemented with the following:*

24
25 "Electrical and Illumination System", lump sum.

26
27 The lump sum Contract price for "Electrical and Illumination System" shall be full pay for the
28 construction of the complete electrical system, modifying existing systems, or both, as described
29 and as show in the Plans, and herein specified, including excavation, backfilling, concrete
30 foundations of meter cabinets, conduit, wiring, service connection and coordination with Tacoma
31 Public Utilities (TPU), restoring facilities destroyed or damaged during construction, salvaging
32 existing materials, and for making all required tests. All additional materials and labor, not
33 shown in the Plans or called for herein and which are required to complete the electrical system,
34 shall be included in the lump sum Contract price.

35 The system shall include relocation of luminaire poles, luminaire bracket arms, LED luminaires,
36 temporary lighting, electrical service cabinet, foundations, junction boxes, conduits, and wiring
37 for electrical services and street lighting.

38
39 "Traffic Signal System", lump sum.

40
41 The lump sum Contract price for "Traffic Signal System" shall be full pay for the construction of
42 the complete signal and electrical system, modifying existing systems, or both, as described and
43 as show in the Plans, and herein specified, including excavation, backfilling, concrete
44 foundations, junction boxes, conduit, wiring, restoring facilities destroyed or damaged during
45 construction, salvaging existing materials, and for making all required tests. All additional
46 materials and labor, not shown in the Plans or called for herein and which are required to
47 complete the signal system, shall be included in the lump sum Contract price.

48 The system shall provide complete traffic signal system for Port of Tacoma Road and Lincoln
49 Avenue intersection and Thorne Road and Lincoln Avenue intersection include mast arm poles,
50 signal mast arms, terminal cabinets, signal strain and luminaire poles, luminaire bracket arms,

ADDENDUM NO. 2

1 LED luminaires, pushbutton and signal posts, vehicular and pedestrian signal heads, signage,
2 traffic signal cabinet and controller equipment, vehicular, bicycle, and emergency pre-emption
3 detection, LED blank-out signs.

4

5 “Intelligent Transportation System”, lump sum.

6

7 The lump sum Contract price for “Intelligent Transportation System” shall be full pay for the
8 construction of the complete ITS and communication system, modifying existing systems, or
9 both, as described and as show in the Plans, and herein specified, including excavation,
10 backfilling, junction boxes, conduit, wiring, restoring facilities destroyed or damaged during
11 construction, salvaging existing materials, and for making all required tests. All additional
12 materials and labor, not shown in the Plans or called for herein and which are required to
13 complete the signal system, shall be included in the lump sum Contract price.

14 The system shall provide complete and tested fiber communication system on as shown in the
15 Plans including fiber optic cables, conduits, junction boxes, pole attachments, risers, fiber
16 termination panels, ethernet switch, fiber splice enclosures, fiber splicing and terminations, and
17 fiber testing.

18

19

END OF SECTION

20

21

ADDENDUM NO. 2

1 **9-29 ILLUMINATION, SIGNALS, ELECTRICAL** 2 **(September 28, 2023 Tacoma GSP)**

3
4 **9-29.1(4) is supplemented with the following new section:**

5 6 **9-29.1(4)E Service Entrance Cap Fittings**

7
8 Service Entrance Cap Fittings for use with PVC shall be PVC clamp-on type. Where used for
9 signal or flashing beacon conductors, the center of the wire entrance shall be cut or machined
10 out to a large diameter to accommodate entry of multi-conductors. All edges shall be smoothed
11 to avoid chaffing.

12 13 **9-29.1(6) Detectable Underground Warning Tape**

14 *This section is supplemented with the following:*

15
16 For electrical circuits detectable underground warning tape shall be high visibility red, with
17 continuous legend of "Caution Electric Line Buried Below" or equal. The warning tape shall be
18 polyethylene with a metallic backing. The polyethylene shall be a minimum 3 inches wide, 4 mils
19 thick.

20 21 **9-29.1(11) Foam Conduit Sealant**

22 *This section is deleted.*

23 24 **9-29.2 Junction Boxes, Cable Vaults and Pull Boxes**

25 *This section is supplemented with the following:*

26
27 Unless otherwise specified, all junction boxes containing illumination and signal control cable
28 shall be Type 1, Standard Duty with Alternate 2 Lid Bolt Down Attachment Tab per state
29 standard plan J-40.10-04.

30
31 Unless otherwise specified, all junction boxes containing interconnect cabling shall be Type 2,
32 Standard Duty with Alternate 2 Lid Bolt Down Attachment Tab per state standard plan J-40.10-
33 04.

34
35 Unless otherwise specified, all junction boxes containing illumination, signal or ITS cable shall
36 have a galvanized slip resistant lid and frame.

37 38 **9-29.2(1)A2 Non-Concrete Junction Boxes**

39 *This section is deleted.*

40 41 **9-29.2(4) Cover Markings**

42 *The second paragraph of this section is revised to read:*

43
44 Covers shall be marked or embossed with "LT" for boxes containing illumination circuits.
45 Covers shall be marked or embossed with "TS" for boxes containing traffic signal circuits.
46 Covers shall be marked or embossed with "IC" for boxes containing signal interconnect circuits.

47 48 **9-29.2(5)C Standard Duty Non-Concrete Junction Boxes**

49 *This section is deleted.*

50

ADDENDUM NO. 2

9-29.3 Fiber Optic Cable, Electrical Conductors, and Cable

This section is supplemented with the following:

Where not otherwise specified, all wiring shall meet standard of the industry for the application employed. Wiring shall be consistent with manufacturers' recommendations and meet all applicable codes.

9-29.3(1) Fiber Optic Cable

This section is supplemented with the following:

Unless otherwise specified, all fiber optic trunk communication lines (lines between intersections) shall be 48 count single mode fiber optic cable. Fiber Optic cables connecting the Fiber Optic Termination Panel in the signal cabinet to the Fiber Optic Splice Closure in the signal communications junction box shall be 6 count single mode fiber optic cable unless otherwise specified in the Plan.

Section 9-29.3(1) is supplemented with the following new sections:

9-29.3(1)C Sealed Fiber Optic Splice Closures

Fiber optic splice closure shall be a sealed dome closure designed for small count fiber splicing in a butt configuration. Splice closure shall be fully sealed and suitable for aerial and underground environments. Splice closure shall be able to receive up to 5 cables with an outside diameter between 0.30 inches and 0.62 inches and shall be fully kitted with all parts required to enable installation. Splice closure shall support stranded loose tube or ribbon fiber cables in either armored or dielectric configurations. Splice closure shall require only a common can wrench for installation and re-entry. Splice closure shall be a maximum of 18.25 inches long with a maximum diameter of 8.75 inches.

Splice trays shall be of the same manufacturer as the splice closure and designed to operate with the specific splice closure provided. Splice closure shall house between 1 and 4 splice trays with a splice capacity of 12 mechanical fused single splices in each tray for a maximum splice capacity of 48 mechanical fused single splices. One splice tray shall be provided with each splice closure unless otherwise identified in the project documents.

Cable grounding kits shall be of the same manufacturer as the splice closure and designed to operate with the specific splice closure provided. Cable grounding kits shall be installed in accordance with the manufacturer's recommendations.

Splice closure shall be designed and tested to Telcordia® GR-771 requirements Splice closure shall be Rural Utilities Service (RUS) Listed.

9-29.3(1)D Fiber Optic Termination Box

Unless otherwise specified, all fiber optic termination boxes located in signal cabinets shall be Fibertronics FOTB-6-12.

One coupler/adaptor shall be provided and installed in the fiber optic termination box. Coupler shall be a female LC duplex to female LC duplex coupler designed for installation in a standard 12.8mm x 9.3mm adaptor port. Coupler color shall be blue, consistent with singlemode OS2 installations. Coupler shall be installed in the last (right most) adaptor port of the termination box and secured with 2 M2x6mm Philips head screws.

ADDENDUM NO. 2

1
2 Two pre-terminated patch cables shall be provided, one 1-foot (0.3m) in length, and one 6 feet
3 (2m) in length. Patch cables shall be LC duplex singlemode OS2 9/125 fiber patch cables and
4 rated for indoor/outdoor use. Patch cables shall have a yellow colored 3mm diameter jacket,
5 and blue LC duplex connectors, consistent with singlemode OS2 installations.
6

7 **9-29.3(2)A Single Conductor**

8 **9-29.3(2)A1 Single Conductor Current Carrying**

9 *This section is supplemented with the following:*
10

11
12 Service connections shall be stranded copper size AWG #6 USE unless otherwise shown in the
13 plans. Black conductor insulation shall be used for the service and the neutral conductor shall
14 be white. Color tape marking shall not be acceptable for the neutral conductor.
15

16 **9-29.3(2)A2 Grounding Electrode Conductor**

17 *This section is supplemented with the following:*
18

19 Grounding electrode conductor shall be minimum #8 AWG unless otherwise shown in the plans.
20 When the ground is pulled through a conduit, the wire shall be insulated. Color tape marking
21 shall not be acceptable for marking the ground conductor.
22

23 **9-29.3(2)A3 Equipment Grounding and Bonding Conductors**

24 *This section is supplemented with the following:*
25

26 Equipment grounding shall be minimum #8 AWG unless otherwise shown in the plans. When
27 the ground is pulled through a conduit, the wire shall be insulated. Color tape marking shall not
28 be acceptable for marking the ground.
29

30 **9-29.3(2)B Multi-Conductor Cable**

31 *This section is supplemented with the following:*
32

33 Two-conductor through 10-conductor unshielded signal control cable, shall have stranded
34 copper conductors, size AWG 14, and shall conform to International Municipal Signal
35 Association (IMSA) signal cable 20-1.
36

37 **9-29.3(2)E Two-Conductor Shielded**

38 *This section is revised to read:*
39

40 Two-conductor shielded (2CS) cable shall be stranded 12 AWG conductors and shall conform
41 to IMSA Specification No. 50-2.
42

43 **9-29.4 Messenger Cable, Fittings**

44 *This section is supplemented with the following:*
45

46 Messenger cable shall be 5/16-inch, seven-wire strand messenger cables conforming to ASTM
47 A 475, extra-high strength grade, 11,200 lbs. min. breaking strength, Class B galvanized.
48

49 All guy eye anchor rods shall be double-hub type.
50

ADDENDUM NO. 2

1 Weatherheads shall be clamp-on type PVC. Where used for signal or flashing beacon
2 conductors, the center of the wire entrance shall be cut or machined out to a large diameter to
3 accommodate entry of multi-conductors. All edges shall be smoothed to avoid chaffing.

4
5 All miscellaneous nuts, bolts, washers and fittings shall be stainless steel or brass unless
6 otherwise noted.

7
8 All metal line hardware shall be hot-dipped galvanized in conformance with the requirements of
9 ASTM Designation A-153. All eyebolts shall be thimble eye design cast or welded to form a
10 solid eye.

11
12 5-strand, class B galvanized steel, pretwisted guy strand dead ends, high strength cable
13 conforming to ASTM Designation A-475, shall be utilized at all span wire terminations. 1/2" rope
14 wire thimbles shall be required where span wire connects to all poles or bull rings, except where
15 thimble eye bolts are used. Span wire shall normally be installed directly pole to pole, unless
16 otherwise directed or specified.

17
18 Strain insulators shall be installed where connecting to wood poles. Where span wire is
19 connected to a steel or concrete pole, insulators shall not be installed. Strain insulators shall be
20 wet process, porcelain, conforming to EEI-NEMA Class 54-2 standards for 12,000-pound
21 ultimate strength and shall be installed 9 feet from the pole.

22 23 **9-29.6 Light and Signal Standards**

24 *This section is supplemented with the following:*

25
26 Pedestrian pushbutton posts (Type PPB) shall have a 7-inch square and 10-inch high aluminum
27 frangible pedestal with an aluminum door and grounding lug, with the post threaded into the top
28 of the pedestal. The post shall be aluminum, 4.5-inch outside diameter, Schedule 40, with no
29 finish. Set screws shall be used to secure the pole to the base. A post cap with set screws shall
30 be provided and installed on the pole top. The bolt circle diameter for the base shall be 6
31 inches. Foundation shall be in accordance with Section 8-20.3(4). Anchor bolts shall be in
32 accordance with Section 9-29.6(5).

33
34 All light and signal standards shall be fixed base, 4-bolt anchor.

35
36 The head of the handhold security bolt shall be flush with the face of plate. The face plate of
37 the handhole shall be flush with pole.

38 **9-29.6(3) Timber Light Standards, Timber Strain Poles, Timber Service Supports**

39 *This section is supplemented with the following:*

40
41 All timber poles shall be Class II unless otherwise specified.

42
43 Mast arms for wood poles shall be "tapered elliptical" or "tapered truss" style, of a size sufficient
44 to be used with a luminaire weight of 48 pounds with an EPA of 1.1 square feet. Arms shall
45 have 2-3/8-inch O.D. x 8-inch long slip fitter for mounting luminaire.

46 47 **9-29.6(5) Foundation Hardware**

48 *This section is supplemented with the following:*

49

ADDENDUM NO. 2

1 All pedestrian pushbutton posts (Type PPB) shall be installed utilizing anchor bolts with WSDOT
2 Standard Plan J-20.15-04 and J-20.11-03, with 5/8-inch diameter and hot dip galvanized or
3 stainless steel and shall meet ASTM F1554 Grade 36 specifications. Supplied with each anchor
4 bolt shall be two hex nuts, meeting the requirements of ASTM A563, Grade A and two flat
5 washers, meeting the requirements of ASTM F436.

6
7 *Section 9-29.6 is supplemented with the following new section:*

8 9 **9-29.6(6) City of Tacoma Universal Pole**

10
11 Unless otherwise specified, light standards and strain poles shall be in conformance with the
12 following City of Tacoma standard design.

13 14 **Strength**

15 Each pole and mast arm shall have adequate strength for the designated luminaire with 1.8
16 safety factor for maximum combined stresses using 90 mph isotach (117 mph gusts) per
17 AASHTO LRFD Specifications for Structure Supports for Highway Signs, Luminaires, and
18 Traffic Signals. Design shall be based on total loading of 50 pounds and EPA of 2.0 square feet.

19 20 **Standard Bolt Spacing – for Streetlight Poles Only**

21 30 Foot poles -- Baseplate shall accommodate 1 inch anchor bolts. The bolt circle shall be
22 between 11 inches and 13 inches.

23 40 Foot Poles -- Baseplate shall accommodate 1 inch anchor bolts. The bolt circle shall be
24 between 12.5 inches and 14.5 inches.

25 26 **9-29.6(6)A Steel Strain Poles**

27
28 Each pole shall be of tapered round or octagonal construction.

29
30 CLASS 1 POLE: Design for dead load tensions up to 1500 pounds

31 CLASS 2 POLE: Design for dead load tensions up to 2600 pounds

32
33 Class 1 poles shall have a minimum base diameter of 12-inches for octagonal poles and 12-1/4-
34 inches for round poles. Poles shall have a minimum wall thickness of 0.3125-inches. Anchor
35 bolts shall be 1-1/2-inch by 60-inches and shall have a spacing of 11-5/16-inches on center, on
36 the square. It is the responsibility of the pole manufacturer to maintain proper clearance
37 between the pole shaft and nuts for the anchor bolts.

38
39 Class 2 poles shall have a minimum base diameter of 13-1/2-inches for octagonal poles and 14-
40 inches for round poles. Poles shall have a minimum wall thickness of 0.375-inches. Anchor
41 bolts shall be 2-inch by 66-inches and shall have a spacing of 12-3/4-inches on center, on the
42 square. It is the responsibility of the pole manufacturer to maintain proper clearance between
43 the pole shaft and nuts for the anchor bolts

44
45 Poles shall be of single-ply construction. Multiple-ply poles shall not be allowed.

46
47 Each pole shall be of tapered round or octagonal construction. Pole taper shall be in the range
48 of 0.13 to 0.14 in/ft.

49

ADDENDUM NO. 2

1 A base plate and top casting shall be securely attached to each pole. The attachment of the
2 base plate to the pole shall be a welded connection sufficient to develop the full strength of the
3 pole. The base plate shall have four (4) holes which will sufficiently accommodate the specified
4 anchor bolts for the pole class.

5
6 Pole shall be of sufficient strength to allow for the span wire to be installed to sag an amount
7 equal to 5% of the span length.

8
9 The maximum acceptable deflection, at 30 feet above the base, is 5 inches. The specified
10 deflection shall be at a loading condition of 1,500 pounds horizontal pull at 30 feet above the
11 base for Class 1 Poles. For Class 2 Poles, the loading condition shall be 2,600 pounds
12 horizontal pull at 30 feet above the base.

13
14 Structural material shall be zinc-coated by a "hot-dip" process in accordance with ASTM A123
15 and the final coating shall measure 0.0039 inch or more in thickness as determined by a
16 magnetic thickness gauge. All tapped holes shall be chased after galvanizing. Hardware shall
17 be coated in accordance with ASTM A307.

18
19 The finished pole shall be reasonably straight and free from injurious defects. If galvanizing is
20 damaged, the maximum area to be repaired is defined in accordance with ASTM A123 Section
21 4.6. The maximum area to be repaired in the field shall be determined in advance by the
22 Engineer. Repair areas damaged during construction, handling, transport or installation by one
23 of the approved methods in accordance with ASTM A780 whenever damage exceeds 3/16
24 inches in width. Minimum thickness for repair shall measure 0.0039 inches.

25
26 The company shall furnish the purchaser with template prints showing spacing and size of holes
27 in base for the anchor bolts.

28
29 The material shall carry the manufacturer's standard guarantee against any defect in material or
30 workmanship for a minimum period of one year following the date of installation. The Contractor
31 shall submit mil test reports for all steel used in the manufacturing of strain poles.

32
33 The Contractor shall submit a Certificate of Compliance with ASTM Standards and
34 Specifications for galvanizing. The certificate, signed by the galvanizer, shall detail galvanizing
35 process and testing procedure to determine that galvanizing meets minimum thickness
36 specified.

37
38 The contractor shall submit welder certification. Welders must be certified to AWS standards.

39
40 Each pole shall include the following:

- 41 1. One (1) rain-tight pole cap.
- 42 2. One (1) 4-inch by 6-1/2-inch handhole at base end to include the handhole cover
43 plate and positioned 90 degrees to the luminaire mast arm (traffic downstream side).
- 44 3. Anchor bolts shall be hot dipped galvanized steel with two (2) galvanized nuts and
45 two (2) washers for each bolt. Only 12-inches of threaded end of the bolts must be
46 galvanized. 1-1/2-inch diameter bolts shall have 8-inches of top thread and 2-inch
47 diameter bolts shall have 10-inches of top thread.
- 48 4. Anchor bolts shall have threaded bottom ends to receive an anchor plate and nut.
49 The nut shall be tack-welded to the anchor plate. Anchor plates for 1-1/2-inch

ADDENDUM NO. 2

- 1 diameter anchor bolts shall be 4-inch square by 1-inch thick. Anchor plates for 2-
2 inch diameter anchor bolts shall be 6-inch square by 1-inch thick
- 3 5. One (1) adjustable strain clamp to be mountable between 26 to 28 feet above the
4 base. Clamp shall provide facility to attach span wire at four-quarter points.
- 5 6. Provisions for mounting a mast arm of specified length. All poles shall be supplied
6 with one luminaire mast arm mounting flange. The centerline of the flange shall be
7 approximately 6 inches below the top of pole. The flanges shall conform with the
8 detail drawing included in the Special Provisions. Poles ordered without luminaire
9 mast arms but with provisions for a later addition of a mast arm shall be provided
10 with a metal cover and gasket to protect the opening. The cover shall be bolted to
11 the pole using the holes provided for fastening the luminaire mast arm.
- 12 7. One (1) two-inch coupling to receive clamp-on type aluminum weatherhead
13 positioned at 27 feet, and no more than 45° from the location of the mast arm, unless
14 otherwise specified.
- 15 8. One (1) 1-1/4-inch coupling for wire inlet located directly opposite the mast arm.
- 16 9. One (1) grounding lug-hole in lip of handhole for 1/2-NC brass bolt.
- 17

18 **9-29.6(6)B Luminaire Mast Arms**

19

20 Each luminaire mast arm shall have sufficient strength with a 1.8 safety factor to support a 70-
21 pound luminaire on an 18-foot mast arm per the latest AASHTO Specifications for Structural
22 Supports for Highway Signs, Luminaires and Traffic Signals.

23

24 Material and workmanship shall conform to the best commercial standards of the industry.

25

26 The mast arm and its fastening shall be constructed of steel conforming to Section 9-29.6

27

28 Each mast arm shall support a ballast-in-head luminaire and shall provide a luminaire mounting
29 height of approximately two (2) feet above the strain pole mounting flange.

30

31 The mast arm shall provide a horizontal extension from the center of the pole to the center of
32 the luminaire as shown in the Plans.

33

34 The mast arm shall be of tapered construction. The luminaire end of the mast arm shall not
35 exceed 2.375 inches O.D. for a minimum distance of 8 inches. The outside arm diameter at the
36 pole flange shall not exceed 5.88 inches.

37

38 The mast arm shall be capable of being fastened to the mast arm mounting flange dimensioned
39 in the detail drawing. All mounting bolt heads shall clear the weld.

40

41 **9-29.10 Luminaires**

42 *The third paragraph is deleted*

43

44 *This section is supplemented with the following:*

45

46 Unless otherwise shown in the plans all new luminaires shall be Light Emitting Diode (LED)
47 fixtures conforming to these specifications.

48

ADDENDUM NO. 2

1 Cobra-head style luminaires and other overhead fixtures, such as shoebox style fixtures, shall
2 be provided with utility labels. Ornamental post top fixtures shall not have utility labels. Utility
3 labels for LED fixtures shall be green and show actual total system wattage.

5 **9-29.10(1) Conventional Roadway Luminaires**

6 *This section is replaced in its entirety with the following:*

8 All Conventional Roadway Luminaires shall be LED meeting the following requirements:

10 1. Applicable Standards:

- 11 a. American National Standards Institute (ANSI) C78 and C136
- 12 b. Electrical and Electronics Engineers (IEEE) C62
- 13 c. Illuminating Engineering Society of North America (IESNA or IES)
- 14 d. Underwriters Laboratories (UL)

15 2. General:

- 16 a. Luminaire shall be UL Listed
- 17 b. Luminaire shall be listed as a Qualified Product on one of the following lists:
 - 18 i. Energy Star
 - 19 ii. Design Lights Consortium
 - 20 iii. Lighting Design Lab
- 21 c. LED light source and driver shall be compliant with the requirements of the
- 22 European Union (EU) Restriction of Hazardous Substances (RoHS) Directive.
- 23 d. Luminaire shall have an external label per ANSI C136.15.
- 24 e. Luminaire shall have an internal label per ANSI C136.22.

25 3. Luminaire Performance:

- 26 a. Operating Temperature Range: -4 F to +122 F
- 27 b. Correlated Color Temperature: (CCT)
 - 28 i. Residential- 3000K Nominal
 - 29 ii. Arterials - 4000K Nominal
- 30 c. Calculated Lumen Maintenance Factor (LMF): 100,000 hours or more (L70
- 31 at 25°C/77°F) in accordance with IESNA TM-21 and IESNA LM-80
- 32 d. Color Rendering Index (CRI) : >70
- 33 e. Light Distribution per IES Handbook: Best fit to meet design criteria
- 34 f. Minimum Efficacy: 80 Lumens/Watt

35 4. Power Supply and Driver Performance:

- 36 a. Input Voltage: Auto-sensing 120 to 277 VAC 50/60HZ
- 37 b. Power factor: >0.90
- 38 c. Drive current maximum of 1.0A
- 39 d. Total harmonics distortion at full power at specified voltage: <20%
- 40 e. Surge Suppression Protection 10kV Minimum (IEEE/ANSI C62.41.2)
- 41 f. Replaceable surge module
- 42 g. Interference FCC 47 CFR part 15/18, Class A
- 43 h. Driver life >100,000 hours
- 44 i. Dimming: 0-10V DC

45 5. Lighting and Dimming Controls:

- 46 a. The luminaire shall be provided with a 7-pin terminal locking type
- 47 photoelectric control mounting receptacle in accordance with ANSI C136.10
- 48 and ANSI C136.41.
- 49 b. Photocell receptacle dimming contacts shall be factory connected to driver
- 50 dimming leads (violet and gray) per ANSI C136.41.

ADDENDUM NO. 2

- 1 6. Luminaire Housing and Door:
 - 2 a. The luminaire housing shall be cast or extruded aluminum. All hardware shall
 - 3 be stainless steel.
 - 4 b. Cast housing components shall have a light gray polyester powder coat
 - 5 finish. Extruded components shall be anodized. Finish shall meet the
 - 6 requirements of ANSI C57.31, latest revision.
 - 7 c. The power-door shall be fabricated from either aluminum or a UV resistant
 - 8 polymer.
 - 9 d. The door shall be easily removable and shall allow for tool-less entry.
- 10 7. Slipfitter and Vibration Resistance:
 - 11 a. Slipfitter shall be capable of accepting a 1-1/4" through 2" IP pipe tenon (1-
 - 12 5/8" to 2-3/8" OD) with maximum allowable insertion lengths of 7-1/2" and 10"
 - 13 respectively in accordance with Table 2 of ANSI C136.3, latest revision.
 - 14 b. The Slipfitter shall have provisions for clamping the luminaire securely to the
 - 15 tenon and for leveling $\pm 5^\circ$ with respect to horizontal.
 - 16 c. Luminaire shall be certified to ANSI C136.31 3G bridge and overpass
 - 17 vibration standards with 4-bolt configurations.
- 18 8. Ingress Protection:
 - 19 a. The luminaire components shall have minimum moisture rating as specified
 - 20 in IEC 60529, with the ability to shed water from inside the housing(weep
 - 21 holes), and designed to minimize water collection and icing.
 - 22 b. Internal Components: IP66
 - 23 c. Enclosure: IP65
- 24 9. Terminal and Grounding Block:
 - 25 a. Components shall be pre-wired to the terminal board requiring only supply
 - 26 power connections to clearly identified terminals.
 - 27 b. The terminal board shall be located so that there is adequate tool-less access
 - 28 to accommodate user wearing electrical gloves to connect the supply leads.
- 29 10. Manufacturer Warranty:
 - 30 a. 10 Year Minimum including power driver and LED chips.

9-29.10(1)A Luminaire Classifications

33 The City of Tacoma has established five (5) classes of LED Conventional Roadway with specific
34 design criteria to ensure long-term lighting continuity. Luminaires are divided into classes based
35 on function, typical use and historical High Intensity Discharge (HID) equivalents. Current
36 classes are 100WEQ, 200WEQ, 250WEQ, 400WEQ, and RES-45. Each conventional
37 luminaire installed shall meet the design criteria of one of these five luminaires.

38
39 Design assumptions and criteria listed for each luminaire classification may not reflect the actual
40 conditions on the project. The design assumptions and criteria identified are only to be utilized
41 to determine luminaire equivalency, such that another luminaire meeting the same criteria can
42 be used to replace a failed unit without a complete redesign of the entire system.

43
44 Equivalence will be determined as follows:

- 45 1. The City of Tacoma will use Lighting Analysts AGi32 lighting software program for
- 46 determination of equivalence using the design assumptions and criteria identified for
- 47 each class of luminaire.
- 48 2. The roadway optimizer will be used to evaluate the performance criteria in all cases,
- 49 except for the Res-45 class luminaire, where model view will be utilized to calculate
- 50 the photometrics.

ADDENDUM NO. 2

- 1 3. Proposed fixtures may not be tilted, rolled, or spun to meet the criteria.
- 2 4. All calculations shall be to the 100th. Rounding will not be permitted.
- 3 5. A copy of the published IES photometric file and BUG (Backlight, Uplight, and Glare)
- 4 Rating shall be provided as a part of product submittal.
- 5 6. It is recognized that there are an infinite number of design variables and it is not
- 6 practical to create a published IES photometric file and BUG rating for each
- 7 combination. In those cases where the wattage is reduced to meet the design
- 8 criteria, the base IES photometric file for the higher wattage configuration shall be
- 9 used as follows:
 - 10 a. Where no IES photometric file exists for the specific configuration, all
 - 11 information required to allow the City to duplicate the results and assure that
 - 12 the fixture meets the criteria must be provided.
 - 13 b. When reducing the system wattage, the BUG rating of the base IES
 - 14 photometric file must be utilized, but may be scaled based on IES LM-79.
 - 15 c. For modified fixtures, the City may require that a representative fixture be
 - 16 provided prior to acceptance. The City reserves the right to have an
 - 17 independent NVLAP approved lab perform an IES LM-79 report for
 - 18 verification of the output for the submitted fixture. A 10 percent margin of
 - 19 error will be allowed in the analysis and comparison of the actual test results.
 - 20 Failure to meet the photometrics within the allowance may be cause for
 - 21 rejection.
- 22

23 Full design assumptions and design criteria for each of the five luminaire classes can be found
24 at the end of this section. Excessive glare or light trespass onto private property is not
25 acceptable. Typical usage for luminaire classes:

- 26 • 100WEQ Luminaires are typically installed along residential roadways at a height of
- 27 25 to 30 feet. 100WEQ Luminaires have a long and narrow light distribution to fit a
- 28 typical residential road.
- 29 • 200WEQ Luminaires are typically installed along local classified arterial roadways
- 30 and along arterials with lower pedestrian conflicts. 200WEQ Luminaires are typically
- 31 installed at a height of 30 feet and will have a slightly wider distribution to cover the
- 32 additional width.
- 33 • 250WEQ Luminaires are typically installed along collector to minor classified arterial
- 34 roadways. 250WEQ Luminaires can be installed at a height of 30 feet or 40 feet
- 35 depending on pedestrian conflict level, road width, and lighting levels required.
- 36 • 400WEQ Luminaires are typically installed along principal classified arterial
- 37 roadways or areas where a higher pedestrian conflict exists. 400WEQ Luminaires
- 38 are typically installed at a height of 40 feet, often installed on both sides of the
- 39 roadway, in a staggered pattern to adequately light the full roadway width.
- 40 • RES-45 Luminaires are typically installed at residential street intersections or for cul-
- 41 de-sacs. For residential intersections, these lights are typically installed on one
- 42 corner of the intersection at a 45 degree angle to the traveled ways. The light
- 43 distribution is designed to provide illumination for the intersection, but not create
- 44 unacceptable light trespass on adjacent properties.
- 45
- 46

47 **9-29.11 Control Equipment**

48 **9-29.11(2) Photoelectric Controls**

49 *This section is revised to read:*
50

ADDENDUM NO. 2

1
2 The photoelectric control shall be the twistlock type and the light sensitive element shall be a
3 solid state photo diode. The control shall be designed to turn on at 2.6 foot-candles (+/- 20%)
4 and turn off at 2.6 foot-candles (+/- 20%). The lighting control shall not drift by more than 1 per
5 cent over a 10-year period.

6
7 The output control relay shall be electro-mechanical. The time delay for both turn on and turn
8 off shall be a minimum of one second and maximum of 5 seconds. The output relay shall be
9 rated 1000 watts incandescent or 15 amps inductive load. The contacts shall be normally
10 closed.

11
12 The lighting control shall have a built in metal oxide varistor (MOV) rated a minimum of 160
13 joules for lightning and transient protection. The control shall also have secondary zener diode
14 and transient filter. The relay shall be suitable for operation on 240 volt, 60 hertz electrical
15 circuits.

16
17 Dimensions shall conform to ANSI specifications for twistlock photocells.

18 19 **9-29.12 Electrical Splice Materials**

20 21 **9-29.12(1) Illumination Circuit Splices**

22 *This section is revised to read:*

23
24 Splices and taps shall be made with solderless crimp connectors on underground and overhead
25 circuits to securely join the wires both mechanically and electrically.
26 Splices shall be sealed in accordance with 8-20.3(8).

27 28 **Thermoplastic Electrical Insulating Tape**

29 Electrical tape shall be made by the same manufacturer and compatible with the electrical
30 coating utilized to form a complete system that both insulates and protects the splice. Electrical
31 tape shall be based on polyvinyl chloride (PVC) and/or its copolymers and have a rubber-
32 based, pressure-sensitive adhesive. The tape shall have a voltage rating of 600V (UL510).
33 The tape shall be 7 mils thick, and be UL Listed and marked per UL Standard 510 as "Flame
34 Retardant, Cold and Weather Resistant." The tape shall be resistant to abrasion, moisture,
35 alkalis, acids, corrosion, and varying weather conditions, including ultraviolet exposure. The
36 tape must be applicable at temperatures ranging from 0°F through 100°F (-18°C through 38°C)
37 without loss of physical properties. The tape shall have an operating temperature up to 220°F
38 (105°C). The tape shall be classified for use in outdoor environments. The tape shall be
39 compatible with synthetic cable insulations, jackets and splicing compounds. The tape will
40 remain stable and will not telescope more than 0.1 inches when maintained at temperatures
41 below 120°F (50°C).

42 43 **Moisture Resistant Electrical Coating**

44 Electrical Coating shall be made by the same manufacturer and compatible with the vinyl
45 electrical tape utilized to form a complete system that both insulates and protects the splice.
46 Electrical Coating shall seal and bond the tape and be suitable for direct burial, direct water
47 immersion, and above ground applications. Electrical coating shall be flexible when dry.
48 Electrical coating shall consist of the solvents Acetone, Methyl Ethyl Ketone and Toluene and
49 shall contain synthetic rubber and resin solids.

50

ADDENDUM NO. 2

1 **9-29.12(2) Traffic Signal Splice Material**

2 *This section is revised to read:*

3
4 Induction loop splices and magnetometer splices shall include an uninsulated barrel-type
5 crimped connector capable of being soldered. The insulating material shall be a heat shrink
6 type meeting requirements of 9-29.

7 **9-29.12(3) Splice Enclosures**

8 *This section is deleted.*

9 **9-29.12(4) Re-Enterable Splice Enclosure**

10 *This section is deleted.*

11 **9-29.13 Control Cabinet Assemblies**

12 *This section is revised to read:*

13
14 The Traffic Controller Cabinet Assembly shall be completely wired and tested to Section 5
15 Terminals and Facilities of the NEMA TS2-2021 V03.08 TRAFFIC CONTROLLER
16 ASSEMBLIES WITH NTCIP REQUIREMENTS Specification, unless modified by these
17 specifications.

18 Cabinet shall be compatible with Econolite Cobalt Shelfmount controller.

19 The following submittals will be required for the review and approval by the City prior to
20 fabrication and wiring:

- 21
22
23
24
25
26 1. Proposed cabinet layout diagram including shelving/rack locations. In addition, detailed
27 diagrams shall be provided for the left side, right side, and back panels. Drawings shall
28 be clearly labeled and dimensioned.
- 29 2. Proposed cabinet wiring diagram shall be submitted for the review and approval by the
30 City. Wiring of cabinets shall not commence prior to City approval of the cabinet wiring
31 plan.

32 All submittal comments shall be incorporated into a final set of prints and each cabinet shall be
33 furnished to three (3) complete sets of cabinet prints. All cabinet wiring, and layout shall come
34 on (1) E1 size sheet, multiple pages shall not be allowed. Upon request (1) CDROM or USB
35 flash drive with AutoCAD v2020 cabinet drawing for the cabinet wiring.

36 **9-29.13(1) Traffic Control Cabinets**

37 The following is for P sized cabinets with internal battery backup:

38 Each of the P sized Traffic Controller Cabinets shall meet the following general operating
39 requirements:

- 40
41
42 1. The Controller Cabinet meets the requirements of the National Electrical Manufacturers
43 Association (NEMA) STANDARDS PUBLICATION TS 2-2021 V03.08 TRAFFIC
44 CONTROLLER ASSEMBLIES WITH NTCIP REQUIREMENTS.
- 45 2. Cabinet is fabricated for 16 Load Switch Channels operation; where each load switch
46 socket can be configured for a vehicle phase, pedestrian phase or overlap operation.
47 Cabinet is wired for 16 Channels of detection, plus 4 Channels of preemption, further
48 details are provided in upcoming sections of these specifications.
- 49 3. The detector panel supports thirty-two (32) channels of vehicle detection, four

ADDENDUM NO. 2

1 (4) channels of emergency vehicle preemption, eight (8) channels of pedestrian
2 detection and eight (8) pedestrian return terminals.

- 3 4. The loop inputs are wired to two adjacent field terminals provided for each loop input.
4 Eight adjacent field terminals are provided for pedestrian field inputs and eight common
5 adjacent field terminals for the field ped push button returns connected to AC neutral,
6 eight adjacent field terminals are provided for preempt field input terminals. Additionally,
7 one (1) equipment ground solid aluminum busbar, and one (1) neutral solid aluminum
8 busbar are provided.

9 10 **9-29.13(1)A Cabinet Enclosures**

11 For the P sized cabinets with internal battery backup the Cabinet enclosures shall meet the
12 following requirements:

- 13 1. Cabinet Dimensions are **44** in. wide, **67** in. high and **26** in. deep. Cabinet is constructed
14 to be base mounted.
- 15 2. Cabinet and up to an 18-inch cabinet riser shall be fabricated from 0.125 in. thickness
16 aluminum alloy sheet meeting the requirements in ASTM Specification No. 5052-H32 or
17 equivalent. All exterior seams meet the requirements for Type 4 enclosures according to
18 NEMA 250.
- 19 3. The cabinet is manufactured to prevent the accumulation of water on its top surface with
20 a 1-1/2 in. slope from front to back. Cabinets are constructed in accordance with the
21 NEMA 3R rating requirement.
- 22 4. Cabinet is natural mill finish aluminum, and it is cleaned with appropriate methods to
23 remove oil film, weld black, and mill ink marks to render the surface clean, smooth, and
24 non-sticky to the touch.
- 25 5. The cabinet is provided with 2 removable lifting ears attached to the top of the cabinet
26 with a single 1/2" bolt.

27 28 **9-29.13(1)A1 Cabinet Enclosures for UPS Systems**

29 The following is for P sized cabinets with internal battery backup:

30 Controller cabinets that are designated in the project plans and specifications as UPS Controller
31 Cabinets Type P with internal battery backup shall be 67-inches high x 44-inches wide x 26-
32 inches deep (nominal dimensions) and meet the footprint dimensions as specified Section 7.3,
33 Table 7-1 of NEMA TS2 standards for a Type P cabinet.

- 34 1. Cabinet is built in a featured BBS/UPS system compartment. The compartment is
35 designed to allow air flow among the devices for their correct operation; compartment is
36 built in a front panel, designed to accommodate one (1) UPS Module and one (1)
37 Transfer Switch Module, the main cabinet door allows access to the front faces of these
38 modules. Further details of these devices are provided in upcoming sections of these
39 specifications.
- 40 2. The compartment is built in shelves to support four (4) 12V DC Batteries, compartment
41 has a hinged door that permits access to the batteries, wiring within the compartment
42 and visual inspection. Compartment access door is hinged on the rear right-side wall of
43 the cabinet as viewed from the outside facing the main cabinet door.
- 44 3. Door hinge, pin, and bolts are made of stainless steel, The hinge pins and mounting are
45 tamperproof.
- 46 4. The compartment access door is provided with a door stop that holds the door open at
47 the 90° (±10°), 120° (±10°) and 135° (±10°) positions.
- 48 5. A three-point latch system is provided on the compartment access door. The latching
49 means is operable without the use of tools.

ADDENDUM NO. 2

- 1 6. The door handle will rotate from the locked position such that the handle does not
2 extend beyond the perimeter of the compartment door at any time. The operation of the
3 handle will not interfere with the key, or any other cabinet mechanism or projection.
- 4 7. Compartment access door is provided with a lock, Best-Lock “Green Construction Core”,
5 it operates with the compatible operation Best-Lock key. One (1) key is furnished with
6 this lock. The lock prevents the movement of latching mechanism when in the locked
7 position.
- 8 8. Compartment access door is provided with the ability to use padlock to externally lock
9 the latching mechanism. A lock with a 0.375 in. diameter shackle can be
10 accommodated.
- 11 9. The access door is provided with a shield tab welded to the wall of the cabinet just above
12 the upper side of the compartment door to prevent any accumulation of water.
13

14 **9-29.13(1)B Cabinet Doors and Locks**

15 The following is for P sized cabinets with internal battery backup:

- 16 1. The cabinet has a hinged main door that permits access to all equipment within the
17 cabinet and visual inspection of all indications and controls. Door is hinged on the right
18 side of the cabinet as viewed from the outside facing the cabinet door opening.
- 19 2. Door hinge, pin, and bolts are made of stainless steel, The hinge pins and mounting are
20 tamperproof.
- 21 3. The cabinet door is provided with a door stop that holds the door open at the 90° ($\pm 10^\circ$),
22 135° ($\pm 10^\circ$) and 165° ($\pm 10^\circ$) positions. The stop-and- catch arrangement can hold the
23 door open at 90° ($\pm 10^\circ$) with a load of 73.2 kilograms per square meter (15 pounds per
24 square foot) applied uniformly over the face of the door.
- 25 4. A three-point latch is provided on the main door of the cabinet. The latching means is
26 operable without the use of tools.
- 27 5. The main door handle will rotate from the locked position such that the handle does not
28 extend beyond the perimeter of the main door at any time. The operation of the handle will
29 not interfere with the key, the police door, or any other cabinet mechanism or projection.
- 30 6. Cabinet is provided with a main door lock, Best-Lock “Green Construction Core”, it
31 operates with a compatible operation Best- Lock key. One (1) key is furnished with each
32 cabinet lock. The lock prevents the movement of latching mechanism when in the locked
33 position.
- 34 7. Cabinet is provided with a padlock to externally lock the latching mechanism. A lock with
35 a 0.375 in. diameter shackle can be accommodated.
- 36 8. The main door opening of the cabinets is around 80% of the area on the side that the
37 door closes, exclusive of the area for plenums.
- 38 9. Gasketing is provided in all door openings and is dust tight. Gaskets are attached with a
39 permanent adhesive bond. The mating surface of the gasket is covered with a silicone
40 lubricant to prevent sticking to the mating surface.
- 41 10. A hinged police compartment door is provided on the outside face of the main cabinet
42 door. The door permits access to a switch panel but does not allow access to exposed
43 electrical terminals or other equipment within the cabinet.
- 44 11. The police compartment door is provided with a lock that can be operated by a standard
45 police key, Corbin Type Blank No. 04266 or equivalent. Two keys are furnished with
46 each cabinet.
- 47 12. The police panel compartment internal dimensions are 5.75 in. high, 12.875 in. wide,
48 and 2.625 in. deep.
49

ADDENDUM NO. 2

9-29.13(1)D Cabinet Ventilation

The following is for P sized cabinets with internal battery backup:

1. Cabinet is provided with two fuse protected fans rated at 2.832 cubic meters per minute (100 cubic feet per minute) minimum.
2. The fans can operate continuously for a minimum of 6,000 hours in a +50°C (+122°F) environment without the need for after-installation maintenance, excluding filter cleaning or replacement.
3. Cabinet is provided with two thermostats to individually control the operation of the fans. The thermostat turn-on point is manually adjustable between 32°F and 140°F, The Thermostat is an Omega KT011 Series or equal and meets the latest *Caltrans TEES 6.2.4.4*.
4. Thermostats are located on the inside of the top portion of the cabinet at the fan panel.
5. Cabinet is provided with replaceable polyester 2-Ply air filter with the following dimensions: width 16 in. height 12 in. thickness 1 in.

9-29.13(1)E Cabinet Shelving

The following is for P sized cabinets with internal battery backup:

1. The cabinet is provided with three shelves to support the CU and auxiliary equipment. The equipment and shelves are arranged so that it is possible to remove any piece of auxiliary equipment from the cabinet without removing any other piece of auxiliary equipment.
2. Shelves are fabricated from 5052-H32 0.125 in. thickness aluminum with double flanged edges rolled front to back and reinforced with a V channel welded. The shelves have perforations patterns to allow air flow through the devices into the cabinet.
3. Size Type P cabinet has continuous vertical mounting channels welded to interior side cabinet walls to provide shelf and panel adjustable locations at any spacing.

9-29.13(2) Wiring

The following is for P sized cabinets with internal battery backup:

All wiring conforms to NEMA TS2 Section 5.2.5 and table 5-1. No cable or wire is attached to any point where movement of shelves or doors may damage the cable or wire. Conductors conform to military specification MIL-W-16878D, Electrical insulated high heat wire, type B. Conductors #14 or larger are UL or THHN type. All wires terminated behind the main panel or on the back side of other panels are soldered. Properly calibrated crimping tools are used to apply terminal insulated lugs to conductors terminated on terminal strips. No pressure or solderless connectors are used. Printed circuit boards are used on the load-bay to connect the bus interface units (BIU).

The connecting cables are sleeved and protected in braided nylon mesh. The connecting cables are long enough to allow removal or moving to any point the equipment for inspection and testing without stretching or disconnecting any conductor.

Each electrical terminal within the facilities is uniquely identified by terminal reference and functional nomenclature and both are referenced by the cabinet wiring diagram. Terminal reference and functional nomenclature for terminals accessible from the front of a panel is permanent and legible and is visible from the front of the panel adjacent to the terminals.

Component nomenclature for all plug-in devices is legibly and permanently marked next to the receptacle for the device. Markings are visible with the device in place.

ADDENDUM NO. 2

9-29.13(3) Electrical Design

9-29.13(3)A Load Bay

The following is for P sized cabinets with internal battery backup:

The design of the load-bay panel conforms to NEMA TS2 Section 5. Terminals and Facilities. The panel is constructed from 5052-H32 brushed aluminum of 0.125 inches thickness and installed to minimize flexing when plug-in components are installed.

Panel is installed and provided with a mounting mechanism which allows easy access to all wiring on the rear of the panel without removing or adjusting any shelving or other panels. Lowering of the Load-bay panel can be performed without the use of hand tools. Complete removal can be possible with the use of simple hand tools.

The **Load-Bay Panel** is located on the lower rear wall just below the bottom shelf, the **Power Supply Interface Panel** is located on the left wall just below the bottom shelf, the **Detector Racks** are placed on the middle shelf, the **Detector Panel** is located on the lower left wall, the **Custom Power Panel** is located just above the detector panel, the **Service Power Panel** is located on the lower right wall just below the **Custom Miscellaneous Panel**, the **Load resistor panel** is mounted on the right wall under the bottom shelf, the power supply, controller unit and monitor unit (not provided) shall be placed on the bottom shelf. the **Neutral Busbars Panel** is located on the lower right wall just below the power panel, the **SDLC Hub Assembly** is located on the rear wall below the middle shelf, the **Automatic Transfer Switch & Generator Inlet panel** is located on the compartment at the main door just below the **Police Panel Compartment**, the **Auxiliary Technician panel** is located on the main door mounted in the rear of the police panel compartment, the **Fans** and **Cabinet LED Light** are located on the top of the cabinet, a second **Cabinet LED Light** is located under the **Drawer** at the bottom shelf, the two eight positions **AC Outlets** are located on the upper left and right sides, and the **Custom Din Rail** is located on the upper rear wall, additionally the **UPS/BBS Equipment Compartment** is located on the right side of the cabinet which further details are provided in upcoming sections of these specifications.

The Load-Bay panel is provided with termination points for the Controller Unit (CU) CA cable, Monitor Unit (MMU) MA & MB cables, bus interface units 1 & 2 (BIU) and field terminal facilities.

The load-bay panel is available in the following configuration:

Sixteen (16) load switch sockets, Eight (8) flash transfer relay sockets, One (1) flasher socket, Two (2) BIU sockets. The Load-bay panel is wired for 16 channels. Load switches 1-8 are vehicle phases 1-8; load switches 9-12 are pedestrian phases 2, 4, 6 & 8; load switches 13-16 are overlaps A, B, C & D. All load switches are routed through a flash transfer relay.

Flashing Operation:

Load-Bay is wired to flash all the vehicle channels. Flashing operation alternates between the vehicle phases 1, 2, 5, 6, pedestrian phases 2, 4, OLA & OLB and vehicle phases 3, 4, 7, 8, pedestrian phases 6, 8, OLC & OLD. Flash programming can be either red, yellow or no flash simply by changing wires on the front of the load-bay. Initial configuration is for all the vehicle and overlap phases **red flash** and for pedestrian phases **no flash**.

9-29.13(3)B Side Panels

The following is for P sized cabinets with internal battery backup:

ADDENDUM NO. 2

1 Cabinet is provided with a load resistor panel with thirty-two (32) 2.5K-ohm, 10-watt panel
2 mount resistors. One common side tied to the neutral busbar. The other side terminated to
3 modular din rail mounted terminal blocks for feasible connections.
4

5 Cabinet is provided with a neutral (AC-) busbar panel to provide extra neutral connections
6 capability; it is constructed of solid aluminum bar and is located per section 2.2 (Cabinet layout).
7

8 **9-29.13(3)B1 Power Supply Interface Panel**

9 The following is for P sized cabinets with internal battery backup:

10 The power supply interface panel includes terminations for all the cabinet's power supply inputs
11 and outputs. It has a protective plastic cover. This panel is mounted on the left wall of the
12 cabinet.
13

14 POWER SUPPLY TS2 - EDI PS250: The power supply shall be a shelf-mounted, enclosed, 24
15 VDC supply. Power supply must meet the requirements of NEMA Standards Publication TS 2-
16 2021, Section 5.3.5.
17

18 **9-29.13(3)B2 SDLC Interface Panel**

19 The following is for P sized cabinets with internal battery backup:

20 An SDLC Hub Assembly including ten (10) D-Subminiature Female 15 pin (DB15) connectors
21 that are connected in parallel. The SDLC Hub Assembly is built in PCB. Two connectors are
22 provided with latching blocks, and eight connectors are provided with jackscrews 4-40 to secure
23 SDLC cables.
24

25 Six (6) SDLC cables are provided for the cabinet's operation and one additional spare SDLC
26 cable is provided for an additional device.
27

28 **9-29.13(3)B5 Power Panel**

29 The following is for P sized cabinets with internal battery backup:

30 The power panel is wired to provide all the power distribution and protection for the cabinet. The
31 power panel is equipped with a removable plastic front cover for protection. The design allows
32 the personnel to access the main and auxiliary breakers without removing the protective front
33 cover. The following major components are included within the power panel:
34

- 35 1. One (1) 30-amp main breaker supplying power to the main surge protector device
36 and turns on/off all power to the cabinet.
- 37 2. Two (2) 15-amp Auxiliary breakers for supply power to the fan, light
38 and ac power outlets.
- 39 3. One (1) Surge protection device CITEL DS72US-120S/G One (1)
40 Line Filer, EMI, CITEL DUC 31
- 41 4. One (1) Normally Open Relay Struthers-Dunn 418AXXL-120VAC
42 One (1) NEMA type 5-15R GFCI AC duplex outlet
- 43 5. One (1) Heavy duty 3 Positions Power Block MARATHON model
44 #1423307 for the cabinet power line in.
- 45 6. One (1) Equipment ground aluminum solid busbar Two (2) Neutral
46 aluminum solid busbars
- 47 7. One (1) Field copper lug 8.0-2.0AWG
48

49 **9-29.13(3)B10 Custom Panel**

50 The following is for P sized cabinets with internal battery backup:

ADDENDUM NO. 2

1 Cabinet is provided with two customized panels; one panel is intended to provide additional AC
2 power distribution and contains a controlled AC+ power signal termination which turns off during
3 flashing operation, panel is provided with one 10 positions terminal block, one convenient 35mm
4 din rail with an approximate length of 10.75 inches, two solid aluminum equipment ground and
5 neutral busbars. The second customized panel is provided with two 12 positions terminal blocks
6 for customer convenience. Terminal blocks of both panels are phenolic body with #8-32 phil-slot
7 screws; rated to 300VAC/DC @ 30A.

9-29.13(3)D Cabinet Illumination

8
9
10 The following is for P sized cabinets with internal battery backup:

11 Cabinet is provided with a lighting system which includes one (1) 24V DC Power supply driver
12 Mean Well model LPV-60-24 mounted on the Fan Panel and two (2) JKL 24V DC LED light
13 fixtures, one mounted on the fan panel and the second one mounted under the drawer's bottom
14 to provide maximum illumination to the cabinet.

9-29.13(3)E Generator Bypass Compartment and Cable

15
16
17 The following is for P sized cabinets with internal battery backup:

18 **Manual Transfer Switch and Generator Inlet Panel:**

19 The cabinet is provided with a heavy-duty manual transfer switch. The manual transfer switch
20 (MTS) provides a means of switching between normal utility power block and auxiliary backup
21 generator power. The MTS does not allow simultaneous active power from more than one
22 source and does not allow generator backflow into normal utility AC circuits. The generator
23 connection is included and consists of a three-prong, 30-amp L5-30P twist-lock connector with
24 recessed male contacts for generator hookup.

25
26
27 One utility indicator lamp is provided, and it turns on when the MTS is in the "Generator Power"
28 position, and the normal utility power service is available. It turns off when the MTS is in the
29 "Utility Power" position. One generator power indicator lamp is provided and turns on when the
30 Generator Power is available.

31
32 The MTS and Generator Inlet panel is easily accessible in a compartment behind the
33 weatherproof lockable exterior access door equipped with a tamper-resistant hinge. This access
34 door is provided with a lock Best-Lock "Green Construction Core". One (1) compatible key is
35 furnished with this lock. The access door and generator's cable entrance include a means to
36 prevent access to insects when cable is not present. The compartment is recessed and is deep
37 enough to allow closing and locking off the access door when the generator cable is connected.

9-29.13(3)F Police Panel

38
39 The following is for P sized cabinets with internal battery backup:

40 The police panel is accessible in the compartment behind the police access door. The wiring for
41 these switches will be accessible when the auxiliary technician panel is open, and the following
42 switches are included:

- 43
44 1. **Auto/Flash Switch:** When the switch is in the AUTO position with controller power on,
45 the signal heads shall be in normal operation. When the auto-flash switch is in the
46 FLASH position with controller power on, the signal heads immediately transfer to the
47 flashing mode, AC power is removed from the load switches and stop timing applied to
48 the controller unit. When the switch is returned to the AUTO position the controller
49 restarts and cycles to normal signal operation.

ADDENDUM NO. 2

- 1 2. **Manual Control Enable Auto/Manual Switch:** When the manual on- off switch is in the
2 ON position, a logic ground is applied to the manual control enable input of the controller
3 unit.
- 4 3. **Interval Advance Control:** It consists of a Manual Control Enable ON/OFF Switch, and
5 a removable Momentary Interval Advance Control Switch with a 6-ft coiled cord, and a ¼”
6 phone plug. The switch ¼” phone plug is connected to a matching panel mounted ¼”
7 phone jack which is wired to the interval advance terminal, and it is clearly shown on the
8 cabinet wiring diagram.
- 9 4. **Momentary Interval Advance Control Switch:** A manual control cord has the minimum
10 length of six feet when extended with a ¼” diameter three circuit plug connected to one
11 end and a hand-held manual pushbutton switch at the other end. When the manual hand
12 cord is plugged into the jack and the push button is pressed, logic ground is connected
13 to the interval advance input of the controller unit. Except for the vehicular yellow and all
14 red clearance intervals, a complete cycle (push-release) of the manual pushbutton
15 terminates the controller unit interval that is active. Cycling the push-button during the
16 vehicular yellow or all red clearance intervals does not terminate the timing of those
17 intervals.

19 **9-29.13(3)G Auxiliary Switch Panel**

20 The following is for P sized cabinets with internal battery backup:

21 The cabinet includes an auxiliary/technician switch panel mounted to the interior side of the
22 police panel compartment on the main cabinet door. The panel is secured to the police panel
23 compartment by (2) screws and is hinged at the bottom to allow access to the soldered side of
24 the switches with the use of only a Phillips screwdriver. All the switches are protected for
25 inadvertent contact by a hinged see-through acrylic cover. The following switches are included:

- 26 1. **Controller On/Off Switch:** A two positions toggle switch is provided. In the “OFF”
27 position, AC power is removed from the controller. In the “ON” position, AC power is
28 applied to the controller.
- 29 2. **Signals On/Off Switch:** A two positions toggle switch is provided. In the “OFF” position,
30 AC power is removed from all signal heads. This switch is connected to the control input
31 of the main signal contactor, and the main signal head power bus is routed through the
32 main signal contactor output contacts.
- 33 3. **Stop Time Normal/Off/On Switch:** A three positions toggle switch is provided. In the
34 “Normal” position, the stop timing command is applied to the controller by the police flash
35 switch or the MMU. In the “Off” position, the stop timing commands shall be removed
36 from the controller. In the “On” position logic ground is applied to the BIU stop-time
37 inputs and shall cause the controller to stop time. A red LED indicator is provided and
38 illuminates when stop time is applied.
- 39 4. **System/Free Switch:** A two positions toggle switch is provided. In the “SYSTEM”
40 position the controller will operate normally as system coordination control. In the
41 “FREE” Position the local controller will be released to operate in an isolated, fully-
42 actuated manner.
- 43 5. **Auto/Flash Switch:** A two positions toggle is provided. This switch places the field
44 signal heads in flashing operation while the controller continues to operate. This flash
45 shall have no effect on the operation of the controller or MMU. In the “AUTO” position the
46 controller cabinet will operate as normal. In the FLASH positions the cabinet will go into
47 flash mode and the controller shall continue to run.
- 48 6. **Cabinet Lights On/Off switch:** A two positions toggle switch is provided. It turns off and
49 on the cabinet lights.

ADDENDUM NO. 2

- 1 7. **Pedestrian On/Off/Test Switches:** Four mini toggle three positions switches are
2 provided to cover the even pedestrian phases (2P, 4P, 6P & 8P) of the controller unit. In
3 the "ON" position, switches provide constant calls. In "OFF" position, controller cabinet
4 performs as normal operation (ped calls are received from field push buttons). In the
5 "TEST" position, switches provide momentary test calls.
- 6 8. **Preemption Normal/Test Switches:** Six mini toggle two positions switches are provided
7 to cover six emergency vehicle preemption channels. In the "NORMAL" position,
8 switches have no effect and PE calls are received from preemption modules. In the
9 "TEST" position, switches provide momentary test calls.

10 **9-29.13(4) Auxiliary Equipment**

11 **9-29.13(4)A Traffic Signal Controller**

12 Traffic Signal Controller shall be an Econolite Cobalt Shelfmount Controller with an Advanced
13 Transportation Controller (ATC) Communications Module and thin film transistor liquid crystal
14 display (TFT LCD) screen. The CPU operating system shall be Linux-based. The Contractor
15 shall contact the City of Tacoma Traffic Signal Shop at 253-255-2443 to obtain the current
16 firmware version to be utilized.

17 Econolite Cobalt traffic signal controllers operating a Pedestrian Hybrid Beacon (PHB Signal),
18 must be configured by the manufacturer for operation of a pedestrian hybrid beacon. The
19 contractor/vendor shall configure and test the operation of the controller and malfunction
20 management unit prior to delivery to the City of Tacoma Signal Shop.

21 **9-29.13(4)B Malfunction Management Unit (MMU)**

22 The cabinet shall come with a Malfunction Management Unit (MMU). The cabinet shall come
23 with a (MMU) that meets all the requirements of NEMA TS2-2003 while remaining downward
24 compatible with NEMA TS1. It shall have (2) high contrast LCD displays and an internal
25 diagnostic wizard. It shall come with a 10/100 Ethernet port. It shall come with software to run
26 flashing yellow arrow operation. The MMU shall be an Eberle Design, Inc. (EDI) model MMU2-
27 16LEip. Contractor shall provide a compatible TS2 program card onboard memory.

28 MMUs monitoring a Pedestrian Hybrid Beacon (PHB Signal), must be configured by the
29 manufacturer specifically for the monitoring and operation of a pedestrian hybrid beacon. The
30 contractor/vendor shall configure and test the operation of the controller and malfunction
31 management unit prior to delivery to the City of Tacoma Signal Shop.

32 **9-29.13(4)C1 Load Switches**

33 The following is for P sized cabinets with internal battery backup:

34 LOAD SWITCH, PDC SSS-87 I/O, DUAL INDICATIONS: The solid-state load switches shall be a
35 three-circuit type meeting the requirements of NEMA Standards Publication TS 2-2021, Section
36 6.2.

37 **9-29.13(4)D1 Flasher**

38 The following is for P sized cabinets with internal battery backup:

39 FLASHER, 204, PDC, SSF-88 DISCRETE, CALTRANS: The discrete, two-circuit flasher unit, rated
40 at 15A per circuit. The flasher unit shall contain no electro-mechanical devices and must meet the
41 electrical and physical characteristics of NEMA Standards Publication TS 2-2021, Section 6.3.

42 **9-29.13(4)E1 Flash Transfer Relay**

43 The following is for P sized cabinets with internal battery backup:

ADDENDUM NO. 2

1 FLASH TRANSFER RELAY, STRUTHERS-DUNN #21ACPX-2/21XBP: The flash transfer
2 relays shall part of the back panel. They will be Struthers-Dunn, Part No. 21ACPX-2/21XBP,
3 plug-in type relay.
4

5 **9-29.13(4)F Loop Detector Card Rack**

6 The following is for P sized cabinets with internal battery backup:

7 The detector racks design and configuration conform to TS-2 Table 5-9. The detector racks
8 support (16) channels of loop detection, (1) Bus Interface Unit (BIU) and (4) channel of
9 preemption provided in the first detector rack only. The detector rack can use eight 2-channel or
10 four 4-channel detection cards and two 2-channel or one 4-channel preemption cards. The loop
11 wiring is connected via a 37-pin DB connector using spring clips, The power wiring is connected
12 via 6-pin power connector. The preemption wiring is connected via an 24-pos connector and
13 secured with safety latches. The addressing of detector rack is accomplished via dip switches
14 mounted to the PCB. The detector rack has space at the bottom front for labeling. The eight
15 slots used for detector cards are labeled with the channel numbers as shown in TS-2 Table 5-10
16 (CH1 to CH16). The ninth and tenth slots used for preemptions cards are labeled as follows:
17 ninth slot is labeled "PE CH.C, PE CH.D" and the tenth slot is labeled "PE CH.A, PE CH.B, PE
18 CH.C, PE CH.D". The requirements for preemption cards spacing and card guides are the same
19 as for detector cards per TS-2 Section 5.3.4.2.
20

21 BUS INTERFACE UNIT, EDI BIU-700 or approved equal: The Bus Interface Units (BIU) shall be
22 24V DC, rack mounted meeting the requirements of NEMA Standards Publication TS 2- 2021,
23 Section 8.
24

25 **9-29.13(4)H Ethernet Switch**

26
27 Ethernet switch shall be EtherWAN ED3575-622 Hardened Managed Switch with 2 VDSL2
28 Ethernet Extender ports. 6 10/100TX, + Gigabit SFP Combo + 2 Copper Pair VDSL2 Ports.
29 (Etherwan P/N ED3575-622). A 30 watt, 24VDC output power supply unit shall be provided by
30 the same manufacturer as the switch. A DSL-Octal Cable 2xRJ45, and a minimum 6' Ethernet
31 patch cable shall be provided with each. Two (2) SFP Optics 100Base-FX SM, 1310NM, 15KM,
32 LC fiber optic units shall be provided with each switch.
33

34 **9-29.13(4)I Uninterruptable Power System (UPS)**

35 The following is for P sized cabinets with internal battery backup:

36 The Battery Backup System (BBS) cabinet includes uninterruptable power system (UPS). The
37 UPS includes associated battery terminal cables to link the batteries to the UPS and the
38 batteries. All other ancillary equipment for a complete functioning UPS system shall be
39 included.
40

41 The key UPS system components are identified in the subsections below.
42

43 **9-29.13(4)I1 UPS Module**

44 The following is for P sized cabinets with internal battery backup:

45 UPS SYSTEM, MARATHON TRTC-1124-N1 1100 VA BBS or approved equal: The UPS unit
46 shall be NEMA TS 2 certified, it features fully programmable AC threshold voltage, remote
47 access via RS-232, USB & Network, it offers high output power factor and performs with 24V
48 DC with two or four batteries arrangement for longer run times. It is provided with external
49 connections accessible from front panel and is built in backlit 4-line LCD Display and LED
50 indicators.

ADDENDUM NO. 2

1
2 CARD, MARATHON, SNMP-CY54-04, SNMP/WEB or approved equal: A NETAgent 9 SNMP
3 card compatible with Marathon Power Traffic & Ruggedized UPS Series shall be provided, it
4 supports advanced encryption: HTTPS, SSL, SSH, SNMPv3, It features real-time UPS
5 monitoring, record events and data log among other features.
6

7 **9-29.13(4)I2 UATS/UGTS Assembly**

8 The following is for P sized cabinets with internal battery backup:

9 POWER TRANSFER SWITCH, MARATHON TSRC-2003-01 or approved equal: The power
10 transfer switch shall be low profile, space saving design, it shall operate in extreme
11 environments from -40°C to + 74 °C (-40°F to + 165°F). Enclosures with a coordinated visual
12 and technical design to match UPS unit TRTC-1124-N1, it contains a high-quality cam switch
13 with leading and overlapping contacts.
14

15 MOUNTING BRACKETS, MARATHON TRTB-002U-0B FOR TRTC-1124, PAIR or approved
16 equal: Mounting Brackets shall be provided and attached to the UPS unit for the proper
17 installation.
18

19 **9-29.13(4)I3 UPS Batteries**

20 The following is for P sized cabinets with internal battery backup:

21 The cabinet shall come with four (4) valve-regulated Absorbed Glass Mat Technology MK
22 Powered batteries with 91 Ah runtime. The BBS batteries shall be MK Battery model 8A24HEI
23 or equivalent.
24

25 **9-29.13(4)I4 UPS Battery Harness**

26 The following is for P sized cabinets with internal battery backup:

27 BATTERY HARNESS KIT, MARATHON TBHK-2009-24, 24V, W/Y-ADAPTER or approved
28 equal: Battery harness kit will provide the interconnections of four 12V DC batteries arrangement
29 to provide 24V DC to the UPS unit, this arrangement is intended for longer run times.
30

31 **9-29.13(4)J Preemption/Priority Equipment**

32
33 The cabinet shall come with (1) 4-channel rack mounted Opticom™ phase selector. This device
34 shall be capable of receiving encoded signals from Opticom series 700 emitters and detectors.
35 The Opticom™ phase selectors shall be Global Traffic Technologies model 764 or equivalent.
36

37 **9-29.13(4)K BUS Interface Unit (BIU)**

38 The cabinet shall come with four (4) BIU's. They shall meet all requirements of NEMA TS2-
39 1998 standards. In addition, all BIU's shall provide separate front panel indicator LED's for DC
40 power status and SDLC Port 1 transmit and receive status. Each BIU's shall utilize only 1 rack
41 position.
42

43 The (BIU)'s shall be Eberle Design, Inc. model BIU-700H, Econolite model BIU-64, Reno A&E
44 model BIU/2, or Engineer approved equal.
45

46 **9-29.13(4)L Door Actuated Switches**

47 The following is for P sized cabinets with internal battery backup:

48 The cabinet is provided with four door-actuated normally closed push-button switches; they
49 are located at the Main Door Opening and Police Door Opening corner brackets respectively,
50 and their functions are as follows:

ADDENDUM NO. 2

- 1 1. This switch turns on the cabinet lights when the door is open and turns off the lights when
2 the door is closed.
- 3 2. **Door Alarm (DS2):** This switch applies logic ground to the Input BIU2-23B (ALARM 1)
4 when the door is open and removes logic ground when the door is closed.
- 5 3. **Manual Control Disable (DS3):** This switch removes the logic ground to the Manual
6 Control Enable Switch for safety purposes when the door is closed.
- 7 4. **Door Alarm (DS4):** This switch applies logic ground to the Input BIU2-24A (ALARM 2)
8 when the door is open and removes logic ground when the door is closed.

9-29.13(4)M Unused Red Jumpers

10 The following is for P sized cabinets with internal battery backup:

11 Cabinet is provided with sixteen (16) "Red jumpers" for unused phases.

12 9-29.13(4)N Standard Cables

13 The following is for P sized cabinets with internal battery backup:

14 Cabinet is provided with the following cables for its operation:

- 15 1. One (1) Controller Power TS 2 type 1
- 16 2. One (1) Controller Power TS 2 Type 2
- 17 3. One (1) Power Supply

18 9-29.13(5) Manufacturer Testing and Certification

19 The complete cabinet assembly with electronics shall undergo complete input/output function
20 testing by the manufacturer before being released to the City of Tacoma.. Testing shall be done
21 via service feed to the 120VAC field terminal. Service power shall be routed through the
22 generator bypass switch, UPS inverter before being connected to the power panel so that all
23 service load circuits are tested.

24 If the cabinet specified comes with a UPS system (BBS) and batteries; the entire controller
25 cabinet assembly shall undergo a BBS field test procedure where the cabinet is run off battery
26 power for a minimum of one hour.

27 9-29.16 Vehicular Signal Heads, Displays, and Housing

28 9-29.16(1) Optically Programmed, Adjustable Face, and Programmable Array 12-Inch 29 Traffic Signal

30 *The second paragraph is supplemented with the following:*

31 Programmable traffic signals are utilized when two intersections are in close proximity. The
32 programmable traffic signal should have the standard features:

- 33 1) Individual modular sections
- 34 2) Reinforcing ribs on top and bottom of housings
- 35 3) Stainless steel door roll pins and eye bolt/wing nut assemblies
- 36 4) Moisture proof and dust tight neoprene gasket fitted to the gasket channel cast in the
37 door perimeter
- 38 5) 5-position, barrier-type terminal block with quick-disconnect terminals on one side of
39 each position and screw clamp terminals on opposite side of each position
- 40 6) 3-prong, PAR-46 lamp secured by a wire ring and a spring load clip
- 41 7) Acrylic lenses colored to ITE specifications
- 42 8) Masking kit

ADDENDUM NO. 2

1 **9-29.16(2)B Signal Housing**

2 *The second paragraph is supplemented with the following:*

3
4 The door shall open a minimum of 160 degrees.

5
6 *The third paragraph is supplemented with the following:*

7
8 The sections shall be held firmly together by corrosion-resistant hardware in such a manner that
9 additional sections may be added easily.

10
11 *The fourth paragraph is supplemented with the following:*

12
13 The terminal strip for a standard three-section head shall be a minimum five-position, ten-
14 terminal, barrier-type strip with No. 8 screw-type fasteners. To one side of each terminal shall
15 be attached the white, red, yellow and green signal section leads, leaving the opposite terminal
16 for field wires. Multi-section heads shall be provided with a terminal strip located in the yellow
17 (center) section. Lead shall be No. 18 AWG type with 1/32-inch wall, 105-1/4 centigrade
18 thermoplastic insulation.

19 20 **9-29.16(3) Polycarbonate Traffic Signal Heads**

21 *This section is deleted.*

22 23 **9-29.17 Signal Head Mounting Brackets and Fittings**

24 *This section is revised to read:*

25
26 Vehicle and pedestrian signal heads shall be as detailed in the standard plans.

27
28 Span wire vehicle signal hanger hardware shall consist of span wire clamp, wire entrance fitting
29 and vehicle head locking device.

30 31 A. Construction

- 32 1. Bronze hangers are required.
- 33 2. The minimum size of pins shall be 5/8-inch diameter. Pins shall be stainless steel.
- 34 3. The minimum size of the 'J' or 'U' cable clamps is 1/2-inch diameter. Cable clamp
35 bolts shall be stainless steel. Clamping insert shall be used.
- 36 4. The cable saddle shall be at least 9 inches long.
- 37 5. All cotter pins shall be brass and washers shall be stainless steel.
- 38 6. All hardware shall be of stainless steel, bronze or brass materials.
- 39 7. Signal stem shall be locked with a square headed set screw 1/4-inch minimum in
40 diameter.
- 41 8. Wire entrance shall be a minimum of 1-1/4-inch diameter and shall have a female
42 threaded base for nipple.
- 43 9. The balance adjuster shall not be used.
- 44 10. All stems shall be secured to signal head with proper lock fitting.

45
46 Vehicle signal heads attached to a mast arm shall use a type M mounting bracket as detailed in
47 the standard plans and in accordance with Section 8-20.3(14)B and Section 9-29.17.

48 49 **9-29.18 Vehicle Detector**

50 *This section is supplemented with the following:*

ADDENDUM NO. 2

1 Unless otherwise specified in the contract plans, the vehicle detection system provided shall
2 include the video and record count data for vehicles, pedestrians, bicycles, and provide
3 classification information.

5 **9-29.18(3) Detection System**

6 The detection system provided shall have all necessary components/appurtenances required to
7 install/mount, test, operate and maintain a fully functional detection system including but not
8 limited to the following requirements and components:

10 **In Cabinet Device**

11 Communications Interface

- 12 A. Must support 4G LTE cellular connectivity with MiMo and diversity (Bands
13 B2/B4/B5/B12/B13/B14/B66/B71), UMTS/HSPA+ and GSM/GPRS/EDGE with peak
14 downlink of 150Mbps and peak uplink of 50Mbps
- 15 B. Must support 802.11 a/b/g/n with MiMo and Diversity antennas with security of at least
16 64/128 bits WEP, WPA, WPA2
- 17 C. Must support GPS and GLONASS
- 18 D. Must support communication of Telemetry Data, Video Data, Alert Data, and Vehicle
19 Identification Data to the server via the Communication Service
- 20 E. Must support direct communication between the server and the devices connected to
21 Controller Interface Hardware

23 Antenna

- 24 A. Must provide an externally mounted antenna for supporting functionality of
25 Communications Interface
- 26 B. Must contain the following fully-enclosed antenna elements and quantities in a single
27 enclosure:
 - 28 • LTE MIMO (quantity: 2)
 - 29 • 2.4GHz/5GHz WIFI MIMO (quantity: 2)
 - 30 • GPS/GLONASS/BEIDOU (quantity: 1)
- 31 C. Must have labeled antenna terminations for easy installation
- 32 D. Must not exceed 35mm in height
- 33 E. Must be colored Pantone 427 U for blend with traffic cabinet construction
- 34 F. Must be IP67 rated and mounted on the cabinet with a water-tight seal made of a closed
35 cell rubber type foam and medium-firm acrylic adhesive with bonding features including
36 a high initial adhesion and excellent high/low temperature holding power with excellent
37 peel strength

39 Peripheral Interface

- 40 A. Must support 1 x USB 2.0 device ports
- 41 B. Must support 1 x 10/100/1000 Ethernet WAN port
- 42 C. Must support 2 x 10/100/1000 Ethernet LAN ports
- 43 D. Must support 3 x 10/100/1000 Ethernet LAN ports with PoE (support for 802.3af PoE
44 and 802.3at PoE+ to a maximum of 50W across all three ports)
- 45 E. Must support configuration as an integrated layer 2 ethernet switch to support cabinet
46 device interconnectivity
- 47 F. All ethernet ports must feature in-line, auto-resetting surge protection compliant to IEC
48 61000-4-5 Class 4
- 49 G. Processor must utilize dual NVIDIA GPU's

ADDENDUM NO. 2

- 1 H. Must support temperature-rated storage comprising of a solid state drive of at least
2 240GB:
 - 3 • Must be SATA III compliant
 - 4 • Must provide support for SMART command set
 - 5 • Must meet minimum shock resistance of 1500 G/0.5ms
 - 6 • Must meet minimum vibration resistance 5~800 Hz at 5G peak
- 7 I. Must provide light-emitting diode (LED) indicators for heartbeat, server connectivity,
8 ethernet link/activity, power, cellular link/activity and device state
- 9 J. Must support 2 x EIA RS-232 over RJ45 interface (cable included)
- 10 K. Must provide 4 x General Purpose I/Os pins (200mA sinking each), digital input, 0~30V
- 11 L. Must provide galvanic isolation between earth ground and logic ground
- 12 M. Must support one SDLC port that meets the following criteria:
 - 13 • Must provide all necessary cabling to connect to a cabinet's existing Port 1/SDLC
14 bus
 - 15 • Must support reading terminal and facility input & outputs at a frequency of at least
16 10 times per second
 - 17 • Must support reading channel state at a frequency of at least 10 times per second
 - 18 • Must support acquisition of MMU fault status including conflict, red failure and
19 clearance failure
 - 20 • Must support reading information from all detectors wired into the cabinet supporting
21 up to 100 ms resolution between detection events
 - 22 • Must detect failure of a detector in either always high, or always low, mode
 - 23 • Must support capturing and reporting Controller Faults based on MMU status bits of
24 'in conflict', 'red failure', 'diagnostic failure', 'in failure state', and 'local flash'
- 25 N. Must provide data buffering of all Telemetry Data (controller state, detector actuations,
26 pre-emption events) and Alert Data during periods of loss of cellular connection for at
27 least 12 minutes
- 28 O. Must provide data buffering of all Telemetry Data and Alert Data during periods of loss of
29 power for at least 5 seconds
- 30 P. All of the above listed Peripheral Interface must be contained within one device with one
31 power supply
- 32 Q. Must support being powered through NEMA 15-5 receptacle OR direct wire to cabinet
- 33 R. Must offer super capacitor-based power reserve sufficient to continue robust operation
34 during brownouts/intermittent power loss for 5 seconds. System must be able to safely
35 shut down in the event of power loss
- 36 S. Must not exceed 10.5" (height), 3" (width), 10" (depth)
- 37 T. Must support vertical and horizontal orientation for installation
- 38 U. Must be configurable via web interface: No dedicated software required to load onto PC
39 for programming interface unit

40

41 Controller Interface (NTCIP)

- 42 A. Must communicate with an NTCIP compliant controller over ethernet providing auto-
43 negotiation to 10/100 Mbps, half or full duplex
- 44 B. Must provide an ethernet cable for interfacing with NEMA TS2 type A1N, A2N, P1N, or
45 P2N controllers
- 46 C. Must communicate to the controller over TCP/IP
- 47 D. Must support communication over SNMP v1, v2c, and v3 protocols
- 48 E. Must support communication over STMP NTCIP protocols reading all objects defined in
49 NTCIP 1201 and 1202 supported by the controller

50

ADDENDUM NO. 2

- 1 In-Cabinet Computation and Actuation
- 2 A. In-cabinet device must support the addition of an optional module for detection and
- 3 counting computation
- 4 B. Computation Module must not increase external physical footprint of cabinet device
- 5 C. Computation Module must derive power from existing in-cabinet device
- 6 D. Must support up to two Intersection Cameras for coverage of larger or irregular
- 7 intersections
- 8 E. Must support up to four Advance Detection cameras in addition to two At-Intersection
- 9 Cameras with the use of vendor recommended POE Switch
- 10 F. Must have an integrated TFT color display which provides diagnostic information such
- 11 as the status of all phases and detectors, as well as diagnostics on the camera IP and
- 12 operational status
- 13 G. Must display status of detection channel on a front panel display
- 14 H. Must display Transmit/Receive status of SDLC bus
- 15 I. Must include onboard processing capabilities to perform video-based vehicle detection
- 16 and generation of traffic analytics
- 17 J. Must integrate with Opticom Cloud Pre-emption without the need for additional hardware
- 18 K. Module must be able to use Interface's existing SDLC port for actuation. Must provide
- 19 the capability to act as one or more SDLC detector racks. Must support generating
- 20 actuations on up to 64 channels over SDLC
- 21 L. Typical system power consumption of the full system should be less than 130W
- 22 M. In cabinet hardware supplied must be able to run Miovision Surtrac adaptive signal
- 23 control
- 24
- 25 Certification Testing
- 26 A. Must be fully NEMA tested and compliant, including shock, vibration, voltage, and
- 27 thermal articles 2.2.7-2.2.11
- 28 B. Must support NEMA operating temperature specification -34 °C to 74 °C (-29 °F to 165
- 29 °F)
- 30 C. Must support NEMA storage temperature specification -34 °C to 74 °C (-29 °F to 165 °F)
- 31 D. Must support humidity operating requirements of 5% - 95% RH non-condensing
- 32 E. External power supplies must be UL and c-UL compliant
- 33 F. Must be FCC tested and compliant
- 34 G. Must be ROHS compliant
- 35
- 36 Intersection 360 Camera
- 37 A. Must provide 360 degrees of visibility from the point of installation
- 38 B. Must be powered via Power over Ethernet (PoE) and be IEEE802.3af compliant
- 39 C. Must NOT require any fiber optic connections from the processor to the camera
- 40 D. Must support configuration in both spherical "fisheye" configuration, and rectangular
- 41 "quad view"
- 42 E. Must support at least 9 megapixel (MP) capture
- 43 F. Must support ability to capture 4K video
- 44 G. Must provide H.264 and MJPEG image compression
- 45 H. Must support H.265
- 46 I. Must support RTSP streaming
- 47 J. Must support third-party integration of RTSP video streams into Video Management
- 48 System (VMS) platforms
- 49 K. Must support maximum aperture ratio of 1:1.9
- 50 L. Must support focal length of 1.38mm

ADDENDUM NO. 2

- 1 M. Must include a clear polycarbonate resin-based dome
- 2 N. Must be rated to IP66 (NEMA 4X compliant)
- 3 O. Must include an electronic de-humidification device for use in various weather conditions
- 4 P. Must support the ability for users to zoom in and out, rotate and pan the video feed
- 5 Q. Must allow direct connection of Cat 5e cable from camera to traffic cabinet to limit
- 6 number of connections
- 7 R. Must include lens defrost functionality with total camera power operation not exceeding
- 8 standard PoE
- 9 S. Must utilize a NEMA temperature rated shielded PoE cable with drain wire
- 10 T. Must support in-line ethernet repeaters for long distance cable runs

11 12 Mount

- 13 A. Must include all mounting hardware with device for vertical and horizontal mounting
- 14 B. Mounting fixture must be constructed of weatherproof painted aluminum or stainless
- 15 steel
- 16 C. Mounting hardware must support 6ft' vertical pole installation, horizontal pole installation,
- 17 or attachment via a 1.5" threaded fitting
- 18 D. Mounting fixture (including camera, 40ft cable) must not exceed 540mm x 460mm x
- 19 205mm in size, and 6kg in weight (not including 6 ft extension)

21 **Detection Plus License (Perpetual)**

- 22 A. Shall include detection plus license
- 23 B. Must support collection of a rolling 365 day buffer of Occupancy Ratios
- 24 C. Must support collection of a rolling 365 day buffer of Arrivals on Red, and Arrivals on
- 25 Green
- 26 D. Must support collection of a rolling 365 day buffer of Phase Interval
- 27 E. Must support collection of a rolling 365 day buffer of Turning Movement Counts
 - 28 • Turning Movement Count accuracy must be a minimum of 90% during normal
 - 29 weather and operating conditions for correct camera set ups
 - 30 • System must be able to generate bi-directional pedestrian counts for each crosswalk,
 - 31 including for groups of pedestrians
 - 32 • Pedestrian counting accuracy must be a minimum of 85%, including for large groups
 - 33 of pedestrians, during normal weather and operating conditions for correctly camera
 - 34 setups
 - 35 • System must be able to count bicycles both on the road and on the crosswalk. These
 - 36 counts should be able to be measured separately
 - 37 • Bicycle counting accuracy must be a minimum of 80% during normal weather and
 - 38 operating conditions for correctly set up cameras
 - 39 • Count data must be available via a real time local device API
 - 40 • Count data must be available via a local CSV download

42 **Upgradability (General)**

- 43 A. Must support the ability for in-field devices to receive over-the-air (OTA) upgrades for
- 44 continued improvement of system capabilities and/or security improvements
- 45 B. Must support the ability to remotely add/upgrade the cellular communications plan for
- 46 each system in cases where remote communications to the entire traffic cabinet is
- 47 required. It is understood that additional costs would apply in these cases.
- 48 C. Must support the ability to add cabinet monitoring for UPS and door alarms with
- 49 additional software license and no additional no additional hardware devices (requires
- 50 communications)

ADDENDUM NO. 2

- 1 D. Must support the ability to add additional software license for ATSPMs with additional
2 software license and no additional hardware devices (requires communications)
- 3 E. Must include the additional software license for cloud-based multimodal counts and
4 mobility dashboard and database without any additional hardware devices
- 5 F. Must support the ability to add additional software license for remote video recall and
6 cloud based streaming capability (requires communications)
- 7 G. Must include the detection/counts computation module where required to support
8 actuation and counting applications using vendor sensors.

9 10 **Intersection Monitoring Software**

11 Cellular Communications

- 12 A. Must provide 4G LTE cellular data service between the Communications Interface and
13 the Server via a national commercial carrier capable of using LTE Bands 2, 4, 5, 12, 13,
14 14, 66 and 71
- 15 B. Must provide 1GB per month per location for 4G LTE cellular data usage, pooled
16 collectively between total number of Intersection Monitoring locations
- 17 C. Must provide optional upgrades of monthly bandwidth by location to support various use
18 cases

19 20 Server

- 21 A. Must be hosted at a professional cloud hosting facility with redundancy of at least two
22 instances, with automatic load balancing and must scale to support simultaneous
23 number of connections
- 24 B. Must support permanent storage of all Telemetry Data, Alert Data, and Vehicle
25 Identification Data in perpetuity

26 27 Secure Communications

- 28 A. Must provide a Virtual Private Network (VPN) for secure data transmission between the
29 Communications Interface and Server
- 30 B. Must create a private network where IP traffic can be transmitted from a traffic cabinet
31 directly into the traffic management center and any central software systems
- 32 C. Must use authenticated using public key infrastructure (PKI) and encrypting using PKI
33 and the TLS/DTLS1.0+ protocol
- 34 D. Must support HTTPS/SSL communication to the Server from the public internet for
35 access of the User Interface
- 36 E. Must support revoking of all authenticated user names, passwords, or keys at any time
- 37 F. Must support simultaneous integration across a heterogeneous mix of different
38 technologies and providers, including different cellular providers, fibre connected
39 networks, and point-to-point radio solutions.
- 40 G. Must support integrating an unlimited number of intersections with the customers Central
41 Management System and be capable of supporting both IP and serial-over-IP
42 connections to all controller models in the field. The communication system must meet
43 all bandwidth and latency requirements of the customers' CMS
- 44 H. Must meet all bandwidth and latency requirements of the Customer's Central
45 Management System

46 47 Device Monitoring

- 48 A. Must provide a serial-over-LTE connection and appropriate networking support to enable
49 secure communications between cabinet hardware and existing third party software

ADDENDUM NO. 2

1 used by the Customer including Central Management Systems and MMU desktop
2 software applications

3

4 User Interface

- 5 A. Must provide a secure web-based Graphical User Interface (GUI) using SSL
- 6 B. Must support an unlimited number of concurrent logins by authenticated users
- 7 C. Must be fully accessible via desktop and tablet on Chrome, Microsoft Edge and Safari
- 8 D. Must provide all the functionality of Signal Monitoring, Alerts Management, Inventory &
9 Asset Management and Traffic Data Analysis from a single software application
10 requiring a single login
- 11 E. Must support user login via OAuth Login
- 12 F. Must support multifactor authentication (MFA)
- 13 G. Must provide a secure means of verifying account registration via email
- 14 H. Must provide a secure means of password reset
- 15 I. Must support the addition and management of user accounts for users that are both
16 inside and outside of the organization at no additional cost
- 17 J. Must support access to all Telemetry Data and Alert Data

18

19 Counts System Capability

- 20 A. Shall include the count system
- 21 B. Must classify road users. Bicycles, Pedestrians, Light Vehicles, Single Unit Trucks,
22 Articulated Trucks, Buses
- 23 C. Must be able to distinguish between lanes for any given vehicle movement. (E.g. NB
24 Thru lane 1, NB Thru lane 2).
- 25 D. Must be cable of counting large groups of pedestrians

26

27 Web-based API

- 28 A. Must make all multimodal counts data collected since initial installation available via a
29 securely hosted REST API
- 30 B. Must require a secure API key for access to the REST API
- 31 C. REST API must be able to provide up to 48 hours worth of data in a single response
- 32 D. REST API must provide an endpoint that returns data in a CSV format compatible with
33 MS2, with 15 minute bins
- 34 E. REST API must provide an endpoint that returns data formatted in JSON with 1 minute
35 bins

36

37 Web-based Dashboard

- 38 A. Must provide access to a secure (authentication required) dashboard for counts data
- 39 B. Must provide summaries of total Vehicles, Pedestrians, Bicycles, and Truck Percentage
- 40 C. Must make it possible to retrieve data from all dates the system was installed for using a
41 date selector
- 42 D. Must show raw data for ranges of a day or less
- 43 E. For ranges of a day or more, it must be possible to show 5th, 50th (median), 85th, and
44 100th percentiles of data for the date range.
- 45 F. It must be possible to export the raw Binned data or Typified data when a percentile
46 aggregation is selected.
- 47 G. Must have at least 15 minute bin resolution

48

49 Support and Training (Included)

50 Technical Support

ADDENDUM NO. 2

- 1 A. Vendor must provide technical support via email and toll-free telephone for all included
- 2 hardware and software between the hours of 9:00 and 17:00 EST/EDT, Monday to
- 3 Friday.
- 4 B. Local partner support can be scheduled from the Distributors network
- 5 C. Must provide onsite training can be scheduled if required (under Covid-19 safety
- 6 protocols)
- 7 D. Vendor must provide guidance on camera placement for optimal performance
- 8 E. Vendor must have dedicated technical account manager supporting installations and
- 9 issue resolution resolutions
- 10 F. Must support periodic internal automated validation of detection accuracy for each
- 11 configured presence zone in the intersection
- 12

13 Training

- 14 A. Vendor must provide free training videos and webinars for device installation of cabinet
- 15 devices, camera locations, configuration of zones and counts, operation, and
- 16 troubleshooting.
- 17

18 Construction

19 General

- 20 A. Provide the devices as indicated on the plans
- 21 B. Provide antenna(s) on the cabinet per provided instructions
- 22 C. Support using settings that were approved at equipment mock up (if required per the
- 23 Special Provision for Testing and Integration) or as approved by the Engineer to ensure
- 24 interoperability and security, including VPN settings, local IP address, port forwarding
- 25 and Network Address Translation (NAT), and IP-based filtering
- 26 D. Integrate and test to meet specifications for integration and as shown on the plans
- 27

28 Warranty

- 29 A. Provide devices with a standard manufacturer's warranty, transferable to the Customer.
- 30 The device must carry a warranty on parts and labor for 3 years from the date of
- 31 installation. Device-level Firmware and Software are updated for the life of the product.
- 32 Software and Web application updates, and security patches, must be provided by the
- 33 vendor over the term of the contract.
- 34

35 All mounting hardware and cabling shall meet the manufacturer's recommendations, unless
36 otherwise specified herein.

37

38

39 9-29.22 Preemption Hardware

40
41 Preemption Hardware shall be Opticom TM Model 721 unless otherwise specified in the Plan.
42 Railroad preemption hardware and wiring shall be provided as specified in the Plan.

43

44 9-29.24 Service Cabinets

45 *This section is supplemented with the following:*

46

47 Service cabinets shall be pole mounted, exterior NEMA 3R Rated with a bolt on HUB for top
48 entry. Cabinet shall be a maximum 10 inches wide, 14 inches high, and 5 inches deep.

49

ADDENDUM NO. 2

1 Load Center shall have between 100 and 150 Amps, with capacity for 6 spaces and 12 circuits,
2 or 8 spaces and 16 circuits as required by Code.

3

4 Service panels shall be Square D – QO Series

5

6 **9-29.24(2) Electrical Circuit Breakers and Contactors**

7 *The first paragraph is supplemented with the following:*

8

9 Mercury relays shall not be accepted. Contactors shall be one of the following brands:

- 10 1. Square D
- 11 2. Siemens
- 12 3. Eaton/Cutler Hammer
- 13 4. Engineer Approved Equal

14

15 *The second paragraph is deleted.*

16

17 *The third sentence of the third paragraph is deleted.*

18

19 *The third paragraph is supplemented with the following:*

20

21 All service panel breakers shall be one of the following brands/series

- 22 1. Square D – QO Series
- 23 2. Siemens – Type BL
- 24 3. Eaton/Cutler Hammer – Quick Lag Type BA
- 25 4. Engineer approved Equal

26

27 All surface mount breakers shall be one of the following Brands/Series:

- 28 1. Square D (Type QOU)
- 29 2. Siemens
- 30 3. Eaton/Cutler Hammer
- 31 4. General Electric
- 32 5. Engineer approved Equal

33

34 **9-29.25 Amplifier, Transformer, and Terminal Cabinets**

35 *This section is supplemented with the following:*

36

37 Terminal compartments may be incorporated into the signal standard as an alternative to
38 providing a separate terminal cabinet attached to the pole. Terminal compartment should offer
39 similar physical and electrical capacity as specified. Contractor shall provide submittals in
40 accordance with the contract documents and obtain approval from the engineer for the alternate
41 design prior to proceeding. Signal standards and terminal compartments shall meet all other
42 structural, mechanical, electrical, and finish requirements as specified, and be suitable for the
43 intended purpose.

44

45

46

END OF SECTION

47

ADDENDUM NO. 2

1 **9-29 ILLUMINATION, SIGNALS, ELECTRICAL** 2 **(September 28, 2023 Tacoma GSP)**

3
4 **9-29.1(4) is supplemented with the following new section:**

5 6 **9-29.1(4)E Service Entrance Cap Fittings**

7
8 Service Entrance Cap Fittings for use with PVC shall be PVC clamp-on type. Where used for
9 signal or flashing beacon conductors, the center of the wire entrance shall be cut or machined
10 out to a large diameter to accommodate entry of multi-conductors. All edges shall be smoothed
11 to avoid chaffing.

12 13 **9-29.1(6) Detectable Underground Warning Tape**

14 *This section is supplemented with the following:*

15
16 For electrical circuits detectable underground warning tape shall be high visibility red, with
17 continuous legend of "Caution Electric Line Buried Below" or equal. The warning tape shall be
18 polyethylene with a metallic backing. The polyethylene shall be a minimum 3 inches wide, 4 mils
19 thick.

20 21 **9-29.1(11) Foam Conduit Sealant**

22 *This section is deleted.*

23 24 **9-29.2 Junction Boxes, Cable Vaults and Pull Boxes**

25 *This section is supplemented with the following:*

26
27 Unless otherwise specified, all junction boxes containing illumination and signal control cable
28 shall be Type 1, Standard Duty with Alternate 2 Lid Bolt Down Attachment Tab per state
29 standard plan J-40.10-04.

30
31 Unless otherwise specified, all junction boxes containing interconnect cabling shall be Type 2,
32 Standard Duty with Alternate 2 Lid Bolt Down Attachment Tab per state standard plan J-40.10-
33 04.

34
35 Unless otherwise specified, all junction boxes containing illumination, signal or ITS cable shall
36 have a galvanized slip resistant lid and frame.

37 38 **9-29.2(1)A2 Non-Concrete Junction Boxes**

39 *This section is deleted.*

40 41 **9-29.2(4) Cover Markings**

42 *The second paragraph of this section is revised to read:*

43
44 Covers shall be marked or embossed with "LT" for boxes containing illumination circuits.
45 Covers shall be marked or embossed with "TS" for boxes containing traffic signal circuits.
46 Covers shall be marked or embossed with "IC" for boxes containing signal interconnect circuits.

47 48 **9-29.2(5)C Standard Duty Non-Concrete Junction Boxes**

49 *This section is deleted.*

50

ADDENDUM NO. 2

9-29.3 Fiber Optic Cable, Electrical Conductors, and Cable

This section is supplemented with the following:

Where not otherwise specified, all wiring shall meet standard of the industry for the application employed. Wiring shall be consistent with manufacturers' recommendations and meet all applicable codes.

9-29.3(1) Fiber Optic Cable

This section is supplemented with the following:

Unless otherwise specified, all fiber optic trunk communication lines (lines between intersections) shall be 48 count single mode fiber optic cable. Fiber Optic cables connecting the Fiber Optic Termination Panel in the signal cabinet to the Fiber Optic Splice Closure in the signal communications junction box shall be 6 count single mode fiber optic cable unless otherwise specified in the Plan.

Section 9-29.3(1) is supplemented with the following new sections:

9-29.3(1)C Sealed Fiber Optic Splice Closures

Fiber optic splice closure shall be a sealed dome closure designed for small count fiber splicing in a butt configuration. Splice closure shall be fully sealed and suitable for aerial and underground environments. Splice closure shall be able to receive up to 5 cables with an outside diameter between 0.30 inches and 0.62 inches and shall be fully kitted with all parts required to enable installation. Splice closure shall support stranded loose tube or ribbon fiber cables in either armored or dielectric configurations. Splice closure shall require only a common can wrench for installation and re-entry. Splice closure shall be a maximum of 18.25 inches long with a maximum diameter of 8.75 inches.

Splice trays shall be of the same manufacturer as the splice closure and designed to operate with the specific splice closure provided. Splice closure shall house between 1 and 4 splice trays with a splice capacity of 12 mechanical fused single splices in each tray for a maximum splice capacity of 48 mechanical fused single splices. One splice tray shall be provided with each splice closure unless otherwise identified in the project documents.

Cable grounding kits shall be of the same manufacturer as the splice closure and designed to operate with the specific splice closure provided. Cable grounding kits shall be installed in accordance with the manufacturer's recommendations.

Splice closure shall be designed and tested to Telcordia® GR-771 requirements Splice closure shall be Rural Utilities Service (RUS) Listed.

9-29.3(1)D Fiber Optic Termination Box

Unless otherwise specified, all fiber optic termination boxes located in signal cabinets shall be Fibertronics FOTB-6-12.

One coupler/adaptor shall be provided and installed in the fiber optic termination box. Coupler shall be a female LC duplex to female LC duplex coupler designed for installation in a standard 12.8mm x 9.3mm adaptor port. Coupler color shall be blue, consistent with singlemode OS2 installations. Coupler shall be installed in the last (right most) adaptor port of the termination box and secured with 2 M2x6mm Philips head screws.

ADDENDUM NO. 2

1
2 Two pre-terminated patch cables shall be provided, one 1-foot (0.3m) in length, and one 6 feet
3 (2m) in length. Patch cables shall be LC duplex singlemode OS2 9/125 fiber patch cables and
4 rated for indoor/outdoor use. Patch cables shall have a yellow colored 3mm diameter jacket,
5 and blue LC duplex connectors, consistent with singlemode OS2 installations.
6

7 **9-29.3(2)A Single Conductor**

8 **9-29.3(2)A1 Single Conductor Current Carrying**

9 *This section is supplemented with the following:*
10

11
12 Service connections shall be stranded copper size AWG #6 USE unless otherwise shown in the
13 plans. Black conductor insulation shall be used for the service and the neutral conductor shall
14 be white. Color tape marking shall not be acceptable for the neutral conductor.
15

16 **9-29.3(2)A2 Grounding Electrode Conductor**

17 *This section is supplemented with the following:*
18

19 Grounding electrode conductor shall be minimum #8 AWG unless otherwise shown in the plans.
20 When the ground is pulled through a conduit, the wire shall be insulated. Color tape marking
21 shall not be acceptable for marking the ground conductor.
22

23 **9-29.3(2)A3 Equipment Grounding and Bonding Conductors**

24 *This section is supplemented with the following:*
25

26 Equipment grounding shall be minimum #8 AWG unless otherwise shown in the plans. When
27 the ground is pulled through a conduit, the wire shall be insulated. Color tape marking shall not
28 be acceptable for marking the ground.
29

30 **9-29.3(2)B Multi-Conductor Cable**

31 *This section is supplemented with the following:*
32

33 Two-conductor through 10-conductor unshielded signal control cable, shall have stranded
34 copper conductors, size AWG 14, and shall conform to International Municipal Signal
35 Association (IMSA) signal cable 20-1.
36

37 **9-29.3(2)E Two-Conductor Shielded**

38 *This section is revised to read:*
39

40 Two-conductor shielded (2CS) cable shall be stranded 12 AWG conductors and shall conform
41 to IMSA Specification No. 50-2.
42

43 **9-29.4 Messenger Cable, Fittings**

44 *This section is supplemented with the following:*
45

46 Messenger cable shall be 5/16-inch, seven-wire strand messenger cables conforming to ASTM
47 A 475, extra-high strength grade, 11,200 lbs. min. breaking strength, Class B galvanized.
48

49 All guy eye anchor rods shall be double-hub type.
50

ADDENDUM NO. 2

1 Weatherheads shall be clamp-on type PVC. Where used for signal or flashing beacon
2 conductors, the center of the wire entrance shall be cut or machined out to a large diameter to
3 accommodate entry of multi-conductors. All edges shall be smoothed to avoid chaffing.

4
5 All miscellaneous nuts, bolts, washers and fittings shall be stainless steel or brass unless
6 otherwise noted.

7
8 All metal line hardware shall be hot-dipped galvanized in conformance with the requirements of
9 ASTM Designation A-153. All eyebolts shall be thimble eye design cast or welded to form a
10 solid eye.

11
12 5-strand, class B galvanized steel, pretwisted guy strand dead ends, high strength cable
13 conforming to ASTM Designation A-475, shall be utilized at all span wire terminations. 1/2" rope
14 wire thimbles shall be required where span wire connects to all poles or bull rings, except where
15 thimble eye bolts are used. Span wire shall normally be installed directly pole to pole, unless
16 otherwise directed or specified.

17
18 Strain insulators shall be installed where connecting to wood poles. Where span wire is
19 connected to a steel or concrete pole, insulators shall not be installed. Strain insulators shall be
20 wet process, porcelain, conforming to EEI-NEMA Class 54-2 standards for 12,000-pound
21 ultimate strength and shall be installed 9 feet from the pole.

22 23 **9-29.6 Light and Signal Standards**

24 *This section is supplemented with the following:*

25
26 Pedestrian pushbutton posts (Type PPB) shall have a 7-inch square and 10-inch high aluminum
27 frangible pedestal with an aluminum door and grounding lug, with the post threaded into the top
28 of the pedestal. The post shall be aluminum, 4.5-inch outside diameter, Schedule 40, with no
29 finish. Set screws shall be used to secure the pole to the base. A post cap with set screws shall
30 be provided and installed on the pole top. The bolt circle diameter for the base shall be 6
31 inches. Foundation shall be in accordance with Section 8-20.3(4). Anchor bolts shall be in
32 accordance with Section 9-29.6(5).

33
34 All light and signal standards shall be fixed base, 4-bolt anchor.

35
36 The head of the handhold security bolt shall be flush with the face of plate. The face plate of
37 the handhole shall be flush with pole.

38 **9-29.6(3) Timber Light Standards, Timber Strain Poles, Timber Service Supports**

39 *This section is supplemented with the following:*

40
41 All timber poles shall be Class II unless otherwise specified.

42
43 Mast arms for wood poles shall be "tapered elliptical" or "tapered truss" style, of a size sufficient
44 to be used with a luminaire weight of 48 pounds with an EPA of 1.1 square feet. Arms shall
45 have 2-3/8-inch O.D. x 8-inch long slip fitter for mounting luminaire.

46 47 **9-29.6(5) Foundation Hardware**

48 *This section is supplemented with the following:*

49

ADDENDUM NO. 2

1 All pedestrian pushbutton posts (Type PPB) shall be installed utilizing anchor bolts with WSDOT
2 Standard Plan J-20.15-04 and J-20.11-03, with 5/8-inch diameter and hot dip galvanized or
3 stainless steel and shall meet ASTM F1554 Grade 36 specifications. Supplied with each anchor
4 bolt shall be two hex nuts, meeting the requirements of ASTM A563, Grade A and two flat
5 washers, meeting the requirements of ASTM F436.

6
7 *Section 9-29.6 is supplemented with the following new section:*

8 9 **9-29.6(6) City of Tacoma Universal Pole**

10
11 Unless otherwise specified, light standards and strain poles shall be in conformance with the
12 following City of Tacoma standard design.

13 14 **Strength**

15 Each pole and mast arm shall have adequate strength for the designated luminaire with 1.8
16 safety factor for maximum combined stresses using 90 mph isotach (117 mph gusts) per
17 AASHTO LRFD Specifications for Structure Supports for Highway Signs, Luminaires, and
18 Traffic Signals. Design shall be based on total loading of 50 pounds and EPA of 2.0 square feet.

19 20 **Standard Bolt Spacing – for Streetlight Poles Only**

21 30 Foot poles -- Baseplate shall accommodate 1 inch anchor bolts. The bolt circle shall be
22 between 11 inches and 13 inches.

23 40 Foot Poles -- Baseplate shall accommodate 1 inch anchor bolts. The bolt circle shall be
24 between 12.5 inches and 14.5 inches.

25 26 **9-29.6(6)A Steel Strain Poles**

27
28 Each pole shall be of tapered round or octagonal construction.

29
30 CLASS 1 POLE: Design for dead load tensions up to 1500 pounds

31 CLASS 2 POLE: Design for dead load tensions up to 2600 pounds

32
33 Class 1 poles shall have a minimum base diameter of 12-inches for octagonal poles and 12-1/4-
34 inches for round poles. Poles shall have a minimum wall thickness of 0.3125-inches. Anchor
35 bolts shall be 1-1/2-inch by 60-inches and shall have a spacing of 11-5/16-inches on center, on
36 the square. It is the responsibility of the pole manufacturer to maintain proper clearance
37 between the pole shaft and nuts for the anchor bolts.

38
39 Class 2 poles shall have a minimum base diameter of 13-1/2-inches for octagonal poles and 14-
40 inches for round poles. Poles shall have a minimum wall thickness of 0.375-inches. Anchor
41 bolts shall be 2-inch by 66-inches and shall have a spacing of 12-3/4-inches on center, on the
42 square. It is the responsibility of the pole manufacturer to maintain proper clearance between
43 the pole shaft and nuts for the anchor bolts

44
45 Poles shall be of single-ply construction. Multiple-ply poles shall not be allowed.

46
47 Each pole shall be of tapered round or octagonal construction. Pole taper shall be in the range
48 of 0.13 to 0.14 in/ft.

49

ADDENDUM NO. 2

1 A base plate and top casting shall be securely attached to each pole. The attachment of the
2 base plate to the pole shall be a welded connection sufficient to develop the full strength of the
3 pole. The base plate shall have four (4) holes which will sufficiently accommodate the specified
4 anchor bolts for the pole class.

5
6 Pole shall be of sufficient strength to allow for the span wire to be installed to sag an amount
7 equal to 5% of the span length.

8
9 The maximum acceptable deflection, at 30 feet above the base, is 5 inches. The specified
10 deflection shall be at a loading condition of 1,500 pounds horizontal pull at 30 feet above the
11 base for Class 1 Poles. For Class 2 Poles, the loading condition shall be 2,600 pounds
12 horizontal pull at 30 feet above the base.

13
14 Structural material shall be zinc-coated by a "hot-dip" process in accordance with ASTM A123
15 and the final coating shall measure 0.0039 inch or more in thickness as determined by a
16 magnetic thickness gauge. All tapped holes shall be chased after galvanizing. Hardware shall
17 be coated in accordance with ASTM A307.

18
19 The finished pole shall be reasonably straight and free from injurious defects. If galvanizing is
20 damaged, the maximum area to be repaired is defined in accordance with ASTM A123 Section
21 4.6. The maximum area to be repaired in the field shall be determined in advance by the
22 Engineer. Repair areas damaged during construction, handling, transport or installation by one
23 of the approved methods in accordance with ASTM A780 whenever damage exceeds 3/16
24 inches in width. Minimum thickness for repair shall measure 0.0039 inches.

25
26 The company shall furnish the purchaser with template prints showing spacing and size of holes
27 in base for the anchor bolts.

28
29 The material shall carry the manufacturer's standard guarantee against any defect in material or
30 workmanship for a minimum period of one year following the date of installation. The Contractor
31 shall submit mil test reports for all steel used in the manufacturing of strain poles.

32
33 The Contractor shall submit a Certificate of Compliance with ASTM Standards and
34 Specifications for galvanizing. The certificate, signed by the galvanizer, shall detail galvanizing
35 process and testing procedure to determine that galvanizing meets minimum thickness
36 specified.

37
38 The contractor shall submit welder certification. Welders must be certified to AWS standards.

39
40 Each pole shall include the following:

- 41 1. One (1) rain-tight pole cap.
- 42 2. One (1) 4-inch by 6-1/2-inch handhole at base end to include the handhole cover
43 plate and positioned 90 degrees to the luminaire mast arm (traffic downstream side).
- 44 3. Anchor bolts shall be hot dipped galvanized steel with two (2) galvanized nuts and
45 two (2) washers for each bolt. Only 12-inches of threaded end of the bolts must be
46 galvanized. 1-1/2-inch diameter bolts shall have 8-inches of top thread and 2-inch
47 diameter bolts shall have 10-inches of top thread.
- 48 4. Anchor bolts shall have threaded bottom ends to receive an anchor plate and nut.
49 The nut shall be tack-welded to the anchor plate. Anchor plates for 1-1/2-inch

ADDENDUM NO. 2

- 1 diameter anchor bolts shall be 4-inch square by 1-inch thick. Anchor plates for 2-
2 inch diameter anchor bolts shall be 6-inch square by 1-inch thick
- 3 5. One (1) adjustable strain clamp to be mountable between 26 to 28 feet above the
4 base. Clamp shall provide facility to attach span wire at four-quarter points.
- 5 6. Provisions for mounting a mast arm of specified length. All poles shall be supplied
6 with one luminaire mast arm mounting flange. The centerline of the flange shall be
7 approximately 6 inches below the top of pole. The flanges shall conform with the
8 detail drawing included in the Special Provisions. Poles ordered without luminaire
9 mast arms but with provisions for a later addition of a mast arm shall be provided
10 with a metal cover and gasket to protect the opening. The cover shall be bolted to
11 the pole using the holes provided for fastening the luminaire mast arm.
- 12 7. One (1) two-inch coupling to receive clamp-on type aluminum weatherhead
13 positioned at 27 feet, and no more than 45° from the location of the mast arm, unless
14 otherwise specified.
- 15 8. One (1) 1-1/4-inch coupling for wire inlet located directly opposite the mast arm.
- 16 9. One (1) grounding lug-hole in lip of handhole for 1/2-NC brass bolt.
- 17

18 **9-29.6(6)B Luminaire Mast Arms**

19

20 Each luminaire mast arm shall have sufficient strength with a 1.8 safety factor to support a 70-
21 pound luminaire on an 18-foot mast arm per the latest AASHTO Specifications for Structural
22 Supports for Highway Signs, Luminaires and Traffic Signals.

23

24 Material and workmanship shall conform to the best commercial standards of the industry.

25

26 The mast arm and its fastening shall be constructed of steel conforming to Section 9-29.6

27

28 Each mast arm shall support a ballast-in-head luminaire and shall provide a luminaire mounting
29 height of approximately two (2) feet above the strain pole mounting flange.

30

31 The mast arm shall provide a horizontal extension from the center of the pole to the center of
32 the luminaire as shown in the Plans.

33

34 The mast arm shall be of tapered construction. The luminaire end of the mast arm shall not
35 exceed 2.375 inches O.D. for a minimum distance of 8 inches. The outside arm diameter at the
36 pole flange shall not exceed 5.88 inches.

37

38 The mast arm shall be capable of being fastened to the mast arm mounting flange dimensioned
39 in the detail drawing. All mounting bolt heads shall clear the weld.

40

41 **9-29.10 Luminaires**

42 *The third paragraph is deleted*

43

44 *This section is supplemented with the following:*

45

46 Unless otherwise shown in the plans all new luminaires shall be Light Emitting Diode (LED)
47 fixtures conforming to these specifications.

48

ADDENDUM NO. 2

1 Cobra-head style luminaires and other overhead fixtures, such as shoebox style fixtures, shall
2 be provided with utility labels. Ornamental post top fixtures shall not have utility labels. Utility
3 labels for LED fixtures shall be green and show actual total system wattage.

5 **9-29.10(1) Conventional Roadway Luminaires**

6 *This section is replaced in its entirety with the following:*

8 All Conventional Roadway Luminaires shall be LED meeting the following requirements:

10 1. Applicable Standards:

- 11 a. American National Standards Institute (ANSI) C78 and C136
- 12 b. Electrical and Electronics Engineers (IEEE) C62
- 13 c. Illuminating Engineering Society of North America (IESNA or IES)
- 14 d. Underwriters Laboratories (UL)

15 2. General:

- 16 a. Luminaire shall be UL Listed
- 17 b. Luminaire shall be listed as a Qualified Product on one of the following lists:
 - 18 i. Energy Star
 - 19 ii. Design Lights Consortium
 - 20 iii. Lighting Design Lab
- 21 c. LED light source and driver shall be compliant with the requirements of the
- 22 European Union (EU) Restriction of Hazardous Substances (RoHS) Directive.
- 23 d. Luminaire shall have an external label per ANSI C136.15.
- 24 e. Luminaire shall have an internal label per ANSI C136.22.

25 3. Luminaire Performance:

- 26 a. Operating Temperature Range: -4 F to +122 F
- 27 b. Correlated Color Temperature: (CCT)
 - 28 i. Residential- 3000K Nominal
 - 29 ii. Arterials - 4000K Nominal
- 30 c. Calculated Lumen Maintenance Factor (LMF): 100,000 hours or more (L70
- 31 at 25°C/77°F) in accordance with IESNA TM-21 and IESNA LM-80
- 32 d. Color Rendering Index (CRI) : >70
- 33 e. Light Distribution per IES Handbook: Best fit to meet design criteria
- 34 f. Minimum Efficacy: 80 Lumens/Watt

35 4. Power Supply and Driver Performance:

- 36 a. Input Voltage: Auto-sensing 120 to 277 VAC 50/60HZ
- 37 b. Power factor: >0.90
- 38 c. Drive current maximum of 1.0A
- 39 d. Total harmonics distortion at full power at specified voltage: <20%
- 40 e. Surge Suppression Protection 10kV Minimum (IEEE/ANSI C62.41.2)
- 41 f. Replaceable surge module
- 42 g. Interference FCC 47 CFR part 15/18, Class A
- 43 h. Driver life >100,000 hours
- 44 i. Dimming: 0-10V DC

45 5. Lighting and Dimming Controls:

- 46 a. The luminaire shall be provided with a 7-pin terminal locking type
- 47 photoelectric control mounting receptacle in accordance with ANSI C136.10
- 48 and ANSI C136.41.
- 49 b. Photocell receptacle dimming contacts shall be factory connected to driver
- 50 dimming leads (violet and gray) per ANSI C136.41.

ADDENDUM NO. 2

- 1 6. Luminaire Housing and Door:
 - 2 a. The luminaire housing shall be cast or extruded aluminum. All hardware shall
 - 3 be stainless steel.
 - 4 b. Cast housing components shall have a light gray polyester powder coat
 - 5 finish. Extruded components shall be anodized. Finish shall meet the
 - 6 requirements of ANSI C57.31, latest revision.
 - 7 c. The power-door shall be fabricated from either aluminum or a UV resistant
 - 8 polymer.
 - 9 d. The door shall be easily removable and shall allow for tool-less entry.
- 10 7. Slipfitter and Vibration Resistance:
 - 11 a. Slipfitter shall be capable of accepting a 1-1/4" through 2" IP pipe tenon (1-
 - 12 5/8" to 2-3/8" OD) with maximum allowable insertion lengths of 7-1/2" and 10"
 - 13 respectively in accordance with Table 2 of ANSI C136.3, latest revision.
 - 14 b. The Slipfitter shall have provisions for clamping the luminaire securely to the
 - 15 tenon and for leveling $\pm 5^\circ$ with respect to horizontal.
 - 16 c. Luminaire shall be certified to ANSI C136.31 3G bridge and overpass
 - 17 vibration standards with 4-bolt configurations.
- 18 8. Ingress Protection:
 - 19 a. The luminaire components shall have minimum moisture rating as specified
 - 20 in IEC 60529, with the ability to shed water from inside the housing(weep
 - 21 holes), and designed to minimize water collection and icing.
 - 22 b. Internal Components: IP66
 - 23 c. Enclosure: IP65
- 24 9. Terminal and Grounding Block:
 - 25 a. Components shall be pre-wired to the terminal board requiring only supply
 - 26 power connections to clearly identified terminals.
 - 27 b. The terminal board shall be located so that there is adequate tool-less access
 - 28 to accommodate user wearing electrical gloves to connect the supply leads.
- 29 10. Manufacturer Warranty:
 - 30 a. 10 Year Minimum including power driver and LED chips.

9-29.10(1)A Luminaire Classifications

33 The City of Tacoma has established five (5) classes of LED Conventional Roadway with specific
34 design criteria to ensure long-term lighting continuity. Luminaires are divided into classes based
35 on function, typical use and historical High Intensity Discharge (HID) equivalents. Current
36 classes are 100WEQ, 200WEQ, 250WEQ, 400WEQ, and RES-45. Each conventional
37 luminaire installed shall meet the design criteria of one of these five luminaires.

38
39 Design assumptions and criteria listed for each luminaire classification may not reflect the actual
40 conditions on the project. The design assumptions and criteria identified are only to be utilized
41 to determine luminaire equivalency, such that another luminaire meeting the same criteria can
42 be used to replace a failed unit without a complete redesign of the entire system.

43
44 Equivalence will be determined as follows:

- 45 1. The City of Tacoma will use Lighting Analysts AGi32 lighting software program for
- 46 determination of equivalence using the design assumptions and criteria identified for
- 47 each class of luminaire.
- 48 2. The roadway optimizer will be used to evaluate the performance criteria in all cases,
- 49 except for the Res-45 class luminaire, where model view will be utilized to calculate
- 50 the photometrics.

ADDENDUM NO. 2

- 1 3. Proposed fixtures may not be tilted, rolled, or spun to meet the criteria.
- 2 4. All calculations shall be to the 100th. Rounding will not be permitted.
- 3 5. A copy of the published IES photometric file and BUG (Backlight, Uplight, and Glare)
- 4 Rating shall be provided as a part of product submittal.
- 5 6. It is recognized that there are an infinite number of design variables and it is not
- 6 practical to create a published IES photometric file and BUG rating for each
- 7 combination. In those cases where the wattage is reduced to meet the design
- 8 criteria, the base IES photometric file for the higher wattage configuration shall be
- 9 used as follows:
 - 10 a. Where no IES photometric file exists for the specific configuration, all
 - 11 information required to allow the City to duplicate the results and assure that
 - 12 the fixture meets the criteria must be provided.
 - 13 b. When reducing the system wattage, the BUG rating of the base IES
 - 14 photometric file must be utilized, but may be scaled based on IES LM-79.
 - 15 c. For modified fixtures, the City may require that a representative fixture be
 - 16 provided prior to acceptance. The City reserves the right to have an
 - 17 independent NVLAP approved lab perform an IES LM-79 report for
 - 18 verification of the output for the submitted fixture. A 10 percent margin of
 - 19 error will be allowed in the analysis and comparison of the actual test results.
 - 20 Failure to meet the photometrics within the allowance may be cause for
 - 21 rejection.
- 22

23 Full design assumptions and design criteria for each of the five luminaire classes can be found
24 at the end of this section. Excessive glare or light trespass onto private property is not
25 acceptable. Typical usage for luminaire classes:

- 26 • 100WEQ Luminaires are typically installed along residential roadways at a height of
- 27 25 to 30 feet. 100WEQ Luminaires have a long and narrow light distribution to fit a
- 28 typical residential road.
- 29 • 200WEQ Luminaires are typically installed along local classified arterial roadways
- 30 and along arterials with lower pedestrian conflicts. 200WEQ Luminaires are typically
- 31 installed at a height of 30 feet and will have a slightly wider distribution to cover the
- 32 additional width.
- 33 • 250WEQ Luminaires are typically installed along collector to minor classified arterial
- 34 roadways. 250WEQ Luminaires can be installed at a height of 30 feet or 40 feet
- 35 depending on pedestrian conflict level, road width, and lighting levels required.
- 36 • 400WEQ Luminaires are typically installed along principal classified arterial
- 37 roadways or areas where a higher pedestrian conflict exists. 400WEQ Luminaires
- 38 are typically installed at a height of 40 feet, often installed on both sides of the
- 39 roadway, in a staggered pattern to adequately light the full roadway width.
- 40 • RES-45 Luminaires are typically installed at residential street intersections or for cul-
- 41 de-sacs. For residential intersections, these lights are typically installed on one
- 42 corner of the intersection at a 45 degree angle to the traveled ways. The light
- 43 distribution is designed to provide illumination for the intersection, but not create
- 44 unacceptable light trespass on adjacent properties.
- 45
- 46

47 **9-29.11 Control Equipment**

48 **9-29.11(2) Photoelectric Controls**

49 *This section is revised to read:*
50

ADDENDUM NO. 2

1
2 The photoelectric control shall be the twistlock type and the light sensitive element shall be a
3 solid state photo diode. The control shall be designed to turn on at 2.6 foot-candles (+/- 20%)
4 and turn off at 2.6 foot-candles (+/- 20%). The lighting control shall not drift by more than 1 per
5 cent over a 10-year period.

6
7 The output control relay shall be electro-mechanical. The time delay for both turn on and turn
8 off shall be a minimum of one second and maximum of 5 seconds. The output relay shall be
9 rated 1000 watts incandescent or 15 amps inductive load. The contacts shall be normally
10 closed.

11
12 The lighting control shall have a built in metal oxide varistor (MOV) rated a minimum of 160
13 joules for lightning and transient protection. The control shall also have secondary zener diode
14 and transient filter. The relay shall be suitable for operation on 240 volt, 60 hertz electrical
15 circuits.

16
17 Dimensions shall conform to ANSI specifications for twistlock photocells.

18 19 **9-29.12 Electrical Splice Materials**

20 21 **9-29.12(1) Illumination Circuit Splices**

22 *This section is revised to read:*

23
24 Splices and taps shall be made with solderless crimp connectors on underground and overhead
25 circuits to securely join the wires both mechanically and electrically.
26 Splices shall be sealed in accordance with 8-20.3(8).

27 28 **Thermoplastic Electrical Insulating Tape**

29 Electrical tape shall be made by the same manufacturer and compatible with the electrical
30 coating utilized to form a complete system that both insulates and protects the splice. Electrical
31 tape shall be based on polyvinyl chloride (PVC) and/or its copolymers and have a rubber-
32 based, pressure-sensitive adhesive. The tape shall have a voltage rating of 600V (UL510).
33 The tape shall be 7 mils thick, and be UL Listed and marked per UL Standard 510 as "Flame
34 Retardant, Cold and Weather Resistant." The tape shall be resistant to abrasion, moisture,
35 alkalis, acids, corrosion, and varying weather conditions, including ultraviolet exposure. The
36 tape must be applicable at temperatures ranging from 0°F through 100°F (-18°C through 38°C)
37 without loss of physical properties. The tape shall have an operating temperature up to 220°F
38 (105°C). The tape shall be classified for use in outdoor environments. The tape shall be
39 compatible with synthetic cable insulations, jackets and splicing compounds. The tape will
40 remain stable and will not telescope more than 0.1 inches when maintained at temperatures
41 below 120°F (50°C).

42 43 **Moisture Resistant Electrical Coating**

44 Electrical Coating shall be made by the same manufacturer and compatible with the vinyl
45 electrical tape utilized to form a complete system that both insulates and protects the splice.
46 Electrical Coating shall seal and bond the tape and be suitable for direct burial, direct water
47 immersion, and above ground applications. Electrical coating shall be flexible when dry.
48 Electrical coating shall consist of the solvents Acetone, Methyl Ethyl Ketone and Toluene and
49 shall contain synthetic rubber and resin solids.

50

ADDENDUM NO. 2

1 **9-29.12(2) Traffic Signal Splice Material**

2 *This section is revised to read:*

3
4 Induction loop splices and magnetometer splices shall include an uninsulated barrel-type
5 crimped connector capable of being soldered. The insulating material shall be a heat shrink
6 type meeting requirements of 9-29.

7 8 **9-29.12(3) Splice Enclosures**

9 *This section is deleted.*

10 11 **9-29.12(4) Re-Enterable Splice Enclosure**

12 *This section is deleted.*

13 14 **9-29.13 Control Cabinet Assemblies**

15 *This section is revised to read:*

16
17 The Traffic Controller Cabinet Assembly shall be completely wired and tested to Section 5
18 Terminals and Facilities of the NEMA TS2-2021 V03.08 TRAFFIC CONTROLLER
19 ASSEMBLIES WITH NTCIP REQUIREMENTS Specification, unless modified by these
20 specifications.

21
22 Cabinet shall be compatible with Econolite Cobalt Shelfmount controller.

23 The following submittals will be required for the review and approval by the City prior to
24 fabrication and wiring:

- 25
- 26 1. Proposed cabinet layout diagram including shelving/rack locations. In addition, detailed
27 diagrams shall be provided for the left side, right side, and back panels. Drawings shall
28 be clearly labeled and dimensioned.
 - 29 2. Proposed cabinet wiring diagram shall be submitted for the review and approval by the
30 City. Wiring of cabinets shall not commence prior to City approval of the cabinet wiring
31 plan.

32 All submittal comments shall be incorporated into a final set of prints and each cabinet shall be
33 furnished to three (3) complete sets of cabinet prints. All cabinet wiring, and layout shall come
34 on (1) E1 size sheet, multiple pages shall not be allowed. Upon request (1) CDROM or USB
35 flash drive with AutoCAD v2020 cabinet drawing for the cabinet wiring.

36 37 38 **9-29.13(1) Traffic Control Cabinets**

39 The following is for P sized cabinets with internal battery backup:

40 Each of the P sized Traffic Controller Cabinets shall meet the following general operating
41 requirements:

- 42 1. The Controller Cabinet meets the requirements of the National Electrical Manufacturers
43 Association (NEMA) STANDARDS PUBLICATION TS 2-2021 V03.08 TRAFFIC
44 CONTROLLER ASSEMBLIES WITH NTCIP REQUIREMENTS.
- 45 2. Cabinet is fabricated for 16 Load Switch Channels operation; where each load switch
46 socket can be configured for a vehicle phase, pedestrian phase or overlap operation.
47 Cabinet is wired for 16 Channels of detection, plus 4 Channels of preemption, further
48 details are provided in upcoming sections of these specifications.
- 49 3. The detector panel supports thirty-two (32) channels of vehicle detection, four

ADDENDUM NO. 2

1 (4) channels of emergency vehicle preemption, eight (8) channels of pedestrian
2 detection and eight (8) pedestrian return terminals.

- 3 4. The loop inputs are wired to two adjacent field terminals provided for each loop input.
4 Eight adjacent field terminals are provided for pedestrian field inputs and eight common
5 adjacent field terminals for the field ped push button returns connected to AC neutral,
6 eight adjacent field terminals are provided for preempt field input terminals. Additionally,
7 one (1) equipment ground solid aluminum busbar, and one (1) neutral solid aluminum
8 busbar are provided.

9 10 **9-29.13(1)A Cabinet Enclosures**

11 For the P sized cabinets with internal battery backup the Cabinet enclosures shall meet the
12 following requirements:

- 13 1. Cabinet Dimensions are **44** in. wide, **67** in. high and **26** in. deep. Cabinet is constructed
14 to be base mounted.
- 15 2. Cabinet and up to an 18-inch cabinet riser shall be fabricated from 0.125 in. thickness
16 aluminum alloy sheet meeting the requirements in ASTM Specification No. 5052-H32 or
17 equivalent. All exterior seams meet the requirements for Type 4 enclosures according to
18 NEMA 250.
- 19 3. The cabinet is manufactured to prevent the accumulation of water on its top surface with
20 a 1-1/2 in. slope from front to back. Cabinets are constructed in accordance with the
21 NEMA 3R rating requirement.
- 22 4. Cabinet is natural mill finish aluminum, and it is cleaned with appropriate methods to
23 remove oil film, weld black, and mill ink marks to render the surface clean, smooth, and
24 non-sticky to the touch.
- 25 5. The cabinet is provided with 2 removable lifting ears attached to the top of the cabinet
26 with a single 1/2" bolt.

27 28 **9-29.13(1)A1 Cabinet Enclosures for UPS Systems**

29 The following is for P sized cabinets with internal battery backup:

30 Controller cabinets that are designated in the project plans and specifications as UPS Controller
31 Cabinets Type P with internal battery backup shall be 67-inches high x 44-inches wide x 26-
32 inches deep (nominal dimensions) and meet the footprint dimensions as specified Section 7.3,
33 Table 7-1 of NEMA TS2 standards for a Type P cabinet.

- 34 1. Cabinet is built in a featured BBS/UPS system compartment. The compartment is
35 designed to allow air flow among the devices for their correct operation; compartment is
36 built in a front panel, designed to accommodate one (1) UPS Module and one (1)
37 Transfer Switch Module, the main cabinet door allows access to the front faces of these
38 modules. Further details of these devices are provided in upcoming sections of these
39 specifications.
- 40 2. The compartment is built in shelves to support four (4) 12V DC Batteries, compartment
41 has a hinged door that permits access to the batteries, wiring within the compartment
42 and visual inspection. Compartment access door is hinged on the rear right-side wall of
43 the cabinet as viewed from the outside facing the main cabinet door.
- 44 3. Door hinge, pin, and bolts are made of stainless steel, The hinge pins and mounting are
45 tamperproof.
- 46 4. The compartment access door is provided with a door stop that holds the door open at
47 the 90° (±10°), 120° (±10°) and 135° (±10°) positions.
- 48 5. A three-point latch system is provided on the compartment access door. The latching
49 means is operable without the use of tools.

ADDENDUM NO. 2

- 1 6. The door handle will rotate from the locked position such that the handle does not
2 extend beyond the perimeter of the compartment door at any time. The operation of the
3 handle will not interfere with the key, or any other cabinet mechanism or projection.
- 4 7. Compartment access door is provided with a lock, Best-Lock "Green Construction Core",
5 it operates with the compatible operation Best-Lock key. One (1) key is furnished with
6 this lock. The lock prevents the movement of latching mechanism when in the locked
7 position.
- 8 8. Compartment access door is provided with the ability to use padlock to externally lock
9 the latching mechanism. A lock with a 0.375 in. diameter shackle can be
10 accommodated.
- 11 9. The access door is provided with a shield tab welded to the wall of the cabinet just above
12 the upper side of the compartment door to prevent any accumulation of water.

14 **9-29.13(1)B Cabinet Doors and Locks**

15 The following is for P sized cabinets with internal battery backup:

- 16 1. The cabinet has a hinged main door that permits access to all equipment within the
17 cabinet and visual inspection of all indications and controls. Door is hinged on the right
18 side of the cabinet as viewed from the outside facing the cabinet door opening.
- 19 2. Door hinge, pin, and bolts are made of stainless steel, The hinge pins and mounting are
20 tamperproof.
- 21 3. The cabinet door is provided with a door stop that holds the door open at the 90° ($\pm 10^\circ$),
22 135° ($\pm 10^\circ$) and 165° ($\pm 10^\circ$) positions. The stop-and- catch arrangement can hold the
23 door open at 90° ($\pm 10^\circ$) with a load of 73.2 kilograms per square meter (15 pounds per
24 square foot) applied uniformly over the face of the door.
- 25 4. A three-point latch is provided on the main door of the cabinet. The latching means is
26 operable without the use of tools.
- 27 5. The main door handle will rotate from the locked position such that the handle does not
28 extend beyond the perimeter of the main door at any time. The operation of the handle will
29 not interfere with the key, the police door, or any other cabinet mechanism or projection.
- 30 6. Cabinet is provided with a main door lock, Best-Lock "Green Construction Core", it
31 operates with a compatible operation Best- Lock key. One (1) key is furnished with each
32 cabinet lock. The lock prevents the movement of latching mechanism when in the locked
33 position.
- 34 7. Cabinet is provided with a padlock to externally lock the latching mechanism. A lock with
35 a 0.375 in. diameter shackle can be accommodated.
- 36 8. The main door opening of the cabinets is around 80% of the area on the side that the
37 door closes, exclusive of the area for plenums.
- 38 9. Gasketing is provided in all door openings and is dust tight. Gaskets are attached with a
39 permanent adhesive bond. The mating surface of the gasket is covered with a silicone
40 lubricant to prevent sticking to the mating surface.
- 41 10. A hinged police compartment door is provided on the outside face of the main cabinet
42 door. The door permits access to a switch panel but does not allow access to exposed
43 electrical terminals or other equipment within the cabinet.
- 44 11. The police compartment door is provided with a lock that can be operated by a standard
45 police key, Corbin Type Blank No. 04266 or equivalent. Two keys are furnished with
46 each cabinet.
- 47 12. The police panel compartment internal dimensions are 5.75 in. high, 12.875 in. wide,
48 and 2.625 in. deep.

49

ADDENDUM NO. 2

9-29.13(1)D Cabinet Ventilation

The following is for P sized cabinets with internal battery backup:

1. Cabinet is provided with two fuse protected fans rated at 2.832 cubic meters per minute (100 cubic feet per minute) minimum.
2. The fans can operate continuously for a minimum of 6,000 hours in a +50°C (+122°F) environment without the need for after-installation maintenance, excluding filter cleaning or replacement.
3. Cabinet is provided with two thermostats to individually control the operation of the fans. The thermostat turn-on point is manually adjustable between 32°F and 140°F, The Thermostat is an Omega KT011 Series or equal and meets the latest *Caltrans TEES 6.2.4.4*.
4. Thermostats are located on the inside of the top portion of the cabinet at the fan panel.
5. Cabinet is provided with replaceable polyester 2-Ply air filter with the following dimensions: width 16 in. height 12 in. thickness 1 in.

9-29.13(1)E Cabinet Shelving

The following is for P sized cabinets with internal battery backup:

1. The cabinet is provided with three shelves to support the CU and auxiliary equipment. The equipment and shelves are arranged so that it is possible to remove any piece of auxiliary equipment from the cabinet without removing any other piece of auxiliary equipment.
2. Shelves are fabricated from 5052-H32 0.125 in. thickness aluminum with double flanged edges rolled front to back and reinforced with a V channel welded. The shelves have perforations patterns to allow air flow through the devices into the cabinet.
3. Size Type P cabinet has continuous vertical mounting channels welded to interior side cabinet walls to provide shelf and panel adjustable locations at any spacing.

9-29.13(2) Wiring

The following is for P sized cabinets with internal battery backup:

All wiring conforms to NEMA TS2 Section 5.2.5 and table 5-1. No cable or wire is attached to any point where movement of shelves or doors may damage the cable or wire. Conductors conform to military specification MIL-W-16878D, Electrical insulated high heat wire, type B. Conductors #14 or larger are UL or THHN type. All wires terminated behind the main panel or on the back side of other panels are soldered. Properly calibrated crimping tools are used to apply terminal insulated lugs to conductors terminated on terminal strips. No pressure or solderless connectors are used. Printed circuit boards are used on the load-bay to connect the bus interface units (BIU).

The connecting cables are sleeved and protected in braided nylon mesh. The connecting cables are long enough to allow removal or moving to any point the equipment for inspection and testing without stretching or disconnecting any conductor.

Each electrical terminal within the facilities is uniquely identified by terminal reference and functional nomenclature and both are referenced by the cabinet wiring diagram. Terminal reference and functional nomenclature for terminals accessible from the front of a panel is permanent and legible and is visible from the front of the panel adjacent to the terminals.

Component nomenclature for all plug-in devices is legibly and permanently marked next to the receptacle for the device. Markings are visible with the device in place.

ADDENDUM NO. 2

9-29.13(3) Electrical Design

9-29.13(3)A Load Bay

The following is for P sized cabinets with internal battery backup:

The design of the load-bay panel conforms to NEMA TS2 Section 5. Terminals and Facilities. The panel is constructed from 5052-H32 brushed aluminum of 0.125 inches thickness and installed to minimize flexing when plug-in components are installed.

Panel is installed and provided with a mounting mechanism which allows easy access to all wiring on the rear of the panel without removing or adjusting any shelving or other panels. Lowering of the Load-bay panel can be performed without the use of hand tools. Complete removal can be possible with the use of simple hand tools.

The **Load-Bay Panel** is located on the lower rear wall just below the bottom shelf, the **Power Supply Interface Panel** is located on the left wall just below the bottom shelf, the **Detector Racks** are placed on the middle shelf, the **Detector Panel** is located on the lower left wall, the **Custom Power Panel** is located just above the detector panel, the **Service Power Panel** is located on the lower right wall just below the **Custom Miscellaneous Panel**, the **Load resistor panel** is mounted on the right wall under the bottom shelf, the power supply, controller unit and monitor unit (not provided) shall be placed on the bottom shelf. the **Neutral Busbars Panel** is located on the lower right wall just below the power panel, the **SDLC Hub Assembly** is located on the rear wall below the middle shelf, the **Automatic Transfer Switch & Generator Inlet panel** is located on the compartment at the main door just below the **Police Panel Compartment**, the **Auxiliary Technician panel** is located on the main door mounted in the rear of the police panel compartment, the **Fans** and **Cabinet LED Light** are located on the top of the cabinet, a second **Cabinet LED Light** is located under the **Drawer** at the bottom shelf, the two eight positions **AC Outlets** are located on the upper left and right sides, and the **Custom Din Rail** is located on the upper rear wall, additionally the **UPS/BBS Equipment Compartment** is located on the right side of the cabinet which further details are provided in upcoming sections of these specifications.

The Load-Bay panel is provided with termination points for the Controller Unit (CU) CA cable, Monitor Unit (MMU) MA & MB cables, bus interface units 1 & 2 (BIU) and field terminal facilities.

The load-bay panel is available in the following configuration:

Sixteen (16) load switch sockets, Eight (8) flash transfer relay sockets, One (1) flasher socket, Two (2) BIU sockets. The Load-bay panel is wired for 16 channels. Load switches 1-8 are vehicle phases 1-8; load switches 9-12 are pedestrian phases 2, 4, 6 & 8; load switches 13-16 are overlaps A, B, C & D. All load switches are routed through a flash transfer relay.

Flashing Operation:

Load-Bay is wired to flash all the vehicle channels. Flashing operation alternates between the vehicle phases 1, 2, 5, 6, pedestrian phases 2, 4, OLA & OLB and vehicle phases 3, 4, 7, 8, pedestrian phases 6, 8, OLC & OLD. Flash programming can be either red, yellow or no flash simply by changing wires on the front of the load-bay. Initial configuration is for all the vehicle and overlap phases **red flash** and for pedestrian phases **no flash**.

9-29.13(3)B Side Panels

The following is for P sized cabinets with internal battery backup:

ADDENDUM NO. 2

1 Cabinet is provided with a load resistor panel with thirty-two (32) 2.5K-ohm, 10-watt panel
2 mount resistors. One common side tied to the neutral busbar. The other side terminated to
3 modular din rail mounted terminal blocks for feasible connections.
4

5 Cabinet is provided with a neutral (AC-) busbar panel to provide extra neutral connections
6 capability; it is constructed of solid aluminum bar and is located per section 2.2 (Cabinet layout).
7

8 **9-29.13(3)B1 Power Supply Interface Panel**

9 The following is for P sized cabinets with internal battery backup:

10 The power supply interface panel includes terminations for all the cabinet's power supply inputs
11 and outputs. It has a protective plastic cover. This panel is mounted on the left wall of the
12 cabinet.
13

14 POWER SUPPLY TS2 - EDI PS250: The power supply shall be a shelf-mounted, enclosed, 24
15 VDC supply. Power supply must meet the requirements of NEMA Standards Publication TS 2-
16 2021, Section 5.3.5.
17
18

19 **9-29.13(3)B2 SDLC Interface Panel**

20 The following is for P sized cabinets with internal battery backup:

21 An SDLC Hub Assembly including ten (10) D-Subminiature Female 15 pin (DB15) connectors
22 that are connected in parallel. The SDLC Hub Assembly is built in PCB. Two connectors are
23 provided with latching blocks, and eight connectors are provided with jackscrews 4-40 to secure
24 SDLC cables.
25

26 Six (6) SDLC cables are provided for the cabinet's operation and one additional spare SDLC
27 cable is provided for an additional device.
28

29 **9-29.13(3)B5 Power Panel**

30 The following is for P sized cabinets with internal battery backup:

31 The power panel is wired to provide all the power distribution and protection for the cabinet. The
32 power panel is equipped with a removable plastic front cover for protection. The design allows
33 the personnel to access the main and auxiliary breakers without removing the protective front
34 cover. The following major components are included within the power panel:

- 35 1. One (1) 30-amp main breaker supplying power to the main surge protector device
36 and turns on/off all power to the cabinet.
- 37 2. Two (2) 15-amp Auxiliary breakers for supply power to the fan, light
38 and ac power outlets.
- 39 3. One (1) Surge protection device CITEL DS72US-120S/G One (1)
40 Line Filer, EMI, CITEL DUC 31
- 41 4. One (1) Normally Open Relay Struthers-Dunn 418AXXL-120VAC
42 One (1) NEMA type 5-15R GFCI AC duplex outlet
- 43 5. One (1) Heavy duty 3 Positions Power Block MARATHON model
44 #1423307 for the cabinet power line in.
- 45 6. One (1) Equipment ground aluminum solid busbar Two (2) Neutral
46 aluminum solid busbars
- 47 7. One (1) Field copper lug 8.0-2.0AWG
48

49 **9-29.13(3)B10 Custom Panel**

50 The following is for P sized cabinets with internal battery backup:

ADDENDUM NO. 2

1 Cabinet is provided with two customized panels; one panel is intended to provide additional AC
2 power distribution and contains a controlled AC+ power signal termination which turns off during
3 flashing operation, panel is provided with one 10 positions terminal block, one convenient 35mm
4 din rail with an approximate length of 10.75 inches, two solid aluminum equipment ground and
5 neutral busbars. The second customized panel is provided with two 12 positions terminal blocks
6 for customer convenience. Terminal blocks of both panels are phenolic body with #8-32 phil-slot
7 screws; rated to 300VAC/DC @ 30A.

9-29.13(3)D Cabinet Illumination

8
9
10 The following is for P sized cabinets with internal battery backup:

11 Cabinet is provided with a lighting system which includes one (1) 24V DC Power supply driver
12 Mean Well model LPV-60-24 mounted on the Fan Panel and two (2) JKL 24V DC LED light
13 fixtures, one mounted on the fan panel and the second one mounted under the drawer's bottom
14 to provide maximum illumination to the cabinet.

9-29.13(3)E Generator Bypass Compartment and Cable

15
16
17 The following is for P sized cabinets with internal battery backup:

18 **Manual Transfer Switch and Generator Inlet Panel:**

19 The cabinet is provided with a heavy-duty manual transfer switch. The manual transfer switch
20 (MTS) provides a means of switching between normal utility power block and auxiliary backup
21 generator power. The MTS does not allow simultaneous active power from more than one
22 source and does not allow generator backflow into normal utility AC circuits. The generator
23 connection is included and consists of a three-prong, 30-amp L5-30P twist-lock connector with
24 recessed male contacts for generator hookup.

25
26
27 One utility indicator lamp is provided, and it turns on when the MTS is in the "Generator Power"
28 position, and the normal utility power service is available. It turns off when the MTS is in the
29 "Utility Power" position. One generator power indicator lamp is provided and turns on when the
30 Generator Power is available.

31
32 The MTS and Generator Inlet panel is easily accessible in a compartment behind the
33 weatherproof lockable exterior access door equipped with a tamper-resistant hinge. This access
34 door is provided with a lock Best-Lock "Green Construction Core". One (1) compatible key is
35 furnished with this lock. The access door and generator's cable entrance include a means to
36 prevent access to insects when cable is not present. The compartment is recessed and is deep
37 enough to allow closing and locking off the access door when the generator cable is connected.

9-29.13(3)F Police Panel

38
39 The following is for P sized cabinets with internal battery backup:

40 The police panel is accessible in the compartment behind the police access door. The wiring for
41 these switches will be accessible when the auxiliary technician panel is open, and the following
42 switches are included:

- 43
44 1. **Auto/Flash Switch:** When the switch is in the AUTO position with controller power on,
45 the signal heads shall be in normal operation. When the auto-flash switch is in the
46 FLASH position with controller power on, the signal heads immediately transfer to the
47 flashing mode, AC power is removed from the load switches and stop timing applied to
48 the controller unit. When the switch is returned to the AUTO position the controller
49 restarts and cycles to normal signal operation.

ADDENDUM NO. 2

- 1 2. **Manual Control Enable Auto/Manual Switch:** When the manual on- off switch is in the
2 ON position, a logic ground is applied to the manual control enable input of the controller
3 unit.
- 4 3. **Interval Advance Control:** It consists of a Manual Control Enable ON/OFF Switch, and
5 a removable Momentary Interval Advance Control Switch with a 6-ft coiled cord, and a ¼”
6 phone plug. The switch ¼” phone plug is connected to a matching panel mounted ¼”
7 phone jack which is wired to the interval advance terminal, and it is clearly shown on the
8 cabinet wiring diagram.
- 9 4. **Momentary Interval Advance Control Switch:** A manual control cord has the minimum
10 length of six feet when extended with a ¼” diameter three circuit plug connected to one
11 end and a hand-held manual pushbutton switch at the other end. When the manual hand
12 cord is plugged into the jack and the push button is pressed, logic ground is connected
13 to the interval advance input of the controller unit. Except for the vehicular yellow and all
14 red clearance intervals, a complete cycle (push-release) of the manual pushbutton
15 terminates the controller unit interval that is active. Cycling the push-button during the
16 vehicular yellow or all red clearance intervals does not terminate the timing of those
17 intervals.

9-29.13(3)G Auxiliary Switch Panel

20 The following is for P sized cabinets with internal battery backup:

21 The cabinet includes an auxiliary/technician switch panel mounted to the interior side of the
22 police panel compartment on the main cabinet door. The panel is secured to the police panel
23 compartment by (2) screws and is hinged at the bottom to allow access to the soldered side of
24 the switches with the use of only a Phillips screwdriver. All the switches are protected for
25 inadvertent contact by a hinged see-through acrylic cover. The following switches are included:

- 26 1. **Controller On/Off Switch:** A two positions toggle switch is provided. In the “OFF”
27 position, AC power is removed from the controller. In the “ON” position, AC power is
28 applied to the controller.
- 29 2. **Signals On/Off Switch:** A two positions toggle switch is provided. In the “OFF” position,
30 AC power is removed from all signal heads. This switch is connected to the control input
31 of the main signal contactor, and the main signal head power bus is routed through the
32 main signal contactor output contacts.
- 33 3. **Stop Time Normal/Off/On Switch:** A three positions toggle switch is provided. In the
34 “Normal” position, the stop timing command is applied to the controller by the police flash
35 switch or the MMU. In the “Off” position, the stop timing commands shall be removed
36 from the controller. In the “On” position logic ground is applied to the BIU stop-time
37 inputs and shall cause the controller to stop time. A red LED indicator is provided and
38 illuminates when stop time is applied.
- 39 4. **System/Free Switch:** A two positions toggle switch is provided. In the “SYSTEM”
40 position the controller will operate normally as system coordination control. In the
41 “FREE” Position the local controller will be released to operate in an isolated, fully-
42 actuated manner.
- 43 5. **Auto/Flash Switch:** A two positions toggle is provided. This switch places the field
44 signal heads in flashing operation while the controller continues to operate. This flash
45 shall have no effect on the operation of the controller or MMU. In the “AUTO” position the
46 controller cabinet will operate as normal. In the FLASH positions the cabinet will go into
47 flash mode and the controller shall continue to run.
- 48 6. **Cabinet Lights On/Off switch:** A two positions toggle switch is provided. It turns off and
49 on the cabinet lights.

ADDENDUM NO. 2

- 1 7. **Pedestrian On/Off/Test Switches:** Four mini toggle three positions switches are
2 provided to cover the even pedestrian phases (2P, 4P, 6P & 8P) of the controller unit. In
3 the “ON” position, switches provide constant calls. In “OFF” position, controller cabinet
4 performs as normal operation (ped calls are received from field push buttons). In the
5 “TEST” position, switches provide momentary test calls.
- 6 8. **Preemption Normal/Test Switches:** Six mini toggle two positions switches are provided
7 to cover six emergency vehicle preemption channels. In the “NORMAL” position,
8 switches have no effect and PE calls are received from preemption modules. In the
9 “TEST” position, switches provide momentary test calls.

10 **9-29.13(4) Auxiliary Equipment**

11 **9-29.13(4)A Traffic Signal Controller**

12 Traffic Signal Controller shall be an Econolite Cobalt Shelfmount Controller with an Advanced
13 Transportation Controller (ATC) Communications Module and thin film transistor liquid crystal
14 display (TFT LCD) screen. The CPU operating system shall be Linux-based. The Contractor
15 shall contact the City of Tacoma Traffic Signal Shop at 253-255-2443 to obtain the current
16 firmware version to be utilized.

17 Econolite Cobalt traffic signal controllers operating a Pedestrian Hybrid Beacon (PHB Signal),
18 must be configured by the manufacturer for operation of a pedestrian hybrid beacon. The
19 contractor/vendor shall configure and test the operation of the controller and malfunction
20 management unit prior to delivery to the City of Tacoma Signal Shop.

21 **9-29.13(4)B Malfunction Management Unit (MMU)**

22 The cabinet shall come with a Malfunction Management Unit (MMU). The cabinet shall come
23 with a (MMU) that meets all the requirements of NEMA TS2-2003 while remaining downward
24 compatible with NEMA TS1. It shall have (2) high contrast LCD displays and an internal
25 diagnostic wizard. It shall come with a 10/100 Ethernet port. It shall come with software to run
26 flashing yellow arrow operation. The MMU shall be an Eberle Design, Inc. (EDI) model MMU2-
27 16LEip. Contractor shall provide a compatible TS2 program card onboard memory.

28 MMUs monitoring a Pedestrian Hybrid Beacon (PHB Signal), must be configured by the
29 manufacturer specifically for the monitoring and operation of a pedestrian hybrid beacon. The
30 contractor/vendor shall configure and test the operation of the controller and malfunction
31 management unit prior to delivery to the City of Tacoma Signal Shop.

32 **9-29.13(4)C1 Load Switches**

33 The following is for P sized cabinets with internal battery backup:

34 LOAD SWITCH, PDC SSS-87 I/O, DUAL INDICATIONS: The solid-state load switches shall be a
35 three-circuit type meeting the requirements of NEMA Standards Publication TS 2-2021, Section
36 6.2.

37 **9-29.13(4)D1 Flasher**

38 The following is for P sized cabinets with internal battery backup:

39 FLASHER, 204, PDC, SSF-88 DISCRETE, CALTRANS: The discrete, two-circuit flasher unit, rated
40 at 15A per circuit. The flasher unit shall contain no electro-mechanical devices and must meet the
41 electrical and physical characteristics of NEMA Standards Publication TS 2-2021, Section 6.3.

42 **9-29.13(4)E1 Flash Transfer Relay**

43 The following is for P sized cabinets with internal battery backup:

ADDENDUM NO. 2

1 FLASH TRANSFER RELAY, STRUTHERS-DUNN #21ACPX-2/21XBP: The flash transfer
2 relays shall part of the back panel. They will be Struthers-Dunn, Part No. 21ACPX-2/21XBP,
3 plug-in type relay.
4

5 **9-29.13(4)F Loop Detector Card Rack**

6 The following is for P sized cabinets with internal battery backup:

7 The detector racks design and configuration conform to TS-2 Table 5-9. The detector racks
8 support (16) channels of loop detection, (1) Bus Interface Unit (BIU) and (4) channel of
9 preemption provided in the first detector rack only. The detector rack can use eight 2-channel or
10 four 4-channel detection cards and two 2-channel or one 4-channel preemption cards. The loop
11 wiring is connected via a 37-pin DB connector using spring clips, The power wiring is connected
12 via 6-pin power connector. The preemption wiring is connected via an 24-pos connector and
13 secured with safety latches. The addressing of detector rack is accomplished via dip switches
14 mounted to the PCB. The detector rack has space at the bottom front for labeling. The eight
15 slots used for detector cards are labeled with the channel numbers as shown in TS-2 Table 5-10
16 (CH1 to CH16). The ninth and tenth slots used for preemptions cards are labeled as follows:
17 ninth slot is labeled "PE CH.C, PE CH.D" and the tenth slot is labeled "PE CH.A, PE CH.B, PE
18 CH.C, PE CH.D". The requirements for preemption cards spacing and card guides are the same
19 as for detector cards per TS-2 Section 5.3.4.2.
20

21 BUS INTERFACE UNIT, EDI BIU-700 or approved equal: The Bus Interface Units (BIU) shall be
22 24V DC, rack mounted meeting the requirements of NEMA Standards Publication TS 2- 2021,
23 Section 8.
24

25 **9-29.13(4)H Ethernet Switch**

26
27 Ethernet switch shall be EtherWAN ED3575-622 Hardened Managed Switch with 2 VDSL2
28 Ethernet Extender ports. 6 10/100TX, + Gigabit SFP Combo + 2 Copper Pair VDSL2 Ports.
29 (Etherwan P/N ED3575-622). A 30 watt, 24VDC output power supply unit shall be provided by
30 the same manufacturer as the switch. A DSL-Octal Cable 2xRJ45, and a minimum 6' Ethernet
31 patch cable shall be provided with each. Two (2) SFP Optics 100Base-FX SM, 1310NM, 15KM,
32 LC fiber optic units shall be provided with each switch.
33

34 **9-29.13(4)I Uninterruptable Power System (UPS)**

35 The following is for P sized cabinets with internal battery backup:

36 The Battery Backup System (BBS) cabinet includes uninterruptable power system (UPS). The
37 UPS includes associated battery terminal cables to link the batteries to the UPS and the
38 batteries. All other ancillary equipment for a complete functioning UPS system shall be
39 included.
40

41 The key UPS system components are identified in the subsections below.
42

43 **9-29.13(4)I1 UPS Module**

44 The following is for P sized cabinets with internal battery backup:

45 UPS SYSTEM, MARATHON TRTC-1124-N1 1100 VA BBS or approved equal: The UPS unit
46 shall be NEMA TS 2 certified, it features fully programmable AC threshold voltage, remote
47 access via RS-232, USB & Network, it offers high output power factor and performs with 24V
48 DC with two or four batteries arrangement for longer run times. It is provided with external
49 connections accessible from front panel and is built in backlit 4-line LCD Display and LED
50 indicators.

ADDENDUM NO. 2

1
2 CARD, MARATHON, SNMP-CY54-04, SNMP/WEB or approved equal: A NETAgent 9 SNMP
3 card compatible with Marathon Power Traffic & Ruggedized UPS Series shall be provided, it
4 supports advanced encryption: HTTPS, SSL, SSH, SNMPv3, It features real-time UPS
5 monitoring, record events and data log among other features.
6

7 **9-29.13(4)I2 UATS/UGTS Assembly**

8 The following is for P sized cabinets with internal battery backup:

9 POWER TRANSFER SWITCH, MARATHON TSRC-2003-01 or approved equal: The power
10 transfer switch shall be low profile, space saving design, it shall operate in extreme
11 environments from -40°C to + 74 °C (-40°F to + 165°F). Enclosures with a coordinated visual
12 and technical design to match UPS unit TRTC-1124-N1, it contains a high-quality cam switch
13 with leading and overlapping contacts.
14

15 MOUNTING BRACKETS, MARATHON TRTB-002U-0B FOR TRTC-1124, PAIR or approved
16 equal: Mounting Brackets shall be provided and attached to the UPS unit for the proper
17 installation.
18

19 **9-29.13(4)I3 UPS Batteries**

20 The following is for P sized cabinets with internal battery backup:

21 The cabinet shall come with four (4) valve-regulated Absorbed Glass Mat Technology MK
22 Powered batteries with 91 Ah runtime. The BBS batteries shall be MK Battery model 8A24HEI
23 or equivalent.
24

25 **9-29.13(4)I4 UPS Battery Harness**

26 The following is for P sized cabinets with internal battery backup:

27 BATTERY HARNESS KIT, MARATHON TBHK-2009-24, 24V, W/Y-ADAPTER or approved
28 equal: Battery harness kit will provide the interconnections of four 12V DC batteries arrangement
29 to provide 24V DC to the UPS unit, this arrangement is intended for longer run times.
30

31 **9-29.13(4)J Preemption/Priority Equipment**

32
33 The cabinet shall come with (1) 4-channel rack mounted Opticom™ phase selector. This device
34 shall be capable of receiving encoded signals from Opticom series 700 emitters and detectors.
35 The Opticom™ phase selectors shall be Global Traffic Technologies model 764 or equivalent.
36

37 **9-29.13(4)K BUS Interface Unit (BIU)**

38 The cabinet shall come with four (4) BIU's. They shall meet all requirements of NEMA TS2-
39 1998 standards. In addition, all BIU's shall provide separate front panel indicator LED's for DC
40 power status and SDLC Port 1 transmit and receive status. Each BIU's shall utilize only 1 rack
41 position.
42

43 The (BIU)'s shall be Eberle Design, Inc. model BIU-700H, Econolite model BIU-64, Reno A&E
44 model BIU/2, or Engineer approved equal.
45

46 **9-29.13(4)L Door Actuated Switches**

47 The following is for P sized cabinets with internal battery backup:

48 The cabinet is provided with four door-actuated normally closed push-button switches; they
49 are located at the Main Door Opening and Police Door Opening corner brackets respectively,
50 and their functions are as follows:

ADDENDUM NO. 2

- 1 1. This switch turns on the cabinet lights when the door is open and turns off the lights when
2 the door is closed.
- 3 2. **Door Alarm (DS2):** This switch applies logic ground to the Input BIU2-23B (ALARM 1)
4 when the door is open and removes logic ground when the door is closed.
- 5 3. **Manual Control Disable (DS3):** This switch removes the logic ground to the Manual
6 Control Enable Switch for safety purposes when the door is closed.
- 7 4. **Door Alarm (DS4):** This switch applies logic ground to the Input BIU2-24A (ALARM 2)
8 when the door is open and removes logic ground when the door is closed.

9-29.13(4)M Unused Red Jumpers

10 The following is for P sized cabinets with internal battery backup:

11 Cabinet is provided with sixteen (16) "Red jumpers" for unused phases.

12 9-29.13(4)N Standard Cables

13 The following is for P sized cabinets with internal battery backup:

14 Cabinet is provided with the following cables for its operation:

- 15 1. One (1) Controller Power TS 2 type 1
- 16 2. One (1) Controller Power TS 2 Type 2
- 17 3. One (1) Power Supply

18 9-29.13(5) Manufacturer Testing and Certification

19 The complete cabinet assembly with electronics shall undergo complete input/output function
20 testing by the manufacturer before being released to the City of Tacoma.. Testing shall be done
21 via service feed to the 120VAC field terminal. Service power shall be routed through the
22 generator bypass switch, UPS inverter before being connected to the power panel so that all
23 service load circuits are tested.

24 If the cabinet specified comes with a UPS system (BBS) and batteries; the entire controller
25 cabinet assembly shall undergo a BBS field test procedure where the cabinet is run off battery
26 power for a minimum of one hour.

27 9-29.16 Vehicular Signal Heads, Displays, and Housing

28 9-29.16(1) Optically Programmed, Adjustable Face, and Programmable Array 12-Inch 29 Traffic Signal

30 *The second paragraph is supplemented with the following:*

31 Programmable traffic signals are utilized when two intersections are in close proximity. The
32 programmable traffic signal should have the standard features:

- 33 1) Individual modular sections
- 34 2) Reinforcing ribs on top and bottom of housings
- 35 3) Stainless steel door roll pins and eye bolt/wing nut assemblies
- 36 4) Moisture proof and dust tight neoprene gasket fitted to the gasket channel cast in the
37 door perimeter
- 38 5) 5-position, barrier-type terminal block with quick-disconnect terminals on one side of
39 each position and screw clamp terminals on opposite side of each position
- 40 6) 3-prong, PAR-46 lamp secured by a wire ring and a spring load clip
- 41 7) Acrylic lenses colored to ITE specifications
- 42 8) Masking kit

ADDENDUM NO. 2

1 **9-29.16(2)B Signal Housing**

2 *The second paragraph is supplemented with the following:*

3
4 The door shall open a minimum of 160 degrees.

5
6 *The third paragraph is supplemented with the following:*

7
8 The sections shall be held firmly together by corrosion-resistant hardware in such a manner that
9 additional sections may be added easily.

10
11 *The fourth paragraph is supplemented with the following:*

12
13 The terminal strip for a standard three-section head shall be a minimum five-position, ten-
14 terminal, barrier-type strip with No. 8 screw-type fasteners. To one side of each terminal shall
15 be attached the white, red, yellow and green signal section leads, leaving the opposite terminal
16 for field wires. Multi-section heads shall be provided with a terminal strip located in the yellow
17 (center) section. Lead shall be No. 18 AWG type with 1/32-inch wall, 105-1/4 centigrade
18 thermoplastic insulation.

19 20 **9-29.16(3) Polycarbonate Traffic Signal Heads**

21 *This section is deleted.*

22 23 **9-29.17 Signal Head Mounting Brackets and Fittings**

24 *This section is revised to read:*

25
26 Vehicle and pedestrian signal heads shall be as detailed in the standard plans.

27
28 Span wire vehicle signal hanger hardware shall consist of span wire clamp, wire entrance fitting
29 and vehicle head locking device.

30 31 A. Construction

- 32 1. Bronze hangers are required.
- 33 2. The minimum size of pins shall be 5/8-inch diameter. Pins shall be stainless steel.
- 34 3. The minimum size of the 'J' or 'U' cable clamps is 1/2-inch diameter. Cable clamp
35 bolts shall be stainless steel. Clamping insert shall be used.
- 36 4. The cable saddle shall be at least 9 inches long.
- 37 5. All cotter pins shall be brass and washers shall be stainless steel.
- 38 6. All hardware shall be of stainless steel, bronze or brass materials.
- 39 7. Signal stem shall be locked with a square headed set screw 1/4-inch minimum in
40 diameter.
- 41 8. Wire entrance shall be a minimum of 1-1/4-inch diameter and shall have a female
42 threaded base for nipple.
- 43 9. The balance adjuster shall not be used.
- 44 10. All stems shall be secured to signal head with proper lock fitting.

45
46 Vehicle signal heads attached to a mast arm shall use a type M mounting bracket as detailed in
47 the standard plans and in accordance with Section 8-20.3(14)B and Section 9-29.17.

48 49 **9-29.18 Vehicle Detector**

50 *This section is supplemented with the following:*

ADDENDUM NO. 2

1 Unless otherwise specified in the contract plans, the vehicle detection system provided shall
2 include the video and record count data for vehicles, pedestrians, bicycles, and provide
3 classification information.

5 **9-29.18(3) Detection System**

6 The detection system provided shall have all necessary components/appurtenances required to
7 install/mount, test, operate and maintain a fully functional detection system including but not
8 limited to the following requirements and components:

10 **In Cabinet Device**

11 Communications Interface

- 12 A. Must support 4G LTE cellular connectivity with MiMo and diversity (Bands
13 B2/B4/B5/B12/B13/B14/B66/B71), UMTS/HSPA+ and GSM/GPRS/EDGE with peak
14 downlink of 150Mbps and peak uplink of 50Mbps
- 15 B. Must support 802.11 a/b/g/n with MiMo and Diversity antennas with security of at least
16 64/128 bits WEP, WPA, WPA2
- 17 C. Must support GPS and GLONASS
- 18 D. Must support communication of Telemetry Data, Video Data, Alert Data, and Vehicle
19 Identification Data to the server via the Communication Service
- 20 E. Must support direct communication between the server and the devices connected to
21 Controller Interface Hardware

23 Antenna

- 24 A. Must provide an externally mounted antenna for supporting functionality of
25 Communications Interface
- 26 B. Must contain the following fully-enclosed antenna elements and quantities in a single
27 enclosure:
 - 28 • LTE MIMO (quantity: 2)
 - 29 • 2.4GHz/5GHz WIFI MIMO (quantity: 2)
 - 30 • GPS/GLONASS/BEIDOU (quantity: 1)
- 31 C. Must have labeled antenna terminations for easy installation
- 32 D. Must not exceed 35mm in height
- 33 E. Must be colored Pantone 427 U for blend with traffic cabinet construction
- 34 F. Must be IP67 rated and mounted on the cabinet with a water-tight seal made of a closed
35 cell rubber type foam and medium-firm acrylic adhesive with bonding features including
36 a high initial adhesion and excellent high/low temperature holding power with excellent
37 peel strength

39 Peripheral Interface

- 40 A. Must support 1 x USB 2.0 device ports
- 41 B. Must support 1 x 10/100/1000 Ethernet WAN port
- 42 C. Must support 2 x 10/100/1000 Ethernet LAN ports
- 43 D. Must support 3 x 10/100/1000 Ethernet LAN ports with PoE (support for 802.3af PoE
44 and 802.3at PoE+ to a maximum of 50W across all three ports)
- 45 E. Must support configuration as an integrated layer 2 ethernet switch to support cabinet
46 device interconnectivity
- 47 F. All ethernet ports must feature in-line, auto-resetting surge protection compliant to IEC
48 61000-4-5 Class 4
- 49 G. Processor must utilize dual NVIDIA GPU's

ADDENDUM NO. 2

- 1 H. Must support temperature-rated storage comprising of a solid state drive of at least
2 240GB:
 - 3 • Must be SATA III compliant
 - 4 • Must provide support for SMART command set
 - 5 • Must meet minimum shock resistance of 1500 G/0.5ms
 - 6 • Must meet minimum vibration resistance 5~800 Hz at 5G peak
- 7 I. Must provide light-emitting diode (LED) indicators for heartbeat, server connectivity,
8 ethernet link/activity, power, cellular link/activity and device state
- 9 J. Must support 2 x EIA RS-232 over RJ45 interface (cable included)
- 10 K. Must provide 4 x General Purpose I/Os pins (200mA sinking each), digital input, 0~30V
- 11 L. Must provide galvanic isolation between earth ground and logic ground
- 12 M. Must support one SDLC port that meets the following criteria:
 - 13 • Must provide all necessary cabling to connect to a cabinet's existing Port 1/SDLC
14 bus
 - 15 • Must support reading terminal and facility input & outputs at a frequency of at least
16 10 times per second
 - 17 • Must support reading channel state at a frequency of at least 10 times per second
 - 18 • Must support acquisition of MMU fault status including conflict, red failure and
19 clearance failure
 - 20 • Must support reading information from all detectors wired into the cabinet supporting
21 up to 100 ms resolution between detection events
 - 22 • Must detect failure of a detector in either always high, or always low, mode
 - 23 • Must support capturing and reporting Controller Faults based on MMU status bits of
24 'in conflict', 'red failure', 'diagnostic failure', 'in failure state', and 'local flash'
- 25 N. Must provide data buffering of all Telemetry Data (controller state, detector actuations,
26 pre-emption events) and Alert Data during periods of loss of cellular connection for at
27 least 12 minutes
- 28 O. Must provide data buffering of all Telemetry Data and Alert Data during periods of loss of
29 power for at least 5 seconds
- 30 P. All of the above listed Peripheral Interface must be contained within one device with one
31 power supply
- 32 Q. Must support being powered through NEMA 15-5 receptacle OR direct wire to cabinet
- 33 R. Must offer super capacitor-based power reserve sufficient to continue robust operation
34 during brownouts/intermittent power loss for 5 seconds. System must be able to safely
35 shut down in the event of power loss
- 36 S. Must not exceed 10.5" (height), 3" (width), 10" (depth)
- 37 T. Must support vertical and horizontal orientation for installation
- 38 U. Must be configurable via web interface: No dedicated software required to load onto PC
39 for programming interface unit

40

41 Controller Interface (NTCIP)

- 42 A. Must communicate with an NTCIP compliant controller over ethernet providing auto-
43 negotiation to 10/100 Mbps, half or full duplex
- 44 B. Must provide an ethernet cable for interfacing with NEMA TS2 type A1N, A2N, P1N, or
45 P2N controllers
- 46 C. Must communicate to the controller over TCP/IP
- 47 D. Must support communication over SNMP v1, v2c, and v3 protocols
- 48 E. Must support communication over STMP NTCIP protocols reading all objects defined in
49 NTCIP 1201 and 1202 supported by the controller

50

ADDENDUM NO. 2

- 1 In-Cabinet Computation and Actuation
- 2 A. In-cabinet device must support the addition of an optional module for detection and
- 3 counting computation
- 4 B. Computation Module must not increase external physical footprint of cabinet device
- 5 C. Computation Module must derive power from existing in-cabinet device
- 6 D. Must support up to two Intersection Cameras for coverage of larger or irregular
- 7 intersections
- 8 E. Must support up to four Advance Detection cameras in addition to two At-Intersection
- 9 Cameras with the use of vendor recommended POE Switch
- 10 F. Must have an integrated TFT color display which provides diagnostic information such
- 11 as the status of all phases and detectors, as well as diagnostics on the camera IP and
- 12 operational status
- 13 G. Must display status of detection channel on a front panel display
- 14 H. Must display Transmit/Receive status of SDLC bus
- 15 I. Must include onboard processing capabilities to perform video-based vehicle detection
- 16 and generation of traffic analytics
- 17 J. Must integrate with Opticom Cloud Pre-emption without the need for additional hardware
- 18 K. Module must be able to use Interface's existing SDLC port for actuation. Must provide
- 19 the capability to act as one or more SDLC detector racks. Must support generating
- 20 actuations on up to 64 channels over SDLC
- 21 L. Typical system power consumption of the full system should be less than 130W
- 22 M. In cabinet hardware supplied must be able to run Miovision Surtrac adaptive signal
- 23 control
- 24
- 25 Certification Testing
- 26 A. Must be fully NEMA tested and compliant, including shock, vibration, voltage, and
- 27 thermal articles 2.2.7-2.2.11
- 28 B. Must support NEMA operating temperature specification -34 °C to 74 °C (-29 °F to 165
- 29 °F)
- 30 C. Must support NEMA storage temperature specification -34 °C to 74 °C (-29 °F to 165 °F)
- 31 D. Must support humidity operating requirements of 5% - 95% RH non-condensing
- 32 E. External power supplies must be UL and c-UL compliant
- 33 F. Must be FCC tested and compliant
- 34 G. Must be ROHS compliant
- 35
- 36 Intersection 360 Camera
- 37 A. Must provide 360 degrees of visibility from the point of installation
- 38 B. Must be powered via Power over Ethernet (PoE) and be IEEE802.3af compliant
- 39 C. Must NOT require any fiber optic connections from the processor to the camera
- 40 D. Must support configuration in both spherical "fisheye" configuration, and rectangular
- 41 "quad view"
- 42 E. Must support at least 9 megapixel (MP) capture
- 43 F. Must support ability to capture 4K video
- 44 G. Must provide H.264 and MJPEG image compression
- 45 H. Must support H.265
- 46 I. Must support RTSP streaming
- 47 J. Must support third-party integration of RTSP video streams into Video Management
- 48 System (VMS) platforms
- 49 K. Must support maximum aperture ratio of 1:1.9
- 50 L. Must support focal length of 1.38mm

ADDENDUM NO. 2

- 1 M. Must include a clear polycarbonate resin-based dome
- 2 N. Must be rated to IP66 (NEMA 4X compliant)
- 3 O. Must include an electronic de-humidification device for use in various weather conditions
- 4 P. Must support the ability for users to zoom in and out, rotate and pan the video feed
- 5 Q. Must allow direct connection of Cat 5e cable from camera to traffic cabinet to limit
- 6 number of connections
- 7 R. Must include lens defrost functionality with total camera power operation not exceeding
- 8 standard PoE
- 9 S. Must utilize a NEMA temperature rated shielded PoE cable with drain wire
- 10 T. Must support in-line ethernet repeaters for long distance cable runs

11 12 Mount

- 13 A. Must include all mounting hardware with device for vertical and horizontal mounting
- 14 B. Mounting fixture must be constructed of weatherproof painted aluminum or stainless
- 15 steel
- 16 C. Mounting hardware must support 6ft' vertical pole installation, horizontal pole installation,
- 17 or attachment via a 1.5" threaded fitting
- 18 D. Mounting fixture (including camera, 40ft cable) must not exceed 540mm x 460mm x
- 19 205mm in size, and 6kg in weight (not including 6 ft extension)

21 **Detection Plus License (Perpetual)**

- 22 A. Shall include detection plus license
- 23 B. Must support collection of a rolling 365 day buffer of Occupancy Ratios
- 24 C. Must support collection of a rolling 365 day buffer of Arrivals on Red, and Arrivals on
- 25 Green
- 26 D. Must support collection of a rolling 365 day buffer of Phase Interval
- 27 E. Must support collection of a rolling 365 day buffer of Turning Movement Counts
 - 28 • Turning Movement Count accuracy must be a minimum of 90% during normal
 - 29 weather and operating conditions for correct camera set ups
 - 30 • System must be able to generate bi-directional pedestrian counts for each crosswalk,
 - 31 including for groups of pedestrians
 - 32 • Pedestrian counting accuracy must be a minimum of 85%, including for large groups
 - 33 of pedestrians, during normal weather and operating conditions for correctly camera
 - 34 setups
 - 35 • System must be able to count bicycles both on the road and on the crosswalk. These
 - 36 counts should be able to be measured separately
 - 37 • Bicycle counting accuracy must be a minimum of 80% during normal weather and
 - 38 operating conditions for correctly set up cameras
 - 39 • Count data must be available via a real time local device API
 - 40 • Count data must be available via a local CSV download

42 **Upgradability (General)**

- 43 A. Must support the ability for in-field devices to receive over-the-air (OTA) upgrades for
- 44 continued improvement of system capabilities and/or security improvements
- 45 B. Must support the ability to remotely add/upgrade the cellular communications plan for
- 46 each system in cases where remote communications to the entire traffic cabinet is
- 47 required. It is understood that additional costs would apply in these cases.
- 48 C. Must support the ability to add cabinet monitoring for UPS and door alarms with
- 49 additional software license and no additional no additional hardware devices (requires
- 50 communications)

ADDENDUM NO. 2

- 1 D. Must support the ability to add additional software license for ATSPMs with additional
2 software license and no additional hardware devices (requires communications)
- 3 E. Must include the additional software license for cloud-based multimodal counts and
4 mobility dashboard and database without any additional hardware devices
- 5 F. Must support the ability to add additional software license for remote video recall and
6 cloud based streaming capability (requires communications)
- 7 G. Must include the detection/counts computation module where required to support
8 actuation and counting applications using vendor sensors.

9 10 **Intersection Monitoring Software**

11 Cellular Communications

- 12 A. Must provide 4G LTE cellular data service between the Communications Interface and
13 the Server via a national commercial carrier capable of using LTE Bands 2, 4, 5, 12, 13,
14 14, 66 and 71
- 15 B. Must provide 1GB per month per location for 4G LTE cellular data usage, pooled
16 collectively between total number of Intersection Monitoring locations
- 17 C. Must provide optional upgrades of monthly bandwidth by location to support various use
18 cases

19 20 Server

- 21 A. Must be hosted at a professional cloud hosting facility with redundancy of at least two
22 instances, with automatic load balancing and must scale to support simultaneous
23 number of connections
- 24 B. Must support permanent storage of all Telemetry Data, Alert Data, and Vehicle
25 Identification Data in perpetuity

26 27 Secure Communications

- 28 A. Must provide a Virtual Private Network (VPN) for secure data transmission between the
29 Communications Interface and Server
- 30 B. Must create a private network where IP traffic can be transmitted from a traffic cabinet
31 directly into the traffic management center and any central software systems
- 32 C. Must use authenticated using public key infrastructure (PKI) and encrypting using PKI
33 and the TLS/DTLS1.0+ protocol
- 34 D. Must support HTTPS/SSL communication to the Server from the public internet for
35 access of the User Interface
- 36 E. Must support revoking of all authenticated user names, passwords, or keys at any time
- 37 F. Must support simultaneous integration across a heterogeneous mix of different
38 technologies and providers, including different cellular providers, fibre connected
39 networks, and point-to-point radio solutions.
- 40 G. Must support integrating an unlimited number of intersections with the customers Central
41 Management System and be capable of supporting both IP and serial-over-IP
42 connections to all controller models in the field. The communication system must meet
43 all bandwidth and latency requirements of the customers' CMS
- 44 H. Must meet all bandwidth and latency requirements of the Customer's Central
45 Management System

46 47 Device Monitoring

- 48 A. Must provide a serial-over-LTE connection and appropriate networking support to enable
49 secure communications between cabinet hardware and existing third party software

ADDENDUM NO. 2

1 used by the Customer including Central Management Systems and MMU desktop
2 software applications

3

4 User Interface

- 5 A. Must provide a secure web-based Graphical User Interface (GUI) using SSL
- 6 B. Must support an unlimited number of concurrent logins by authenticated users
- 7 C. Must be fully accessible via desktop and tablet on Chrome, Microsoft Edge and Safari
- 8 D. Must provide all the functionality of Signal Monitoring, Alerts Management, Inventory &
9 Asset Management and Traffic Data Analysis from a single software application
10 requiring a single login
- 11 E. Must support user login via OAuth Login
- 12 F. Must support multifactor authentication (MFA)
- 13 G. Must provide a secure means of verifying account registration via email
- 14 H. Must provide a secure means of password reset
- 15 I. Must support the addition and management of user accounts for users that are both
16 inside and outside of the organization at no additional cost
- 17 J. Must support access to all Telemetry Data and Alert Data

18

19 Counts System Capability

- 20 A. Shall include the count system
- 21 B. Must classify road users. Bicycles, Pedestrians, Light Vehicles, Single Unit Trucks,
22 Articulated Trucks, Buses
- 23 C. Must be able to distinguish between lanes for any given vehicle movement. (E.g. NB
24 Thru lane 1, NB Thru lane 2).
- 25 D. Must be cable of counting large groups of pedestrians

26

27 Web-based API

- 28 A. Must make all multimodal counts data collected since initial installation available via a
29 securely hosted REST API
- 30 B. Must require a secure API key for access to the REST API
- 31 C. REST API must be able to provide up to 48 hours worth of data in a single response
- 32 D. REST API must provide an endpoint that returns data in a CSV format compatible with
33 MS2, with 15 minute bins
- 34 E. REST API must provide an endpoint that returns data formatted in JSON with 1 minute
35 bins

36

37 Web-based Dashboard

- 38 A. Must provide access to a secure (authentication required) dashboard for counts data
- 39 B. Must provide summaries of total Vehicles, Pedestrians, Bicycles, and Truck Percentage
- 40 C. Must make it possible to retrieve data from all dates the system was installed for using a
41 date selector
- 42 D. Must show raw data for ranges of a day or less
- 43 E. For ranges of a day or more, it must be possible to show 5th, 50th (median), 85th, and
44 100th percentiles of data for the date range.
- 45 F. It must be possible to export the raw Binned data or Typified data when a percentile
46 aggregation is selected.
- 47 G. Must have at least 15 minute bin resolution

48

49 Support and Training (Included)

50 Technical Support

ADDENDUM NO. 2

- 1 A. Vendor must provide technical support via email and toll-free telephone for all included
- 2 hardware and software between the hours of 9:00 and 17:00 EST/EDT, Monday to
- 3 Friday.
- 4 B. Local partner support can be scheduled from the Distributors network
- 5 C. Must provide onsite training can be scheduled if required (under Covid-19 safety
- 6 protocols)
- 7 D. Vendor must provide guidance on camera placement for optimal performance
- 8 E. Vendor must have dedicated technical account manager supporting installations and
- 9 issue resolution resolutions
- 10 F. Must support periodic internal automated validation of detection accuracy for each
- 11 configured presence zone in the intersection
- 12

13 Training

- 14 A. Vendor must provide free training videos and webinars for device installation of cabinet
- 15 devices, camera locations, configuration of zones and counts, operation, and
- 16 troubleshooting.
- 17

18 Construction

19 General

- 20 A. Provide the devices as indicated on the plans
- 21 B. Provide antenna(s) on the cabinet per provided instructions
- 22 C. Support using settings that were approved at equipment mock up (if required per the
- 23 Special Provision for Testing and Integration) or as approved by the Engineer to ensure
- 24 interoperability and security, including VPN settings, local IP address, port forwarding
- 25 and Network Address Translation (NAT), and IP-based filtering
- 26 D. Integrate and test to meet specifications for integration and as shown on the plans
- 27

28 Warranty

- 29 A. Provide devices with a standard manufacturer's warranty, transferable to the Customer.
- 30 The device must carry a warranty on parts and labor for 3 years from the date of
- 31 installation. Device-level Firmware and Software are updated for the life of the product.
- 32 Software and Web application updates, and security patches, must be provided by the
- 33 vendor over the term of the contract.
- 34

35 All mounting hardware and cabling shall meet the manufacturer's recommendations, unless
36 otherwise specified herein.

37

38

39 9-29.22 Preemption Hardware

40
41 Preemption Hardware shall be Opticom TM Model 721 unless otherwise specified in the Plan.
42 Railroad preemption hardware and wiring shall be provided as specified in the Plan.
43

44 9-29.24 Service Cabinets

45 *This section is supplemented with the following:*

46

47 Service cabinets shall be pole mounted, exterior NEMA 3R Rated with a bolt on HUB for top
48 entry. Cabinet shall be a maximum 10 inches wide, 14 inches high, and 5 inches deep.
49

ADDENDUM NO. 2

1 Load Center shall have between 100 and 150 Amps, with capacity for 6 spaces and 12 circuits,
2 or 8 spaces and 16 circuits as required by Code.

3

4 Service panels shall be Square D – QO Series

5

6 **9-29.24(2) Electrical Circuit Breakers and Contactors**

7 *The first paragraph is supplemented with the following:*

8

9 Mercury relays shall not be accepted. Contactors shall be one of the following brands:

- 10 1. Square D
- 11 2. Siemens
- 12 3. Eaton/Cutler Hammer
- 13 4. Engineer Approved Equal

14

15 *The second paragraph is deleted.*

16

17 *The third sentence of the third paragraph is deleted.*

18

19 *The third paragraph is supplemented with the following:*

20

21 All service panel breakers shall be one of the following brands/series

- 22 1. Square D – QO Series
- 23 2. Siemens – Type BL
- 24 3. Eaton/Cutler Hammer – Quick Lag Type BA
- 25 4. Engineer approved Equal

26

27 All surface mount breakers shall be one of the following Brands/Series:

- 28 1. Square D (Type QOU)
- 29 2. Siemens
- 30 3. Eaton/Cutler Hammer
- 31 4. General Electric
- 32 5. Engineer approved Equal

33

34 **9-29.25 Amplifier, Transformer, and Terminal Cabinets**

35 *This section is supplemented with the following:*

36

37 Terminal compartments may be incorporated into the signal standard as an alternative to
38 providing a separate terminal cabinet attached to the pole. Terminal compartment should offer
39 similar physical and electrical capacity as specified. Contractor shall provide submittals in
40 accordance with the contract documents and obtain approval from the engineer for the alternate
41 design prior to proceeding. Signal standards and terminal compartments shall meet all other
42 structural, mechanical, electrical, and finish requirements as specified, and be suitable for the
43 intended purpose.

44

45

46

END OF SECTION

47