



TOWN OF BURLINGTON  
DEPARTMENT OF PUBLIC WORKS

# 2021 TRAFFIC SIGNAL IMPROVEMENT PROJECT

WINN STREET  
AT  
PEACH ORCHARD ROAD

Contract #21C-411-0054

**This is an unofficial Bid Spec. If this document is used to submit a bid then you must email your contact information to [Engineering@burlington.org](mailto:Engineering@burlington.org) in order to be added to the bidders list.**

Department of Public Works  
25 Center Street  
Burlington MA 01803

*March 2021*

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## INVITATION FOR BID

### PUBLIC WORKS CONSTRUCTION

Sealed bids for *2021 TRAFFIC SIGNAL IMPROVEMENT PROJECT – WINN STREET AT PEACH ORCHARD ROAD, CONTRACT 21C-411-0054* must be received by Department of Public Works, Town Hall Annex, 25 Center Street, Burlington, Massachusetts, 01803 until **April 15, 2021 at 10:00AM** and will be publicly opened and read aloud at such time.

- Electronic specifications and bid forms are available on the DPW website site for free at: <http://www.burlington.org> under the DPW Department page.
- Specifications and bid forms may be obtained at the Department of Public Works, Town Hall Annex, 25 Center Street, Burlington, Massachusetts, 01803 on and after March 31, 2021 between 8:30 AM and 4:00 PM for a fifty (\$50.00) dollar non-refundable reproduction cost.
- A bid bond of five (5) percent is required.
- Successful bidder must provide 100% Payment and Performance bonds.
- This project is bid according to MGL 30-39M.
- Town's Designated Representative and point of contact for questions is: Brian White, [bwhite@burlington.org](mailto:bwhite@burlington.org), 781-505-1116
- Prevailing wage must be paid per MGL 149 SECT. 26-27D
- The Bidder must be prequalified by MassDOT.
- Due to the Covid-19 pandemic the Burlington Town Offices are closed to the public, but staff is still working and the Town intends to go forward and bid projects.
  - **Bid Documents** – Pick-up/Drop-off of bid documents will be by appointment only, USPS mail, UPS, FedEx, etc. are not reliable options as the Town buildings are closed and not receiving deliveries. Contact the DPW/Engineering Division at 781-270-1640 to arrange a time to pick-up or drop-off bid documents.
  - **Bid Opening** – Bids will be publicly opened and read aloud at the Town Hall Annex 25 Center Street Burlington MA, specific location to be determined on the bid opening day.

## **PROJECT DESCRIPTION**

The work under this Contract consists of reconstruction of the traffic signal at the intersection of Winn Street at Peach Orchard Road.

The work also includes unclassified excavation, cement concrete sidewalks, cement concrete pedestrian curb ramps, granite curb, conduit, pull boxes, signs, pavement markings, new traffic signal system and other incidental work.

The Town of Burlington reserves the right to change, modify, increase or decrease the limits of work. All work shall be performed in accordance with these Specifications.

## INSTRUCTIONS TO BIDDERS

### Receipt and Opening of Bids

The Town of Burlington, Massachusetts, herein called the Owner, acting by and through its Department of Public Works, will receive sealed bids as specified in the invitation for Bids at which time bids will be publicly opened and read.

Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified will not be considered. The bidder agrees that this bid will be good and may not be withdrawn for a period of thirty (30) days, Saturdays, Sundays, and legal holidays excluded, after opening the bids.

### Location and Work to be Done

The Location of the Work to be done is described in the project description.

The Contractor will furnish all labor, services, materials, equipment, plant, machinery, apparatus, appliances, tools, supplies, and all other things necessary to do all work required for the completion of each item of the Work and as herein specified.

The Work to be done and paid for under any item will not be limited to the exact extent mentioned or described but will include all incidental work necessary or customarily done for the completion of that item.

### Preparation of Bid

Each bid must be submitted on the prescribed form. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures.

Each bid must be submitted in a sealed envelope bearing on the outside **the name of the bidder, his address, and endorsed with the name of the project as specified in Receipt and Opening of Bids.**

If forwarded by mail, **the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in Receipt and Opening of Bids.**

The following sections need to be filled out and completed as part of the bid package;

- Form of General Bid
- Acknowledgement of Addenda, if any
- Bid Form
- Total Bid Price
- Contractor Reference
- Contractor Certification

### **Bid Opening Procedure**

The following list of requirements will apply to each filed bid. Bids not meeting all the requirements for timeliness and security will be rejected without opening; bids not meeting signature and addenda requirements will be rejected prior to checking of bid amounts.

Bids will be filed at the place and before the time specified in Receipt and Opening of Bids.

Properly executed bid security will be placed in a sealed envelope and will be attached to the outside of the envelope containing the bid.

Bid signatures will be checked.

The total dollar amount of each bid will be read, and the three apparent lowest bids will be selected for further consideration. These three apparent low bids will be read aloud for the benefit of the other bidders and the bid opening procedure will be closed. All those present at the bid opening may arrange a time to examine all bids after the bid opening and after the reading of the three apparent low bids.

### **Ability and Experience of Bidder**

No award will be made to any bidder who cannot satisfy the Owner that he has sufficient ability and experience in this class of work and sufficient capital and resources to enable him to complete the work successfully within the time named. The Owner's decision or judgment on these matters will be final, conclusive, and binding. This Contract will be awarded only to a Contractor who is presently and primarily engaged in the business of maintaining, servicing, or installing traffic control signals and devices.

**Bidder must have a minimum of five (5) years' experience and have completed satisfactorily five (5) jobs within that time of similar size and scope.**

**Bidder must have at least two (2) full time Massachusetts Licensed Electricians employed. Within 10 days after opening of bids, the low bidder must submit a list of the Journeyman Electricians (Massachusetts License) who will perform the electrical work in this contract. Also, the low bidder must submit copies of each Journeyman Electrician's current Massachusetts License.**

**Bidder must have at least two (2) full time employees that have a minimum of ten (10) years of experience maintaining or installing traffic signal field equipment.**

**Bidder must have at least two (2) full time employees that are IMSA Signal Technicians Level II.**

**All Subcontractors must have a minimum of five (5) years' experience and have completed satisfactorily five (5) jobs within that time of similar size and scope.**

The Contractor must submit with his bid proposal a list of five (5) jobs which he has successfully completed, giving the name and the address of these projects so they can be investigated prior to the award of the contract.

The Owner may make such investigations as he deems necessary, and the bidder must furnish to the Owner, under oath if so required, all such information and data for this purpose as the Owner may request.

### **Condition of Work**

Each bidder must familiarize himself fully with the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of this Contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.

### **Addenda and Interpretations**

No interpretation of the bid documents will be made orally. Every request for such interpretation should be in writing addressed to the Town's Designated Representative listed in INVITATION TO BID and to be given consideration must be received at least seven (7) days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the Contract Documents. Failure of any bidder to receive any such addendum or interpretation will not relieve such bidder from any obligation under this bid as submitted. All addenda so issued will become part of the Contract Documents.

### **Laws and Regulations**

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulation of all authorities having jurisdiction over construction of the project will apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

### **Bid Security**

Each bid must be accompanied by a BID BOND, CASH, or, CERTIFIED CHECK, payable to the Town, in the amount stated in INVITATION FOR BID. Such checks will be returned to all except the three (3) lowest responsible and eligible bidders within five (5) days, Saturday, Sundays, and legal holidays excluded, after the opening of bids, and the remaining checks will be returned promptly after the Owner and the accepted bidder have executed the Contract, or if no notice of intent to award has been presented to the selected contractor within thirty (30) days,

Saturdays, Sundays and holidays excluded, after the date of the opening of bids, upon demand of the bidder at any time thereafter.

The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount will be retained from time to time by the Owner from current periodical estimates.

### **Right to Reject Bid**

The Owner reserves the right to waive any informality or reject any and all bids and alternate bids, should the Owner deem it to be in the public interest to do so.

The Owner also reserves the right to reject the bid of any bidder that the Owner considers to be unqualified based on the criteria set forth herein.

### **Time for Completion**

The bidder must agree to commence work and to fully complete the project within the time limit stated in SPECIAL CONDITIONS.

### **Comparison of Bids**

In the event that there is a discrepancy in FORM OF GENERAL BID between the lump sum or unit prices written in words and figures, the prices written in words will govern.

### **Rule for Award of Contract**

The Contract will be awarded to “the lowest responsible and eligible bidder” for the Total Price Bid pursuant to General Laws Chapter 30, Section 39M, as amended. Such a bidder will possess the skill ability and integrity necessary for the faithful performance of the work, will be able to furnish labor that can work in harmony with all other elements of labor employed, or to be employed, in the work, and will otherwise comply with all applicable provisions of law. Bidder will execute formal agreement within ten (10) days of the Notice of Award.

### **Statutes Regulating Competitive Bidding**

Any bid that does not comply with the provisions of Massachusetts General Laws Chapter 30, Section 39M as amended, need not be accepted and the Owner may reject every such bid.

### **Wage Rates**

Prevailing Wage Rates as determined by the Commissioner of Department of Labor and Industries under the provision of the Massachusetts General Laws, Chapter 149, Section 26 to 27G, as amended, apply to this project. It is the responsibility of the contractor, before bid opening to request if necessary, any additional



information on Prevailing Wage Rates for those trades people who may be employed for the proposed work under this contract.

State schedules of Prevailing Wage Rates are included in the contract documents.

### **Specifications**

All work under this contract shall be done in conformance with the *Standard Specifications for Highways and Bridges* dated 2021; the *2017 Construction Standard Details*, the *1990 Standard Drawings for Signs and Supports*; the *1996 Construction and Traffic Standard Details* (as relates to the Pavement Markings details only); *The 2015 Overhead Signal Structure and Foundation Standard Drawings*, the *2009 Manual on Uniform Traffic Control Devices (MUTCD)* with *Massachusetts Amendments* and the *Standard Municipal Traffic Code*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the Town of Burlington Standards, the Plans and these Special Provisions.

The General Conditions, Supplementary Conditions and Special Provisions shall take precedence over the General Requirements of Division I of the Standard Specifications.

**THE PAYMENT CLAUSES CONTAINED IN THE MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS DO NOT APPLY TO THIS CONTRACT.**

**THIS WORK SHALL BE BID ON A LUMP SUM BASIS. THE CONTRACT LUMP SUM PRICE SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTAL COSTS REQUIRED TO COMPLETE THIS WORK, EXCEPT FOR POLICE SERVICES, WHICH WILL BE PAID FOR ON A REIMBURSABLE BASIS.**

### **Bid Items Not Guaranteed**

The successful bidder is not guaranteed all items or the total bid price under this contract. Bidders must understand that like items may be bid under other contracts specifically packaged as one complete project. The successful bidder has no right to similar items bid under other projects. The Owner will specify where and when this contract will be applied to undertake a particular improvement.

### **Liquid Asphalt Adjustment**

Per MGL 30-38A paving or Hot Mix Asphalt items bid under this contract (if any) as subject to liquid asphalt price adjustment.

### **Tie Bids**

In the event of tied bids, wherein two or more responsive and responsible vendors provide the same bid price a coin toss will be used to break the tie.

**Unforeseen Office Closure**

If, at the time of the scheduled bid opening, Town Offices are closed due to uncontrolled events, the bid opening will be postponed until the next normal business day at the original time specified in the documents. Bids will be accepted until that date and time.

**Covid 19 Guidelines and Procedures**

Commonwealth of Massachusetts COVID-19 GUIDELINES AND PROCEDURES FOR ALL CONSTRUCTION SITES AND WORKERS AT ALL PUBLIC WORK dated March 2020 as amended shall be adhered to.

It is the Contractor's responsibility to stay current with any changes or addendums issued to these guidelines. For copies of the guidelines go to:

<https://www.mass.gov/covid-19-guidelines-and-procedures-for-all-construction-sites-and-workers-at-all-public-work>

These Guidelines and Procedures will remain in effect until further notice. At the start of the Work the Contractor is required to submit a letter to the Engineer certifying that the Contractor is in compliance with CDC, OSHA and the Commonwealth's COVID-19 guidelines. The certification applies to the general contractor as well as all subcontractors engaged with the Work covered under this contract. No Work will be allowed to begin until the letter is submitted and approved by the Engineer. In addition, on a daily basis, the Contractor is required to submit a copy of the MassDOT Contractor COVID-19 Guidelines Compliance Checklist to the Engineer. If the Contractor fails to submit the daily checklist no work will be allowed until one is submitted. Any items checked with a NO will require immediate corrective action by the Contractor before any Work can begin.

Per Subsection 5.09 – Inspection of the Work - the Contractor is required to provide assistance to the Engineer to make a complete and detailed inspection of the work. That assistance includes furnishing equipment to perform the inspection, therefore the Contractor will be required to provide CDC compliant Personal Protective Equipment (PPE) to personnel field staff. The CDC compliant PPE shall consist of face masks, gloves and eye protection.

All costs associated with compliance with this provision are considered to be incidental to the contract cost and therefore the Contractor will not be entitled to any additional compensation.

**FORM OF GENERAL BID**

Bid of \_\_\_\_\_ (hereinafter called "Bidder")\*

(\_\_\_\_) a corporation, organized and existing under the laws of the state of \_\_\_\_\_.

(\_\_\_\_) a partnership

(\_\_\_\_) a joint venture

(\_\_\_\_) an individual doing business as \_\_\_\_\_

To the Town of Burlington, Massachusetts (hereinafter called "Owner").

Gentlemen:

The bidder, in compliance with your invitation for bid, examined the Contract Documents and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby propose to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents within the time set forth in the agreement, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, or which this proposal is a part.

-----

\*Insert corporation, partnership or individual as applicable.

**ADDENDA**

Bidder acknowledges receipt of the following addenda:

No. \_\_\_\_\_ Dated: \_\_\_\_\_

No. \_\_\_\_\_ Dated: \_\_\_\_\_

No. \_\_\_\_\_ Dated: \_\_\_\_\_

No. \_\_\_\_\_ Dated: \_\_\_\_\_

No. \_\_\_\_\_ Dated: \_\_\_\_\_

**BID FORM**

<b>Item</b>	<b>Unit</b>	<b>Unit Cost</b>	<b>Qty</b>	<b>Item Total</b>
Traffic Signal Reconstruction	LS	\$ _____	1	\$ _____

**TOTAL BID PRICE**

Total Price Bid: \$ \_\_\_\_\_

Bid Price in Words: \_\_\_\_\_

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

**This is an unofficial Bid Spec. If this document is used to submit a bid then you must email your contact information to [Engineering@burlington.org](mailto:Engineering@burlington.org) in order to be added to the bidders list.**

## CONTRACTOR REFERENCES

The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the plans and specifications.

1. Have been in business under present name for \_\_\_years.
2. The names and addresses of all persons interested in the bid (if made by a partnership or corporation) as Principals are as follows:

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(Attach supplementary list if necessary)

3. The bidder is requested to state below what work of a similar character to that included in the proposed contract he has done, and give references that will enable the Owner to judge his experience, skill and business standing (add supplementary page if necessary).

#	Completion Date	Project Name	Contract Amount	Reference Name	Telephone No.
1					
2					
3					
4					
5					

4. Bank reference \_\_\_\_\_

(Name)

---

(Bank)

---

(Address)

(Telephone No.)

## **CONTRACTOR CERTIFICATION**

### **NON-COLLUSION**

I certify under penalties of perjury that this bid or proposal has been made and submitted under good faith and without collusion or fraud with any other person. As used in this certification, the word "person" means any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals.

### **TAX COMPLIANCE**

Pursuant to Massachusetts General Law Chapter 62C, Section 49A, I certify under the penalties of perjury that, to the best of my knowledge and belief, I am in compliance with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

### **LABOR HARMONY / OSHA 10-HOUR**

I will furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work, and All employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health administration that is at least 10 hours in duration.

Signature: \_\_\_\_\_  
(Person Signing Bid)

\_\_\_\_\_  
(Name of Business)



**AGREEMENT**

THIS AGREEMENT, by and between the party of the first part, the Town of Burlington, hereinafter called "OWNER", acting herein through its Town Administrator, and the party of the second part hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described by these bid documents hereinafter called the project, for the sum of the contract price and all extra work in connection therewith, under the terms as stated in the Contract Documents; and at his (its and their) own proper cost and expense to furnish all the materials, supplies, machinery equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in FORM OF GENERAL BID, GENERAL CONDITIONS, Contract Documents as prepared by the Owner.

IN WITNESS WHEREOF, the parties to these presents have executed this contract.

\$ \_\_\_\_\_  
Contract Price

AGREED:  
Town of Burlington

\_\_\_\_\_  
Owner Date

Contractor

\_\_\_\_\_  
Contractor Date

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

In accordance with M.G.L. C. 44, Section 31C, this is to certify than an appropriation in the amount of this contract is available therefore and that the Town Administrator has been authorized to execute the contract and approve all requisitions and change orders.

\_\_\_\_\_  
Account # Town Accountant Date

## SPECIAL CONDITIONS

1. All work under this contract must comply with the most recent edition of the Town of Burlington Department of Public Works; Street Opening/Utility Connection Rules & Regulations.
2. Prior to the commencement of any work the Contractor must obtain a Street Opening permit from the DPW/Engineering Division.
3. The cost of police details will be paid for by the Town of Burlington. The Contractor will be responsible for coordinating and scheduling all police details. If the details are not properly canceled by the Contractor in time, the Contractor will be back-charged all detail costs related to the improper cancellation.
4. The Contractor shall submit a submittals schedule for all materials and equipment required for this Project. Submittals schedule shall indicate required dates for submitting shop drawings, samples, and product data for materials to meet project schedule.
5. The Contractor must submit a Schedule of Values in order to request and receive progress payments under the lump sum bid item. In addition, each request for a progress payment must include the list of Schedule of Values stating which items have been complete and the associated quantities of each item.
6. All certified payroll slips must be submitted as part of the pay requisition package for each individual pay requisition request, for each contractor and sub-contractor that has performed work under this contract, up to date of the current pay requisition before the pay requisition will be processed and paid.
7. Tack coats will be made on all HMA and cement concrete surfaces and joints immediately before new HMA pavement is placed at the application rates set forth in the *Standard Specifications for Highway & Bridges*. Tack coating will be considered incidental to the cost of this item.
8. In addition to the contract warranty, the Contractor warrants concrete sidewalk panels and wheel chair ramps against spalling for a three (3) year period from the date of project substantial completion. Any spalling concrete identified within a three (3) year period will be deemed defective and considered warranty work. Once the defective panels are replaced, the warranty will reset and continue another three (3) year warranty period on all concrete work covered by the original contract.
9. After installation of new gate boxes and structures, or adjustment of existing gate boxes and structures, all construction debris will be removed providing easy access if need arises. All work and labor needed to furnish and remove the construction debris out of the gate boxes and structures will be considered incidental to the bid price.

10. The payment clauses contained in the *Massachusetts Highway Department Standard Specifications* do not apply to this Contract.
11. This work is bid on a lump sum basis. The Contract lump sum price will include all labor, materials, equipment and incidental costs required to complete this work, except for police services. The cost of police detail officer(s) will be paid for by the Town of Burlington.
12. **All proposed work requiring roadway excavations will be complete and invoiced for by June 30, 2021. This includes curb ramps and any other locations that require granite curb adjustments. The proposed traffic signal posts that will have pedestrian signal heads “P3” and “P4” affixed to them will be installed at the time WCR #3 and #4 are constructed to maintain safe pedestrian passage across Peach Orchard Rd. If lead times for the specified pedestrian equipment prevent this condition from being met, installations of stock item pedestrian equipment will be installed temporarily and replaced when specified equipment is delivered. Temporary installation and removal will be considered incidental to the contract price.**
13. The Town may direct items labeled to be “removed & stacked” to be “removed & disposed” at no additional cost to the contract price.
14. All excavations in existing asphalt and cement concrete surfaces must be saw-cut.
15. Any clearing, grubbing, hedge trimming will be done in a neat manner to minimize disturbance.
16. Under this contract the Contractor agrees to complete “Punch List of Items” assembled by the Designated Representative. The “Punch List of Items” must be completed before the final payment requisition is processed. All the items will be paid for under the appropriate bid item under this contract.
17. The location of work is within a school zone for an elementary school and middle school. Construction delays around drop-off and pick-up times will be expected and considered incidental to the contract price.
18. The Contractor will be furnished information and ties for the survey baseline and benchmarks. The Contractor shall perform all survey required for the work.
19. The following traffic management conditions apply and are considered incidental to the contract price:
  - Two (2) way traffic must be maintained at all times
  - Complete compliance with the Traffic Management Plan standards set forth in the *Town of Burlington Department of Public Works Street Opening/Utility Connections Rules & Regulations*, Section 850 of the

Standard Specifications, and the Manual on Uniform Traffic Control Devices.

- Detours not included as part of the Traffic Management Plan will be allowed only upon written authorization from the Owner and the Contractor is responsible for supplying all necessary sign(s) and traffic barrels to which to attach the signs, for the detour.
- Work that will disrupt travel on the existing roadways (lane closures, lane shifts, trenching, etc.) will only be allowed between the hours of **9:00AM and 3:00PM** unless prior approval by the Owner is given.
- The Contractor must provide necessary access for fire apparatus and other emergency vehicles through the work zones at all times.
- The Contractor must provide safe and ready means of ingress and egress to all stores and shops, public and private professional offices and any other businesses or residences in the project area, both day and night, for the duration of the project.
- All sidewalks shall be safe and open to pedestrians by the end of each work shift of the approved work hours. Temporary wheelchair ramps may be needed to maintain access at driveways and intersections.
- The Contractor is responsible for keeping the worksite and travel ways clean of debris. The cost for maintenance and cleaning of travel ways will be considered incidental to the contract price.

20. No work will be allowed on Saturdays, Sundays, or holidays without prior approval by the Owner.

21. Attention is directed to the following parts of the contract:

Description	Location in Contract
Preparation of Bid	Instructions Bidders
Experience of Bidders	Instructions to Bidders
Bid Security	Instructions to Bidders
Execution, Correlation and Intent	General Conditions; Article 1
Contract Administration	General Conditions; Article 2
Superintendent	General Conditions; Article 4, Section 8
Project/Progress Schedule	General Conditions; Article 4, Section 9
Liquidated Damages	General Conditions; Article 6
Prevailing Wage Rates	Appendix A
Project Plans	Appendix B

22. Summary Table of Important Contract Dates

Item	Date	Liquidated Damages
Bid Opening	10:00AM, April 15, 2021	---
Commencement of Work	No later than 10 days following the receipt of Notice to Proceed	---
Completion of Work (Work requiring roadway excavation, including curb ramps and granite adj.)	June 30, 2021	\$1,000 per calendar day not in compliance after this date
Completion of Work (All Work in Entirety)	August 31, 2021	\$1,000 per calendar day not in compliance after this date

## **GENERAL CONDITIONS**

### **ARTICLE 1**

#### **CONTRACT DOCUMENTS**

##### **1.1 DEFINITIONS**

###### **1.1.1 THE CONTRACT DOCUMENTS**

The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General, and other Conditions), the Drawings, the Specifications, all Addenda issued prior to and all Change Orders issued after execution of the Contract, and all applicable laws, ordinances and regulations. The Contract Documents include Bidding Documents such as the Advertisement or Invitation for Bid, the Instructions to Bidders, sample forms, the Contractor's Bid or portions of Addenda relating to any of these, or any other documents, specifically enumerated in the Owner-Contractor Agreement.

###### **1.1.2 THE CONTRACT**

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a written Change Order.

###### **1.1.3 THE WORK**

The Work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction, and all materials and equipment incorporated in such construction.

###### **1.1.4 THE PROJECT**

The project is the total construction of which the Work performed under the Contract Documents may be the whole or a part.

###### **1.1.5 OR EQUAL**

The use of the words "Or Equal" following the name of any manufacturer, vendor or proprietary product will be understood to mean that articles or materials may be substituted which, in the opinion of the Owner, are equal in quality, durability, appearance, strength, design and performance to the articles or materials named or described and will perform adequately in providing a first-class facility.

When submitting shop drawing information on articles or materials which are being proposed as substitutes for specified items, the Contractor must clearly identify them as such. If the articles or materials are accepted as equal to those on which dimensions on the drawings are based, any dimensional variance from those shown and/or specified must be shown on the shop drawings prepared by the Contractor, illustrating the manner in which conformity to dimensions and design is to be obtained. All such drawings will be subject to the approval of the Owner and the installation of the article will not proceed without first obtaining said approval.

## **1.2 EXECUTION, CORRELATION AND INTENT**

### **1.2.1**

By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

### **1.2.2**

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one will be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable there from as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

### **1.2.3**

The Notice to Proceed will come in the form of a written letter to the Contractor. Once the written Notice to Proceed has been received by the Contractor, that date will be the legal start date for work under the Contract.

In the event of a failure to issue a Notice to Proceed written document specifying the commencement date, the pre-construction meeting date will serve as the Notice to Proceed date.

## **1.3 OWNERSHIP AND USE OF DOCUMENTS**

### **1.3.1**

All Drawings, Specifications and copies thereof furnished by the Owner are and will remain the Owner's property. They are to be used only with respect to this Project and are not to be used on any other project without prior written consent of the Owner. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

## **ARTICLE 2**

### **ADMINISTRATION**

#### **2.1 ADMINISTRATION OF THE CONTRACT**

##### **2.1.1**

The Owner or its Designated Representative will visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Owner's Designated Representative will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.

##### **2.1.2**

The Owner will at all times have access to the Work whenever it is in preparation and progress. The Contractor must provide facilities for such access so the Owner may perform its functions under the Contract Documents.

##### **2.1.3**

The Owner will make payments for completed work, as approved by the Owner, in accordance with M.G.L. Ch. 30, Sec. 39G. A five percent retainage will be deducted from periodic payments to the Contractor.

##### **2.1.4**

The Owner will render information necessary for the proper execution or progress of the Work within twenty (20) days of any request by the contractor or in accordance with any time limit agreed upon.

##### **2.1.5**

The Owner will have authority to reject Work which does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work whether or not such Work is then fabricated, installed or completed. Any such rejection of work will not relieve the Contractor of the responsibility for maintaining protection of the Work and the Owner's property.

##### **2.1.6**

The Owner or its Designated Representative will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. Such action will be taken with reasonable promptness so as to cause no delay. The Owner's approval of a specific item will not indicate approval of an assembly of which the item is a component.



**2.1.7**

The Owner will conduct inspections to determine the date of Substantial Completion and Final Completion, will review written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment.

**ARTICLE 3**

**OWNER**

**3.1 DEFINITION**

**3.1.1**

The Owner is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Town of Burlington or its designated representative.

**3.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

**3.2.1**

The Owner will, at the time of execution of the Agreement and any subsequent Change Orders, certify for the Contractor that financial arrangements have been made to fulfill the Owner's obligations under the Contract.

**3.2.2**

The Owner will furnish all documents describing the work.

**3.2.3**

Except as provided in Subparagraph 4.7.1. Owner will secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

**3.2.4**

Information or services under the Owner's control will be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.

**3.2.5**

The Owner will furnish the Contractor with three (3) copies of all Drawings and Specifications and revisions issued during the progress of the Work; all additional copies will be furnished upon request at the cost of reproduction.

**3.2.6**

The Owner, through its Designated Representative, will forward all instructions directly to the Contractor.

### **3.3 OWNER'S RIGHT TO STOP THE WORK**

#### **3.3.1**

If the Contractor fails to correct defective Work as required by the Owner or fails to carry out the Work in accordance with the Contract Documents or if the Owner will for any other reason so require, the Owner, by a written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated or until further written notice from the Owner; however, this right of the Owner to stop the Work will not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. The Contractor must resume the Work after such stoppage promptly upon written notice to do so from the Owner. If such stoppage is required through no fault of the Contractor, the Contract Time (and the dates for achieving Substantial Completion and Final Completion) will be extended by a period equal to the period of the stoppage, and the Contractor will be compensated for its reasonable and justifiable cost incurred as a result of such stoppage.

### **3.4 OWNER'S RIGHT TO CARRY OUT THE WORK**

#### **3.4.1**

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within seven days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to any other remedy he may have, perform such work or cause such work to be performed and/or make good such deficiencies. In such case an appropriate Change Order will be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for additional services made necessary by such default, neglect or failure. If the payments then or thereafter due the Contractor are not sufficient to cover the amount, the Contractor must pay the difference to the Owner.

### **3.5 OWNER'S RIGHT TO TERMINATE CONTRACT**

#### **3.5.1**

The Town reserves the right to terminate this Contract at their discretion with thirty (30) days written notice to the contractor. In the event of Contract termination, all finished or unfinished work, or un-used material, already paid for under Contract prices, will become the property of the Town of Burlington.

## **ARTICLE 4**

### **CONTRACTOR**

#### **4.1 DEFINITION**

##### **4.1.1**

The Contractor is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.

#### **4.2 REVIEW OF CONTRACT DOCUMENTS**

##### **4.2.1**

The Contractor must carefully study and compare the Contract Documents and must at once report to the Owner any error, inconsistency or omission he may discover. The Contractor will not be liable to the Owner for any damage resulting from errors, inconsistencies or omissions in the Contract Documents which he discovers but will be liable for damage to the extent he reasonably should have but failed to discover such errors, inconsistencies or omissions. The Contractor will perform no portion of the Work at any time without Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

#### **4.3 SUPERVISION AND CONSTRUCTION PROCEDURES**

##### **4.3.1**

The Contractor must supervise and direct the Work, using his best skill and attention which will not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor must maintain adequate supervisory personnel at the Site during the performance of the Work. He will be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

##### **4.3.2**

The Contractor will be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor. This obligation will also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the work.

##### **4.3.3**

The Contractor will not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Owner in its administration of the Contract.

#### **4.4 LABOR AND MATERIALS**

#### **4.4.1**

Unless otherwise provided in the Contract Documents, the Contractor will provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and service necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

#### **4.4.2**

The Contractor will at all times enforce strict discipline and good order among his employees and will not employ on the Work any unfit person or anyone not skilled in the task assigned to him including all persons on the Site controlled directly or indirectly by the Contractor.

### **4.5 WARRANTY**

#### **4.5.1**

The Contractor warrants to the Owner that all materials and equipment furnished under this Contract will be new and of recent manufacture unless otherwise permitted in writing by the Owner and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective and, promptly after written notification of non-conformance, will be repaired or replaced by the Contractor with Work conforming to such requirements. If required by the Owner, the Contractor will furnish satisfactory evidence as to the kind and quality of materials and equipment.

### **4.6 TAXES**

#### **4.6.1**

The Contractor will pay all applicable sales, consumer, use and other similar taxes for the Work or portion thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective.

### **4.7 PERMITS, FEES AND NOTICES**

#### **4.7.1**

Unless otherwise expressly provided in the SPECIAL CONDITIONS, the Contractor will secure and pay for all permits and fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received, and the same will at all times be the property of the Owner and will be delivered to the Owner upon completion of the Project.

#### **4.7.2**

The Contractor must give all notices and comply with all federal, state and local laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work. The Contractor must provide the Owner with reproductions of all permits, licenses and receipts for any fees paid. The Owner represents that it has disclosed to the Contractor all orders and requirements known to the Owner of any public authority particular to this Contract.

#### **4.7.3**

If the Contractor observes that any of the Contract Documents are at variance with applicable laws, statutes, codes and regulations in any respect, he must promptly notify the Owner in writing, and any necessary changes must be accomplished by appropriate Modification.

#### **4.7.4**

If the Contractor performs any Work which he knows or should know is contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he will assume full responsibility therefore and will bear all costs attributable thereto.

### **4.8 SUPERINTENDENT**

#### **4.8.1**

The Contractor must employ a competent superintendent and necessary assistants who will be in attendance at the Project site at all times during the progress of the Work. The superintendent will represent the Contractor and all communications given to the superintendent will be as binding as if given to the Contractor. Important communications will be confirmed in writing. Other communications will be so confirmed on written request in each case.

### **4.9 PROGRESS SCHEDULE**

#### **4.9.1**

The Contractor, immediately after being awarded the Contract, must prepare and submit for the Owner's information an estimated progress schedule for the Work. The progress schedule must be related to the entire Project to the extent required by the Contract Documents, and will provide for expeditious and practicable execution of the Work. No work will start without the Project schedule. The Contractor must submit the project schedule five days prior to start the work.

### **4.10 DOCUMENTS AND SAMPLES AT THE SITE**

#### **4.10.1**

The Contractor must maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, and "As-Built"

Drawings and Specifications in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These will be available to the Owner upon completion of the Work.

#### **4.11 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

##### **4.11.1**

Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

##### **4.11.2**

Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

##### **4.11.3**

Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

##### **4.11.4**

The Contractor must review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.

##### **4.11.5**

By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all material, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

##### **4.11.6**

The Contractor will not be relieved of responsibility for any deviation from the requirements or the Contract Documents by the Owner's approval of Shop Drawings, Product Data or Samples or the Owners' approval of the same unless the Contractor has specifically informed the Designated Representative in writing of such deviation at the time of submission and the Designated Representative has given written approval to the specific deviation. The Contractor will not be relieved from responsibility from errors or omissions in the Shop Drawings, Product Data or Samples by the Owner's approval thereof.

**4.11.7**

The Contractor must direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Owner or its Designated Representative on previous submittals.

Designated Representative

**4.11.8**

No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample will be commenced until the submittal has been approved by the Owner or Designated Representative . All such portions of the Work will be in accordance with approved submittals.

**4.12 USE OF SITE**

**4.12.1**

The Contractor will confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and must not unreasonably encumber the site with any materials or equipment.

**4.13 CUTTING AND PATCHING OF WORK**

**4.13.1**

The Contractor will be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

**4.13.2**

The Contractor must not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work or by excavation. The Contractor must not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor. The Contractor must not unreasonably withhold from the Owner or any separate contractor his consent to cutting or otherwise altering the Work.

**4.14 CLEANING UP**

**4.14.1**

The Contractor at all times will keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work he will remove all his waste materials and rubbish from and about the Project in full compliance with all applicable laws and regulations as well as all his tools, construction equipment, machinery and surplus materials and the Project must be thoroughly cleaned and ready for immediate occupancy by the Owner.

**4.14.2**

If the Contractor fails to clean up at the completion of the Work, the Owner may do so as provided in Paragraph 3.4 and the cost thereof will be charged to the Contractor.

#### **4.15 COMMUNICATIONS**

##### **4.15.1**

The Contractor must forward all communications to the Owner's designated representative.

##### **4.16.2**

The Contractor will at all times have a designated representative in the field that is authorized to act on behalf and make decisions for the Contractor under this contract agreement.

#### **4.16 ROYALTIES AND PATENTS**

##### **4.16.1**

The Contractor must pay all royalties and license fees. He must defend all suits or claims for infringement of any patent rights and will save the Owner harmless from loss on account thereof, except that the Owner will be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor believes or has reason to believe that the design, process or product specified is an infringement of a patent, he will be responsible for such loss unless he promptly gives such information to the Owner, and thereafter the Owner insists on the use of the design, process or products specified.

#### **4.17 INDEMNIFICATION**

##### **4.17.1**

To the fullest extent permitted by law, the Contractor will indemnify and hold harmless the Owner, the Designated Representative, and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury or destruction of tangible property (other than the Work itself) including the loss of use resulting there from, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified there under. Such obligation will not be construed to negate, abridge, or otherwise reduce any other right or of indemnity which would otherwise exist as to any party or person described in this Paragraph 4.17.

##### **4.17.2**

In any and all claims against the Owner the Designated Representative or any of their agents or employees by any employee of the Contractor, any Subcontractor anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.17 will not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or



for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

**4.17.3**

The obligations of the Contractor under this paragraph 4.17 will not extend to the liability of the Owner, the Designated Representative, their agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) written directions or instructions given by the Owner, the Designated Representative, their agents or employees, provided they are the sole cause of the injury or damage.

**ARTICLE 5**  
**INSURANCE**

Contractor must provide insurance as specified below:

**General Liability**

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Includes:

- Comprehensive form
- Premises/Operations
- Underground Explosion & Collapse Hazard
- Products / Completed Operations
- Independent Contractors
- Broad From Property Damage
- Personal Injury

Each Occurrence	\$1,000,000
Aggregate	\$2,000,000

**Automobile Liability**

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Includes:

- All Owned Vehicles
- Hired Vehicles
- Non-owned Vehicles

Bodily Injury & Property Damage Combined	\$1,000,000
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**Workers Compensation & Employers Liability**

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- As Required by State of Massachusetts

Each Accident	\$100,000
Bodily Injury by Disease (Policy Limit)	\$500,000
Bodily Injury by Disease (Each Employee)	\$100,000

**Additional Insurance / Requirements**

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- The Town of Burlington Will be named as Additional Insured

**ARTICLE 6**  
**LIQUIDATED DAMAGES**

**6.1 LIQUIDATED DAMAGES**

If the Contractor neglects, fails or refuses to complete the work as herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to Owner the amount of \$1,000 per day, not as a penalty but as liquidated damages for such breach of Contract as hereinafter set forth, for each and every calendar day that the Contract will be in default after the date stipulated in the Contract for completing the work.

## SPECIFICATIONS

### General

#### NOTICE TO OWNERS OF UTILITIES

(Supplementing Subsection 7.13)

Written notice shall be given by the Contractor to all public service corporations or municipal and State officials owning or having charge of publicly or privately owned utilities at least one week in advance of the commencement of operations that will affect the utilities. The Contractor shall, at the same time, file a copy of such notice with the Engineer.

Before commencing work on service connections, the Contractor shall be responsible for contacting the Electric Company servicing the area to obtain construction requirements, standards, and to give adequate notice of commencement of work. The Contractor's attention is further directed to the requirements of Work in the Immediate Vicinity of Certain Underground Structures and Poles herein included in these Special Provisions.

The following are the names of owners and representatives of the principal utilities affected, but completeness of this list is not guaranteed by the Department:

#### Town of Burlington

Burlington Fire Department  
29 Center Street  
Burlington, MA 01803

Michael Hanafin  
Fire Prevention Captain  
Phone:(781)-238-5640

Burlington Police Department  
45 Center Street  
Burlington, MA 01803

Chief Michael Kent  
Phone:(781)-505-4920

Department of Public Works  
25 Center Street- Annex Building  
Burlington, MA 01803

Brian White, P.E.  
Asst. Town Engineer  
Phone:(781)-270-1640

#### Electric

Eversource Electric  
247 Station Drive, NWBED 180  
Westwood, MA 02090

Steve Owens  
Phone:(508)-441-5881

#### Telephone

Verizon  
385 Myles Standish Blvd  
Taunton, MA 02780

Karen Mealey  
Phone:(774)-409-3160

#### Gas

National Grid Gas  
40 Sylvan Rd  
Waltham, MA 02451

Melissa Owens  
Phone:(781)-907-2845

Tennessee Gas Pipeline  
8 Anngina Drive  
Enfield, CT 06082

David Wood  
Phone:(860)-763-6005

Cable

Comcast  
676 Island Pond Road  
Manchester, NH 03109

Wendy Brown  
Phone:(603)-541-1082

RCN  
956 Massachusetts Avenue  
Arlington, MA 02476

Margot Jones  
Phone:(781)-316-8881

AT&T/ TCA, c/o Siena Engineering  
50 Mall Road – Suite 203  
Burlington, MA 01803

Hayleigh Walker  
Phone:(781)-221-8400

Other Affected Parties are:

Vanasse Hangen Brustlin, Inc.  
101 Walnut Street  
Watertown, MA 02471-9151

David Greenberg, P.E.  
Senior Project Manager  
Phone :(617)-924-1770

The Contractor shall make his own investigation to assure that no damage to existing structures, drainage lines, traffic signal conduits, and other utilities will occur as a result of construction operations.

The Contractor shall notify "Mass. DIG SAFE" and procure a DIG SAFE number of each location prior to disturbing ground in any way.

**"DIG-SAFE" Call Center: Telephone 1-888-344-7233**

PROTECTION OF UTILITIES AND PROPERTY  
(Supplementing Subsection 7.13)

The Contractor, in constructing or installing facilities alongside or near sewers, drains, water or gas pipes, electric or telephone conduits, poles, sidewalks, walls, vaults or other structures shall sustain them securely in place. The Contractor shall coordinate with the officers and agents of the various utility companies and municipal departments to assure that the services of these structures are maintained. The Contractor shall also be responsible for the repair or replacement, at no additional cost to the Owner, of any damage to such structures caused by construction operations. The Contractor is responsible to leave them in the same condition as they existed prior to commencement of the work. In case of damage to utilities, the Contractor shall promptly notify the utility owner and shall, if requested by the Engineer, furnish labor and equipment to work temporarily under the utility owner's direction. Pipes or other structures damaged by the operation of the Contractor may be repaired by the Town or by the utility owner which suffers the loss. The cost of such repairs shall be borne by the Contractor, without compensation therefor.

If during construction there is an existing utility and/ or structure found to be in conflict with the proposed work under this Contract, the Contractor shall protect and maintain the

services to the utilities and structures. The Engineer will, as soon as possible identify the utilities to be relocated or other such activities deemed suitable for resolution.

If live service connections are to be interrupted by excavations of any kind, the Contractor shall not break the service until new services are provided. Abandoned services shall be plugged off or otherwise made secure.

Full compensation for furnishing all labor, materials, tools, equipment and incidentals for doing all the work involved in protecting or repairing property as specified in this Section, shall be considered included in the lump sum price bid and no additional compensation will be allowed therefor.

#### ACCESS TO UTILITIES

The Contractor shall provide access to the Owner of any private or publicly owned utility in the event of an emergency. The Contractor shall accurately locate any structures whenever the structures are to be lowered below grade. The Contractor shall be available to access any buried structure 24 hours a day with a minimum 1 hour response time.

#### WORK IN THE IMMEDIATE VICINITY OF CERTAIN UNDERGROUND STRUCTURES AND UTILITY POLES

For overhead connections, the Electric Company servicing the area will make the connection from the top of the riser on the utility pole to the power source. The Contractor shall supply all labor, materials and equipment to install the service connection, complete in place and in accordance with the Electric Company procedures, from the controller to and including the riser with enough wire coiled above the riser to permit the Electric Company servicing the area to make the final connection.

For underground connections, the Electric Company servicing the area will perform the actual wiring of the service connections from its power source to the sweep at the local controllers, but all steel sweeps, ducts, entrance holes into manholes, patching and all other necessary labor, materials and equipment required to install the electric service, complete in place, shall be furnished by the Contractor.

The Contractor shall pay the Electric Company servicing the area for their services rendered for the connection of overhead and underground service connections.

Before starting work at existing manholes, the Contractor shall test for gas and blow out the manholes.

#### WORK DONE BY OTHERS

Relocation and/or resetting to new grades of all private utilities, including utility poles, gas gates, telephone and electric manholes, made necessary by the construction of this project, will be accomplished by the respective utility companies.

The Contractor must prosecute the work efficiently and with the least possible delay.

Immediately after award of the Contract, the Contractor shall confer with the owners of all utilities to assure that relocations of facilities and services may be made at times consistent with operations under this Contract.

#### MAINTENANCE OF TRAFFIC SIGNALS

It shall be the responsibility of the Contractor to provide all labor, equipment and material required for the total maintenance and repair of all proposed traffic signal control equipment, including damage by automobile accidents until final completion and acceptance of the project, unless otherwise specified under Subsection 7.17 "Traffic Accommodation: of the Standard Specifications as amended, in which case Subsection 7.17 will govern. These provisions will apply to the signalized location included as part of this construction Contract from the date of written notice given to the Engineer that the Contractor will work on or adjacent to an existing signal until the date when the Town accepts the complete project. This written notice must be given before the Contractor may proceed with any work on the specified traffic signal location. For the purpose of these Special Provisions, the phrase "Traffic Signal Control Equipment" is intended to include, but is not limited to, controllers, signal housings, supporting structures, cabinet accessories and panels, wires, conduit and all other ancillary electrical equipment used for traffic control.

#### FINE TUNING, ADJUSTMENT, AND TESTING PERIOD

After the Contractor has finished installing the controller and all other associated signal equipment and after the Contractor has set the signal equipment to operate as specified in the Contract documents, the fine tuning, adjusting and testing period shall begin. The Contractor shall advise the Engineer, in writing, of the date of the beginning of the fine tuning and testing period. This period shall not start until the work at the intersection is complete. During this period, the Contractor, under the direction of the Engineer, shall make necessary adjustments and tests to insure safe and efficient operation of the equipment. This period shall not last for more than 30 days and the Contract completion date has taken this testing period into consideration. No request for final acceptance will be considered until successful completion of the testing period.

The Contractor shall notify the Engineer in writing of the starting date of the fine tuning period prior to the starting date.

#### FINAL INSPECTION AND ACCEPTANCE

Upon successful completion of the 30 day testing period wherein the traffic signal system has operated for 30 days without failure, the Contractor shall notify the Engineer. The Engineer will make a final inspection of the installation in the presence of the Town of Burlington and the Contractor. An inspection check will be made to ensure that all equipment, materials, installations and operations are in accordance with the construction contract, plans and specifications. Items to be checked will include, but not be limited to, traffic signal systems operation, cabinet equipment, documents (wiring diagrams, instruction manuals, parts list, warranties, grounding resistivity test report, etc.), signs, and pavement markings, and street hardware (posts, bases, housings, brackets, etc.).

The Engineer will notify the Contractor in writing of any items in which the inspection reveals that the work is incomplete, defective, or does not otherwise meet the project specifications. The Contractor shall perform the corrective actions necessary to achieve final acceptance by the Town of Burlington. These corrective actions shall be done by and at the expense of the contractor and within 15 days of the date of the inspection report, unless otherwise approved in writing by the Town.

#### GUARANTEE AFTER FINAL ACCEPTANCE

The Contractor shall diagnose (troubleshoot) the system and replace any part of the traffic signal system found to be defective in workmanship, material or manner of functioning within six months from date of final acceptance of all the installations under this Contract. This requirement does not affect the one-year warranty period on equipment specified in Subsection 815.20 of the Standard Specifications.

Upon the date of acceptance of the project by the Town, the Contractor shall turn over all guarantees and warranties to the Town of Burlington.

#### PROPERTY BOUNDS

The Contractor shall exercise due care when working around all property bounds which are to remain. Should any damage to a bound result from the actions of the Contractor, the bound shall be replaced and/or realigned by the Contractor as directed by the Engineer at no cost to the Owner.

#### ARCHITECTURAL ACCESS BOARD TOLERANCES

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards.

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR – Rules and Regulations of the Architectural Access Board.

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheelchair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.



EXISTING CONDITIONS

Before any work commences, the Contractor shall conduct pre-existing conditions photographic documentation for each property within the project limits. The documentation shall clearly show the existing conditions of each property including but not limited to any foundations, walls, wells, driveways, fences and landscape areas. At the end of all construction activities, the Contractor shall take a post construction documentation of the same areas. The Contractor shall provide the Town with two (2) copies.

### Item 120.1 – Unclassified Excavation

The work under this item shall conform to the relevant provisions of Section 120 of the Standard Specifications for Highways and Bridges and the following:

The work shall include the disposal of existing materials shown on the drawings to be removed and reset, but which in the judgment of the Engineer are unsuitable for reuse in the proposed work and their disposal is not paid for under a separate item.

The work shall also include the excavation of material of every description regardless of the type encountered, from within the project limits as shown on the drawings and as directed by the Engineer, included with the work specified to be performed under other items of this Contract.

The Contractor is responsible for adequately protecting and supporting any utilities exposed during excavation. Any damage to a utility caused by the Contractor failing to sufficiently protect and support it will be replaced and/or repaired by the Contractor at no cost to the owner. Payment for protection and support of utilities shall not be paid separately but shall be incidental to the Contract lump sum bid price.

### Item 141.1 – Test Pit for Exploration

Work under this item shall conform to the relevant provisions of Section 140 of the Standard Specifications and the following:

The Contractor shall not perform any test pits exploration without the approval of the Engineer for the test pit location and size.

The Engineer may require hand excavation or vacuum explorations to avoid damaging surrounding utilities.

Item 191. – Drive Sample Boring

Item 191.10 – Hollow Stem Auger Boring

Item 191.11 – Core Boring

Item 193. – Mobilization and Dismantling of Boring Equipment

The work under these items shall conform to the relevant provisions of Section 190 of the Standard Specifications and the following:

The work under these items shall include mobilization and set-up of boring equipment, the drilling of hollow stem auger borings, drive sample borings and rock core borings, the retrieval of soil samples, the visual classification of the soil, the recording of boring logs and samples, and the dismantling and transporting of the equipment to and from each site.

Hollow stem auger borings shall be taken at the locations of the proposed traffic signal mast arm foundations as shown on the plans and as directed by the Engineer. The Engineer shall be notified a minimum of 72 hours before borings are taken. Borings shall be taken to a minimum depth of 20 feet at the location of each mast arm.

Two types of samples will be required in vertical soil borings:

1. Standard Sample. A standard penetration test using a split spoon sampler shall be made at the ground surface and at every change in soil stratum, but the sampling intervals shall not exceed 5 feet in a continuous stratum. The auger hole shall terminate at the required bottom elevation and a split spoon sample shall be taken at the bottom of the hole.
2. Supplement Sample. A volume sample shall be taken at 5-foot intervals in order to classify the subsurface soils with respect to grain size and visual classification as required. Each sample shall consist of the remainder of the spoon sample and shall be contained in quart jars appropriately labeled.

The purpose of this method along with its sampling procedure is to determine the visual properties, arrangement and thickness of the various soil strata as they exist in the ground. The elevations/depths at which any change in stratification occurs shall be located and recorded on the log by the driller. Detection of stratum changes should be made by careful observation of the soil as it exists in the augered hole and by the rate of penetration of the auger during drilling.

The auger casing I.D. shall be a minimum of 2-3/4 inches for all holes in which split spoon samples are required. The O.D. shall be a maximum of 7 inches to limit the size of the resulting hole.

**Supplement Samples**

The quart jar samples shall have positive identification of the contents by typewritten glued-on label.

The following information shall be shown:

1. Name and address of boring contractor
2. Date sample was taken
3. Location and name of project.
4. Location of borehole by station and offset or identifying number of borehole, if so identified on the plan.
5. Depth below ground surface at which sample was obtained and recorded blow counts of 6 inches of penetration of the sampler.

Upon completion of all borings, the Contractor shall submit two copies of the typewritten boring logs to the Engineer.

**Obstructions**

Obstructions other than ledge shall be considered in accordance with Sub-section 190.60E of the Standard Specifications. The actual location of the additional boring will be specified by the Engineer. When ledge is encountered, a rock core boring will be made in accordance with Sub-section 190.63 of the Standard Specifications.

**Rock Core**

If rock is encountered at an elevation above the specified highest bottom elevation, then a rock core boring will be made in accordance with Sub-section 190.63 of the Standard Specification. The core hole shall be large enough to accommodate the required auger casing so that sampling may be continued past the rock obstruction. The minimum cored depth shall be 10 feet.

**Practical Refusal**

Practical refusal of the sample spoon or "refusal" is as defined by Sub-section 190.60F of the Standard Specifications.

Due to the size of the resulting auger hole, it is particularly important that upon completion, all borings shall be backfilled with clean, well-graded sand and tamped to fill all voids created during the augering procedure.

**Advancing the Boring for Soil Sampling**

As the boring is advanced, care shall be taken to note and record the depth where wet soil is encountered if this should occur.

If groundwater is encountered then the water level in the hollow stem shall be maintained at the top of the casing at all times during the sampling operation to avoid unequal hydrostatic pressure that could result in blow-in of fine-granular soils and inaccurate blow counts.

In each boring the driller shall record the water level prior to backfilling and whenever possible, prior to the start of each day's work.

Each boring shall be advanced by using a hollow stem auger with cutting head and center rod and plug assembly. The hollow stem auger will advance and case the hole simultaneously to the required sampling levels. The center rod and plug assembly is held in place by the cap and inside drill rod connecting the auger and its assembly to the rotating spindle on the drilling machine to prevent soil from entering the mouth of the auger. Upon reaching the sampling level, the plug is to be retreated by withdrawing the center rod to permit lowering of the sampler through the auger.

The sample shall be obtained by driving the sampler 18 inches into the undisturbed material below the bottom of the auger. The sampling and handling procedure shall be as specified under Sub-section 190.61 of the Standard Specifications.

After the sampling operations are completed and the sampler has been retracted, the plug is re-inserted and held in place by the center rod; another auger section is connected to the first, together with one additional center rod section to secure the plug to the cap and the hole is advanced.

This procedure shall be repeated until the required bottom elevation is reached. The auger shall be stopped at any depth level to allow normal sampling practices upon request by the Engineer.

If, in the judgment of the Engineer, the borehole cannot be advanced by the hollow stem auger method due to the material encountered (with the exception of bedrock) and every attempt has been made by the driller to complete the boring using the conventionally cased, drive sample, wash boring method as specified in Section 190 of the Standard Specifications, then the borehole shall be cored.

Item 472. – Temporary Asphalt Patching

The work under this item shall conform to the relevant provisions of Section 472 of the Standard Specifications and the following:

The work shall include placement of hot mix asphalt for temporary pedestrian and vehicular access as well as traffic management and maintenance.

The Contractor is advised that this material will have to be placed primarily by hand methods.

Item 580. – Curb Removed and Reset

Item 594. – Curb Removed and Discarded

Work under these Items shall conform to the relevant provisions of Section 500 of the Standard Specifications and the following:

The Contractor shall only reset existing curbing that has been approved by the Engineer for re-use. All unsuitable pieces shall be legally disposed of off-site.

Granite curb not required to be removed and reset, shall become the property of the Contractor and shall be removed from the site during the construction period and legally disposed of off-site.

Curved granite curb with different radius than the proposed curb are unsuitable for reuse.

Damaged curb stones are unsuitable for reuse.

All stones to be reused which have damaged ends shall be sawcut square with the top plane so when stones are placed end to end the joint opening does not exceed one half inch.

Reset curb shall be reset contiguously. New curb stones shall be installed contiguously. Alternating new and old stones shall not be permitted.

The Contractor is advised that granite curb removed may be reset elsewhere at a different location within the Contract limits and all costs incurred for handling and transporting existing curb shall be included in the Contract lump bid price.



## Item 701. – Cement Concrete Sidewalk

### Item 701.1 – Cement Concrete Sidewalk at Driveways

### Item 701.2 – Cement Concrete Wheelchair Ramp

The work under this item must conform to the relevant provisions of the *Standard Specifications for Highway & Bridges* and the following:

This work shall consist of the installation of cement concrete sidewalk. Concrete shall have fiber mesh added at the plant. All work shall conform to the latest edition of the MassDOT, AAB, and ADA standards.

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope, nor for dimensions less than the minimum dimensions.

Sidewalks shall be constructed in accordance with requirements as set forth in this specification, including placement of alternating sections, thirty (30) feet in length and provided with expansion joints. Expansion filler shall also be used at pours against existing sidewalks, buildings, walls, other hard objects, and to create isolation areas around existing utility poles, fire hydrants, etc. Expansion joints shall be comprised of a felt based material capable of resisting moisture penetration, and provide adequate thermal expansion/contraction of the concrete. The expansion joint shall be installed to complete depth of the pour.

Control joints should be scored or saw cut to a depth of one quarter (1/4) inch per one (1) inch of poured depth of the sidewalk. For example, for a pour of four (4) inches, the scored or saw cut depth shall be one (1) inch. Scored or saw cut joints shall be installed every five (5) feet, square to the face of granite curbing, to make a square panel.

Four (4) inches of cement concrete will be placed upon eight (8) inches of compacted gravel, for all sidewalks, and six (6) inches of cement concrete will be placed upon eight (8) inches of compacted gravel for all driveway crossings, curb cuts, and access ramp locations. The depth of and compaction of the gravel sub base should be checked using a level edge capable of spanning the width sidewalk, from curbing to form, and the depth to the top of the compacted gravel will be measured from the bottom of the level edge. The purpose of the measurement is not to check the depth of gravel, but rather to check that the area has been prepared to an appropriate depth, for the appropriate pour depth.

Concrete for sidewalk shall be 5,000 psi at twenty eight (28) days, with three quarter (¾) inch coarse aggregate, 705 pounds cement per cubic yard, seven (7) percent air entrained (AASHTO – M154), Type A water reducing admixture (AASHTO – M194), four to five (4 to 5) inch slump, and fiber mesh.

Once the concrete arrives on site and it is determined to need a small addition of water before the pour, water must be added prior to discharge from the shoot, and spun a minimum of thirty (30) times at mixing speed. During the pour, if the concrete is setting

too quickly due to heat or wind, **NO WATER** is allowed to be added once it has been poured. Instead a curing agent must be added to slow the curing process, allowing more workable time with the concrete.

*Fiber mesh*

Fiber mesh fibers (100% virgin polypropylene, collated, fibrillated fibers) at a rate of one to one and a half (1.0 to 1.5) pounds per cubic yard of concrete shall be added for reinforcement. Fiber mesh shall be FIBERMESH 150, manufactured by PROPEX Concrete Systems or an approved equal. Installation shall be per manufacturer's recommendations.

Contractor is responsible for securing areas with curing concrete, and shall supply barricades or watchmen, as necessary to prevent defacement of concrete surfaces.

The contractor will warranty the installation of all concrete flatwork for a period of one (1) year from the date of installation, or the last installation date in the event of a large pour over multiple days, for any damage or defects caused by poor product, installation methods/techniques, or other issues that arise within the warranty period. The contractor will also warranty the work for a period of three (3) years against spalling, from de-icing chemicals. Warranty work will be considered incidental to the original bid price as set forth in the Bid Form, and no additional monetary compensation will be paid for by the Owner, for all labor, equipment, material, etc., necessary to repair the damage.

Once the Contractor is notified they will be required to repair or remove and replace and damaged concrete sidewalk, under the direction of the Engineer, the repairs will be required in a timely manner. Failure to complete the work in a timely manner, as agreed upon by the Engineer, could result in the Contractor to be considered in breach of contract at be barred from being awarded any future contracts, or be required to complete the warranty work before any work can begin on a new contract.

In the event that warranty work is undertaken by the Contractor, as directed by the Engineer, than the warranty timeframe will reset, and start back at time zero (0). The Contractor will also be responsible for repairing any damage to adjacent areas of the concrete sidewalk, as a result of their work to repair/remove the concrete sidewalk, at no additional cost to the Owner. All necessary repair work will be dictated to the Contractor by the Engineer/Owner.

### Item 804.3 – 3-Inch Electrical Conduit Type NM Plastic (UL)

The work under this Item shall conform to the relevant provisions of Section 801 of the Standard Specifications and the following:

The work shall include the furnishing and installation of 3-inch non-metallic conduit for the traffic signal system in accordance with the plans and as directed by the Engineer.

The conduit material shall be Schedule 80 polyvinyl chloride (PVC) plastic conduit.

The linear footage of conduit estimated under this Item is not guaranteed by the Engineer; it may be increased or decreased by the Engineer depending upon actual conditions encountered as provided for in Section 4.06 of the Standard Specifications.

Where new conduits are installed in existing grass areas outside the limits of grading, the work shall include the placement of a minimum of 4 inches of topsoil and sod to restore the disturbed areas to their original condition, unless otherwise directed by the Engineer. No separate payment will be made for this work, but all costs in connection therewith shall be included in the Contract lump sum bid price.

Where conduit is installed in existing sidewalk or paved median areas to remain, the work shall include replacement of the gravel base material and the surface pavement to match preconstruction conditions unless otherwise noted on the plans. No separate payment will be made for this work, but all costs in connection therewith shall be included in the Contract lump sum bid price.

Metallic warning tape shall be placed above the conduit as shown on the Construction Details.

A ¾-inch polypropylene pull rope shall be installed in all conduit.

### Item 816.01 – Traffic Signal Reconstruction Location No. 1

The work under this Item shall conform to the relevant provisions of Section 800 of the Standard Specifications, the 2009 Manual on Uniform Traffic Control Devices (MUTCD), and the following:

The work shall include the furnishing and installation of part or all of the following items: local traffic signal controller; cabinet and foundation with concrete pad; mast arm assemblies with anchor bolts and foundations; signal posts and foundations; pull boxes; signal heads; backplates; pedestrian signals with countdown timers; audible pedestrian signal (APS) push buttons with signs; single-point vehicle detection; emergency vehicle preemption; Connected Vehicle Hybrid Bridge Traffic Signal System (CVHBTSS); all cable and wiring; ground rods, equipment grounding and bonding; and all other equipment, materials and incidental costs necessary to provide complete, fully operational traffic control signal system as specific herein and as shown on the plans. The location is as follows:

- Winn Street at Peach Orchard Road

The Contractor shall integrate the above intersection into the existing cloud-based Town of Burlington Central Management System (CMS) Trafficware ATMS.NOW. The Contractor shall include any software/hardware to allow for this integration including but not limited to cabling and licenses.

Lists of the major traffic signal items required at this location is included on the plans.

#### **Shop Drawings**

Within 30 days following execution of the Contract, the Contractor shall submit shop drawings for signal supports, a list of equipment, and manufacturer's equipment specifications to the Engineer in accordance with the relevant provisions of Section 815.20.

No work shall be commenced by the Contractor until approval of the shop drawings and manufacturer's data has been received in writing from the Engineer. Approval of these drawings will be general in character and shall not relieve the Contractor from the responsibility of, or the necessity of, furnishing materials and workmanship conforming to the plans and specifications.

The Design Consultant shall return the shop drawings within 15 days from the date of receipt from the Engineer.

The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer.

### **Signal Turn-on**

Prior to initial turn-on of the new signal, equipment, signal displays, and vehicle detection as shown on the plans and called for in these special provisions, shall be installed and operable. Applicable signs and pavement makings shall also be in place when the signals are put into operation.

### **Existing Installation**

The existing signal system to be reconstructed under this Item shall be maintained in operation throughout the construction period and until the new signal is ready for operation. The Contractor may use temporary supports for signal heads as necessary to allow construction activities.

Any temporary installations shall be in conformance with the MUTCD at all times. If an existing signal is to be turned off temporarily to allow controllers switch overs or rewiring, police detail shall be used to control traffic at the intersection.

Once construction is completed and the new signal is in operation, unused items of the old signals shall be completely removed and stacked as directed by the Engineer in accordance with Section 815.65. Old cable and unusable materials shall be disposed of by the Contractor.

### **Service Connection**

The service connection shown on the plans is approximate only. The Contractor shall determine exact location from the servicing utility, arrange to complete the service connection, and be responsible for all charges incidental thereto.

The respective utility company is responsible for making the connection from the respective riser to the overhead wires.

### **Testing of Grounding System**

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with MassDOT Standard Specifications.

### **Flashing Operation**

Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in the MUTCD.

### **Traffic Signal Equipment**

The traffic signal controller unit (CU) malfunction management units (MMU), and all other ancillary traffic signal control components included in the traffic control cabinet

shall comply with the National Electrical Manufacturers Association (NEMA) Standard No. TS 2-2003 (R2008) v02.06 and Amendment 4-2012 Traffic Controller Assemblies with National Transportation Communications for ITS Protocol (NTCIP) Requirements.

### **Traffic Signal Controller**

The traffic controller supplied shall conform to Section 3 “Controller Units” of the NEMA TS 2 Standard. The traffic controller shall be supplied in a TS 2 Type 1 Configuration as required in the list of major traffic signal items included on the plans.

The controller unit shall utilize an interface conforming to Subsection 3.3 of the NEMA TS 2 Standard. The controller unit shall utilize an input/output interface conforming to the requirements of Paragraph 3.3.1 for all input/output functions with the Terminals and Facilities (TF), Malfunction Management Unit (MMU), detector rack assemblies and auxiliary devices. The controller unit shall also meet the requirements of Paragraph 3.3.6 of the NEMA TS 2 Standard.

The controller unit shall be supplied with Port 1, Port 2, and Port 3 as defined by the requirements of Subsections 3.3.1, 3.3.2, and 3.3.3, respectively. It shall include a temperature compensated, 8 line by 40 character display with LED backlight. The controller operating system (OS) shall be Linux and contain a Flash File System to allow for controller software upgrades.

The controller shall support 1/10<sup>th</sup> second high-resolution data logging which provides detailed operational information allowing for the generation of enhanced performance metrics. This would include construction of Purdue Coordination Diagrams, time space diagrams and measures of effectiveness.

The controller unit shall meet the approval of the Town. Note: As part of the shop drawing submission the Contractor shall provide written approval of the controller unit from the Town.

### **Malfunction Management Unit**

The malfunction management unit (MMU) shall comply with Section 4 of the NEMA TS 2 standard, as defined by amendment 4-2012. The MMU shall be supplied as a NEMA MMU designation “MMU2” as defined in table 4-1 of the NEMA standards. The MMU shall operate as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian and 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU supplied shall be configured to operate as a Type 16 unit. The MMU shall be supplied with an Ethernet port and shall support Ethernet communications. The Malfunction Management Unit shall have the functionality to support MUTCD’s flashing yellow operations.

The MMU in either the Type 16 or Type 12 configuration shall operate in a NEMA TS 2 Type 1 cabinet, a NEMA TS 2 Type 2 cabinet, or a NEMA TS 1 cabinet without loss of functionality.

**Connected Vehicle Hybrid Bridge Traffic Signal System (CVHBTSS)**

The Contractor shall provide, install, and configure a Connected Vehicle Hybrid Bridge Traffic Signal System (CVHBTSS) and all necessary equipment to make a complete functional system. The Contractor shall label and wire all components into the traffic equipment. The CVHBTSS shall be as described in these specifications and shall satisfy the following requirements:

The CVHBTSS shall include a 10 year data/ service plan.

**Overview**

- A. The system shall integrate into the ATC traffic signal controller and provide connected vehicle applications to On-Board Units (OBU) and mobile devices through a Connected Vehicle Hybrid Bridge system using both V2X and cellular (C-V2X) and DSRC communications.
- B. A mobile device application shall connect to either cellular or DSRC radios to display CV applications.
- C. The system shall provide Signal Phase and Timing (SPaT) to mobile devices.
- D. The system shall display user defined Traveler Information Messages (TIM) messages on mobile devices.
- E. The system shall support MAP files (MAP) and SPaT files that determine the vehicle approach, links the lanes to the correct phases, and in turn provides the corresponding SPaT messages. When a vehicle approaches an intersection, they shall only receive the information from the traffic controller that relates to their approach.
- F. A web-based configuration utility shall provide a way of editing the MAP and SPaT information.
- G. The system shall use a GPS position of the vehicle/mobile device to determine when to provide the SPaT information to the vehicle/mobile device.
- H. The Contractor shall fully configure the CVHBTSS to include all features supplied by the CVHBTSS manufacturer. The Contractor shall submit to the Town of Burlington and the Engineer a list of all features that the CVHBTSS can perform during shop drawing submittal to allow the Town to choose which features to enable. There shall not be any additional fees, or costs to enable the features.
- I. The CVHBTSS shall be configured to allow for the remote display and control of the connected traffic signal controller via the CVHBTSS manufacturer cloud hosted web-based software. This feature shall not require the end user to create a separate VPN connection to the CVHBTSS.
- J. The CVHBTSS shall be configured to provide access to view the live stream of the detection system, including the video image of each approach, via the CVHBTSS web-based software. This feature shall not require the end user to create a separate VPN connection to the CVHBTSS.
- K. The CVHBTSS shall perform a load test of the connected Battery Backup System (BBS) batteries on a scheduled or on demand basis (if applicable).
- L. The CVHBTSS shall, within the size limitations above, include a battery and battery charging/monitoring circuit to allow the CVHBTSS to function correctly even when

- all power to the intersection has failed. The battery shall continue to power the CVHBTSS for a minimum of 5 hours after all power has failed to the intersection
- M. The CVHBTSS shall be supplied with an internal four (4) port Ethernet switch. An external non-integrated Ethernet switch shall not be allowed.
- N. The CVHBTSS shall be supplied with two (2) 120 VAC outlets that can be controlled using the CVHBTSS web-based software. Any external, non-integrated outlets shall not be allowed for this application.
- O. The CVHBTSS shall be able to be rack mounted within a 19' equipment rack installed within the ATCC.
- P. The hardware shall be able to be upgraded to support the future 5G cellular communications.
- Q. The CVHBTSS shall Display real time fault status of the traffic intersection to Town of Burlington:
- i. Incoming cabinet AC voltage
  - ii. Preemption outputs
  - iii. Cabinet temperature
  - iv. Cabinet humidity
  - v. Normal/flashing status of the intersection
  - vi. Stop Time status
  - vii. Cabinet door status
  - viii. Intersection fan status
  - ix. Realtime conflict monitor information
- R. The Contractor shall procure the 5.9Ghz DSRC FCC license on the behalf of Town of Burlington.
- S. The CVHBTSS shall be supplied with a four (4) channel detector card for interface into the traffic control cabinet to allow for direct inputs to the controller.
- T. The Contractor, working with the DSRC Hybrid Bridge system manufacturer, shall create and support a SCMS (Security Certificate Management System).
- U. The TSS shall support the following minimum applications
- i. SPaT/MAP display of signal timing – V2I
  - ii. Red-light running at traffic signals – V2I
  - iii. Emergency vehicle preemption – V2I
  - iv. Bus/transit priority – V2I
  - v. Motorist – Cyclist communication - V2V
  - vi. Motorist – Pedestrian communication – V2V
  - vii. Rear end collision warning – V2V
  - viii. Wrong way detection – V2I

**Connected Vehicle Hybrid Bridge Traffic Signal System (CVHBTSS) Client User Interface Requirements.**

The CVHBTSS software user interface shall provide at a minimum the following requirements:



**A. General**

- a. The user interface shall be web based and be able to be viewed in a web browser. Internet Explorer, Chrome, and Firefox browsers shall be supported.
- b. The CVHBTSS shall require a user name and password to log on.
- c. The CVHBTSS systems shall be mobile friendly and operators shall be able to open the system on a mobile device to access the data and control the system. The web-based system shall be viewable on any web browser and on a mobile device. The system display shall be automatically sized for the varying screen sizes.

**B. MAP files for connected vehicles.**

- a. The CVHBTSS shall include a web-based configuration tool for setting up the MAP messages for capturing the intersection. Input for the MAP configuration shall be configured by the Contractor, by drawing the lanes on a map image. Lanes shall be linked to phase data so that users are provide the correct information when they are approaching on a specific travel lane. Once configured these MAP files shall be saved at each intersection as well being saved on a cloud server where they shall be available for use by the TSS.
- b. The RSU-Processor shall be connected to the server where the MAP files are stored. A security check shall be performed on each of the MAP files by the RSU device to ensure that the most recent MAP file is used. Anytime the MAP file stored on the server is changed, the RSU-Processor shall securely retrieve the revised MAP file and store it locally at the intersection on the RSU device. The contents of the MAP file shall then be encoded in accordance with J2735 to make a MAP message. This MAP message shall then broadcast out of the DSRC and the cellular connection once per second. The On-board unit (OBU) and the mobile device shall retrieve the MAP messages over DSRC and cellular, where they shall be available for use in applications.
- c. It shall be possible to configure the following items in this file.
  - i. The approach lanes shall be identified by drawing a set of points on a map file that defines the lane. The lane width shall be configurable to define the size of the lane.
  - ii. Each lane approach shall include the name of the approach in relation to the intersection.
  - iii. Each lane shall have the lane phase that it links to. This is required such that the SPaT message from the controller is linked to the approaching lane.
  - iv. Each lane shall also include an allowed maneuvers field. This field defines the allowed maneuvers for the lanes, such as left only, straight only, straight and right, right on red, etc.

**i. Connected Vehicle Application Requirements**

The Connected Vehicle system shall support the following applications and conform to the requirements listed:

**1) SPaT/MAP Display of Signal Timing Overall Requirements**

- a. The CVHBTSS shall provide real time Signal Phase and Timing (SPaT) messages to the motorist. These SPaT messages shall be collected directly from the traffic signal controller and include the next phase information.
- b. When the CV/mobile device approaches an intersection, it shall receive the MAP files that include all the geometry of the traffic intersection, lanes and phase information.
- c. The CV/mobile device shall then determine where the device is relative to the intersection via GPS positioning and reference this to the MAP files. The mobile application shall then display the real-time traffic signal conditions for the phase/phases at the intersection the device is approaching.
- d. The display shall include the current traffic signal state and the countdown of when the traffic signal will change its state.
- e. The SPaT message shall not be derived from a database and/or algorithm that attempts to predict the next phase. This SPaT message shall be directly received from the ATC traffic signal controller.

**B. Intersection Road Side Processor (RSP) Device Requirements**

The CVHBTSS shall operate independent of the brand/type of ATC controller deployed at the intersection. The traffic controller shall support transmission of SPaT data. The Contractor shall install the necessary interface into each intersection control cabinet which connects the RSP to the traffic controller via an Ethernet port. The RSP shall be installed such that it receives all necessary inputs required to support the functionality defined by these specifications. The RSP shall conform to the following requirements:

- a. RSP shall operate between -34 degrees C and +74 degrees C.
- b. RSP shall incorporate an integrated GPS and a cell modem.
- c. RSP shall be able to communicate to multiple different radios via Ethernet communications.
- d. RSP shall receive the SPaT message from the traffic controller and send a processed J2735 SPaT message out the radio device. The RSP shall support multiple types of traffic controller with different formats and multiple different radios.
- e. RSP shall support J2735 compliant message for the radio using the 2016 standard and DER/UPR encoding schemes, as appropriate.
- f. RSP shall utilize a standard 120VAC input.
- g. RSP shall allow for the routing of the controller configuration packets to and from the controller (either by Ethernet or serial communications). In this way, it shall be possible to configure the controller, utilize the controller specific software to interrogate the controller, and have the RSP provide the communications pathway.
- h. RSP shall utilize field-initiated communications. This shall allow for cellular data plans to be used with infrequent polling. When an abnormal event occurs and is detected by the RSP, the RSP shall immediately initiate the transfer of a data packet to the RSP to enable real-time alerting of MassDOT and the Engineer to take place.

- i. RSP shall operate without requiring a static IP address. The only configuration required at the RSP shall be to enter the URL of where the CVHBTSS central software is hosted.
- j. RSP shall utilize Hyper Text Transfer Protocol System (HTTPS), and XML data structures, for communications with the CVHBTSS. In this way, the data shall be open for future expansion. The use of proprietary protocols shall not be permitted.
- k. RSP shall support “over the air” software updates to remotely update firmware software.
- l. RSP shall include Ethernet communications with an RJ45 connector.
- m. The RSP shall include a weatherproof, external cellular data antenna with sufficient DB gain necessary to fully support the functionality defined in these specifications.

**C. DSRC Roadside Unit (RSU) and On board Unit (OBU)**

- a. RSUs and OBUs shall comply with the all applicable FCC regulations.
- b. The Contractor shall provide the FCC’s Grant of Equipment Authorization showing that both RSUs and OBUs are FCC 47 CFR Parts 90 and 95L approved.
- c. The DSRC units shall support SAE J2735 communications protocols.
- d. The DSRC RSU and OBU shall support at a minimum:
  - i. Quad-Core ARM® Cortex A9 processor at 1GHZ
  - ii. 1GByte RAM
  - iii. 2 (2x2) QCA6584 Hi-Power DSRC Radios
  - iv. Ublox NEO-8ML ADR based Multi GNSS Navigation module
  - v. 10/100/1000 Mbps Ethernet
  - vi. Operating Voltage -12V DC
- e. The DSRC RSU shall include a Power over Ethernet (PoE) adaptor.
- f. The DSRC OBU shall include all power and antennas designed to be deployed in a vehicle.
- g. The DSRC OBU shall have the ability to communicate directly to a mobile device using Bluetooth.
- h. A DSRC unit shall be installed at each intersection within the project.
  - i. The Contractor shall interface the DSRC to the ATC controller via Ethernet connections.
  - ii. The DSRC shall be supplied with all equipment and software to support a fully operational system.
- i. OBUs shall be installed by the Contractor into ten (2) existing vehicles as directed by the Engineer.
  - i. All costs to install and configure the DSRC OBU shall be covered by the Contractor.

**D. Connected Vehicle In-Vehicle Mobile Device Application**

The Connected Vehicle Traffic Signal System shall conform to the following requirements:

**1) General**

- a. The mobile device application shall support, at a minimum, both Apple and Android devices.
- b. The mobile device application shall connect to the connected vehicle system through either cellular communications or via Bluetooth to a DSRC OBU.
- c. The mobile device application shall run in the background during mobile device operation.
- d. The mobile device application shall provide audible alerts for warnings messages.

**E. Hosting, Connectivity and Service.**

The Contractor shall furnish a 10-year service plan to support the connectivity for providing streaming digital video and data, as part of the purchase price of the TSS. The Contractor shall provide the option to extend the plan for another 5 years of connectivity for the system.

The CVHBTSS shall be the primary form of remote communication between the ATC controller and the existing ATMS system. All remote VPN connections between the ATC controller shall be configured by the Contractor to provide for a secure tunnel to the ATMS system. No unsecured connections shall be allowed.

The service plan shall include at a minimum:

- i. Cellular Connectivity.
- ii. Upgrade of the cellular modem if the existing technology is not supported by the cellular network.
- iii. No cellular overage charges.
- iv. Extended warranty on the hardware for the period of the service plan.
- v. Over-the-air software updates.
- vi. Over-the-air security updates.

**Single-Point Video System**

The Contractor shall provide and install a Single-Point Video Detection (SPVD) System at the project intersection as shown on the plans and these special provisions. The SPVD system shall include a single ultra-wide angle lens camera, video processor unit, detection algorithms, all cables, connections, mounting hardware, application software, and accessories required by the manufacturer for proper operation of the system, including but not limited to surge protection devices. No additional hardware, software items and/or subscription fees/ costs shall be needed/ allowed to satisfy the requirements in these specifications for the life of the project.

The SPVD system shall detect and monitor vehicles on approach roadways utilizing advanced, omni-directional, vehicle tracking algorithms along with three-dimensional vehicle modeling to supply accurate and consistent stop line detection. The SPVD system shall be able to count vehicles and store this information on a database that can be retrieved by the Town at a later date. The SPVD system shall include software for

counting vehicles, including turning movement counts by 15-minute time intervals and be capable of storing said data.

The SPVD system shall include all necessary software and hardware to allow the end user to program, setup, and/or modify detection zones within the video camera image. The system software shall be an installable client configuration software, and not be a web-based client program.

One pointing device and one color monitor within the controller cabinets for future viewing of the camera images shall be supplied by the Contractor. The Contractor shall also supply any necessary cables, interface devices and software for monitoring video detection via laptop computers.

The camera shall be mounted at the intersection, as shown on the plan or as directed by The Engineer,

At a minimum, the SPVD shall meet the following requirements:

Camera

- Power: 48 VDC, single burial grade CAT 5e cable
- Operating Temp: -35C to +60C
- Humidity: Up to 100%
- Dimensions: 10" diameter x 9"
- Weight: less than 11 lbs.
- The camera shall include an ultra-wide-angle lens.
- The camera shall include a heater to prevent the formation of ice and condensation.
- The camera, when properly installed and configured, shall be able to concurrently observe at least 5 lanes of traffic per approach.

The camera shall be able to concurrently observe more than one approach.

Video Processor Unit

- Power: 120-240 VAC, requiring 150 watts or less.
- Operating Temp: -34C to +74C
- Humidity: Up to 95% non-condensing
- Dimensions: 12.25" wide x 11.25" depth x 5" high
- Weight: 12 lbs.
- Enclosure: Rack mount in traffic cabinet The video processor unit shall save configurations and zone plans locally to maintain operation with or without monitoring equipment connected.  
The video processor unit shall be designed to function dependably in the adverse environment found in the typical roadside traffic cabinet.
- The video processor unit shall include at least 24 detector outputs.
- The video processor unit shall include an SDLC connection for TS2 type controllers.

- The video processor unit shall include o USB on the front surface for simple data collection on non-network systems. The video processor unit shall include both LAN and WAN RJ-45 interface ports on the front surface of the unit.

#### Application Software

- The application software shall support the creation and modification of at least twenty-four (24) polygonal detection zones within the graphical user interface.
- The application software will show images of the detection zones superimposed on the video image of traffic.
- The application software shall support the assignment of a detector output(s) to each zone. These assignments can be modified at any time through the software.
- The application software shall support direction of travel assignment within detection zones. The vehicle detection zone shall not activate for objects traveling any direction other than the one specified for detection. Cross-street and wrong way traffic shall not cause detection.
- The application software shall change the color of the zone within the graphical user interface as vehicles enter or exit a detection zone, changing its occupancy status. This will be required for real-time or historical monitoring and may be turned on or off by the user at any time.
- The application software shall provide visual indication of the light state for each zone within the graphical user interface.
- The application software shall feature the ability to digitally pan, tilt, and zoom within the camera's field of view without movement of the camera.
- The application software shall maintain a database of current and historical traffic data and allow for the user to run reports against this data to include traffic counts, turn movements, speed, and classification at a minimum.
- The application software shall feature the ability to mask objects that occlude the camera field of view and/or disrupt the camera automatic gain and exposure control.
- The application software shall feature an optional reporting interface offering point and click reporting for turning movement counts and vehicle classification.

The Contractor shall provide software that enables a technician to test all features and functions of the SPVD system, and to perform all set-up procedures. This software shall be delivered on a CD so that it can be installed on other tablets/laptops. The owner shall have the right to make and use an unlimited number of copies of this software.

The SPVD system shall be installed in accordance with the manufacturer's recommended procedure for installation.

The SPVD system shall be installed by factory certified installers and as recommended by the manufacturer and documented in installation materials provided by the manufacturer. Proof of the factory certification shall be provided. Installation includes connecting the SPVD to the traffic signal controller and power supply in the associated controller cabinet assembly. When the setup is complete and the SPVD system is ready

for operation, the values of all parameters that were set during the process shall be delivered to the Engineer in printed and computer-readable form. All equipment, such as software, laptop computer, tools and cables, needed for setup work shall be provided by the Contractor.

The Contractor shall be responsible for the proper programming of the SPVD, orientation of the SPVD, and all other work necessary to provide a complete operating system. The Contractor may be required to field adjust the location of the SPVD system in the presence of the Engineer to properly detect approaching vehicles.

The cabinet documentation (box prints) shall show all wiring between the SPVD system and the controller cabinets.

### **Data Stick/ Drive**

The Contractor shall supply A USB stick or drive used for collecting and synchronizing data and site configurations. The USB stick or drive must be NTFS-formatted and have enough available space to allow data to be synchronized.

Warranty -The supplier shall provide a three-year warranty on the SPVD system following installation and warranty registration. The camera shall include an additional warranty to require no aiming or focusing for a period of five years. During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers. During the warranty period, updates to SPVD software shall be available from the supplier without charge.

### **Video BIU Module**

The Video BIU module shall be compatible with NEMA TS2 detector card racks and shall meet the following requirements:

- Shall support 64 detector inputs.
- Shall select TS-2 detector BIUs to emulate and operate up to 4 BIUs simultaneously.
- Shall provide SDLC interface for video processing cards.
- Allow for multiple detection zones to be assigned to the same camera.

### **Detector Rack Assemblies**

The detector rack assemblies shall conform to Paragraph 5.3.4 of the NEMA TS 2 Standard. The detector rack assembly shall be supplied in a Type 2 configuration as defined in Table 5-9 of the NEMA TS 2 Standard.

### **Cabinet Power Supply**

Separate power supply shall be supplied and installed in the TS 2 cabinet. As a minimum, the power supply shall meet all requirements of Paragraph 5.3.5 of the NEMA TS 2 Standard. The unit shall be AC line powered and provide regulated DC power, unregulated AC power, a line frequency reference for the load switches and other auxiliary cabinet equipment as required.

The power supply shall be either shelf or rack mounted.

The unit shall contain four LED indicators on the front panel to indicate the four outputs;

1. + 12 VDC +/- 1 VDC @ 2.0 amps,
2. + 24 VDC +/- 2 VDC @ 2.0 amps,
3. 12 VAC @ 250 milliamps, and
4. 60 Hz line frequency reference.

A test point terminal shall also be located on the unit front panel for + 24VDC and logic ground testing.

### **Surge Suppression**

The Contractor shall supply and install surge suppression in the traffic controller cabinet in accordance with the manufacturer's recommendations. At a minimum surge suppression shall be provided for, video detection, power service, and emergency preemption.

### **Load Switches**

Load switches shall comply with Subsection 6.2 of the NEMA TS 2 standard. All load switches shall utilize optically isolated encapsulated modular solid state relays. Discrete components on circuit boards are not acceptable.

Load switch indicator lights shall be LED-type and wired on the input side of the device.

### **Flasher**

Flashers shall comply with Subsection 6.3 of the NEMA TS 2 standard and be equipped with two output indicator lights which will show flashing power out to the cabinet assembly.

### **Flash Transfer Relays**

Flash transfer relays shall comply with Subsection 6.4 of the NEMA TS 2 standard.



The field electrical loading for flash operation shall be wired through the transfer relays such that the load on the 2-circuit flasher is as balanced as possible within the limitations of the signal phasing.

**Traffic Controller Cabinet**

Controller cabinet shall conform to the NEMA TS 2 Standards, Section 7. Cabinet sizes shall be as indicated on the plans and as shown below.

**TS 2 Type 1 Configuration Table**

Item Number	NEMA TS 2 Cabinet Size	Nominal Cabinet Size (HxWxD)*	Configuration Type Table 5-2	Load Switch Positions	Flash Transfer Relays	BIUs Required	Detector Rack Type Table 5-9	MMU2 (Channels)
816.01	6	52x44x24	3	12	6	4	2	16 Channel

\* Approximate cabinet dimensions are provided in inches.

The cabinet shall be made of aluminum.

Where applicable, the cabinet shall be installed with the door opening positioned in order to allow general observation of the flow of traffic and the inside of the cabinet at the same time.

The cabinet shall be furnished with a minimum of two moveable shelves suitable for placing the controller, MMU, detector racks, network equipment, or any other required equipment. A slide-out document tray shall be mounted below the bottom shelf. The tray shall be of sufficient size to hold cabinet wiring diagrams and two manuals. The tray shall operate by sliding out on nylon rollers or ball bearings and opening a hinged cover to remove documents.

The closed cover shall provide a suitable support for resting documents or a laptop computer. All cables shall be tied away to allow the tray to be opened and closed smoothly without any obstructions.

Controller cabinet foundation shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired.

**GFI Duplex Outlet**

The Contractor shall supply and install a second separate GFI protected duplex outlet in the controller cabinet, and mounted on the side wall of the cabinets for servicing other devices.

### **Manual Override (Police Control Button)**

The Contractor shall provide and install a fully wired, environmentally sealed momentary contact (push button) hand held switch shall be supplied with a retractable cord that will extend approximately 6 feet.

Provision shall be made for neat cord and hand held switch storage within the police panel. This hand held switch and retractable cord shall be permanently wired and shall not be plugged-in removable.

Manual operation of the controller shall provide the same color sequence as was programmed for the automatic operation. The duration of all intervals, except the yellow vehicle and red vehicle clearance interval, shall be controlled by operation of the remote manual control switch. Duration of the yellow interval and red clearance interval shall be the time specified to be programmed in the controller unit.

### **Bus Interface Units**

The Bus Interface Units (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in a NEMA TS 2 Type 2 cabinet assembly.

At a minimum the BIU shall perform the interface function between port 1 at the controller unit, the malfunction management unit (MMU), the detector rack assembly (video detection), and the terminal facilities. The cabinets shall be supplied with the appropriate number of BIUs required to provide an operating traffic control signal according to the plans and these specifications.

As a minimum, two LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use; as a power on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

### **Spare Equipment**

The Contractor shall provide the following spare signal equipment in the proposed traffic signal controller cabinet:

- A full complement of load switches to accommodate each available position of the back panel.
- A full complement of flash transfer relays to accommodate each available position of the back panel.
- Two (2) Bus Interface Units.
- A 25 foot RS-232 cable for communication function with a laptop computer.

### **Emergency Preemption**

The emergency vehicle preemption system shall be Global Traffic Technologies, LLC (GTT) OPTICOM Priority Control System Model 700 series, or approved equivalent, installed in the same cabinet as the controller.

The emergency vehicle preemption control system shall consist of a data-encoded phase selector to be installed within the traffic control cabinet in the detector racks. This unit will serve to validate, identify, classify, and record the signal from the optical detectors located on support structures at the intersection.

Upon receiving a valid signal from the detector, the phase selector shall generate a preempt call to the controller initiating a preemption operation as shown on the plans.

The optical detector shall be single input, single output unit used to control one approach. The optical detector shall be OPTICOM model 711 series or approved equal. All traffic signal installations shall be supplied with a minimum of two optical detectors unless otherwise noted in the major items list.

The phase selector shall be a rack-mounted plug-in four channel dual priority device OPTICOM model 754 series or approved equal. The phase selector shall plug into an empty slot in the detector rack. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of preemption programming software on a CD shall be supplied and licensed to the Town of Burlington. A hard copy of final programming data shall be left in the control cabinet. A complete set of interface cables for phase selector to laptop connection shall be supplied in the cabinet.

The Contractor shall install a confirmation strobe at the traffic signal location as shown on the plans. The confirmation strobe shall serve to validate to the driver of the emergency vehicle that the traffic signal has recognized the preemption call and will initiate the proper preemption sequence. The confirmation strobe shall be a white lens Whelen IS3 series or equivalent.

The Contractor shall be responsible for the proper programming of the phase selector, orientation of the optical detectors, and all other work necessary to provide complete and operating emergency vehicle preemption systems. The Contractor may be required to field adjust the location of the optical detectors in the presence of the Engineer to properly detect preemption calls from approaching vehicles. Upon final inspection and testing, any discrepancies or failures to properly preempt the traffic signals will necessitate a complete replacement on any non-compatible equipment.

### **Mast Arms, Poles and Foundations**

Mast arm poles shall be fabricated and constructed in conformance with the 2015 MassDOT Standard Drawings and as stated below.

All mast arm poles shall be Type 2, galvanized steel monolevers with shoe bases.

Acceptance of Type 2 mast arm poles will be contingent upon review and approval of shop drawings submitted by the Contractor. Longhand design calculations shall be submitted by the Contractor with the shop drawings for all Type 2 mast arm poles.

The Contractor shall provide a set of calculations, stamped by a Structural Engineer registered in the Commonwealth of Massachusetts, along with plans and specifications for review by the Project Engineer.

The Contractor shall be responsible for performing all soil borings and soil classifications associated with the mast arms and poles. Reference is made to Items 191, 191.10, 191.11, and 193 for more information.

All mast arm pole foundations shall be cored pier foundations and constructed in conformance with MassDOT Standard Drawings. Foundation sizes and depths shall be selected from the foundation design charts shown in MassDOT's Standard Drawings.

Prior to installation, the Contractor shall notify the Engineer in writing of his selection of mast arm foundation footing sizes.

If ledge or unsuitable soil is encountered (i.e. on which does not apply to the design tables shown in MassDOT's standard drawings), an alternative design shall be provided by the Design Engineer. If utilities or other underground obstructions are encountered, the Contractor shall backfill the area to its original condition until an alternate design has been provided by the Design Engineer and approved by the Town.

No separate payment will be made for work considered incidental to the excavation, including but not limited to, mast arm foundations, dewatering, etc. but all costs in connection therewith shall be included in the contract lump sum bid price.

Foundation shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is not impaired.

### **Signal Heads**

Signal heads mounted on mast arms shall be rigidly attached to the mast arms. All signal heads mounted overhead on mast arms shall be installed, with the bottom of the signals at the same height. All traffic signal lenses shall be 12 inches in diameter. All signal heads shall be equipped with ball and/or arrow light emitting diode (LED) modules. Five (5) inch non-louvered backplates and tunnel visors shall be provided on all signal heads.

All backplates shall include 3-inch wide, yellow reflective micro-prismatic retroreflective sheeting conforming to ASTM D4956 Type VIII or better on the outside edge of the backplates.

### **Red, Yellow, and Green LED Vehicle Signal Module**

All signal and pedestrian displays shall be equipped with LED signal modules. All red, amber, green, and pedestrian signal housings with the exception of optically programmed and fiber optic housings and shall conform to the following where applicable:

- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Arrow Traffic Signal Supplement, Dated July 1, 2007
- ITE's Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Circular Signal Supplement, Dated June 27, 2005.
- ITE's Pedestrian and Countdown Signal Modules Compliant to PTCSI - Part 2 Light Emitting Diode (LED), Dated, February 2011
- On the MassDOT Traffic Signal Approved Equipment List

For an LED module to be installed on this project, the LED module shall have approval from the MassDOT Traffic Control Products Approved Equipment Committee and be included on the Traffic Control Products List prior to the date of this proposal

To prevent the LED module warranty from being voided, the connecting leads on the module shall not be cut. The original LED module leads shall be connected to the signal head terminal block as continuous wire without splices.

The LED signal module will be replaced or repaired by the manufacturer if it exhibits one of the following:

- A failure due to workmanship or material defects within the first 60 months of field operation.
- A greater than 40 percent light output degradation or a fall below the minimum intensity levels (as defined by the latest ITE performance specifications) within the first 36 months of field operation

### **Pedestrian Heads with Countdown Timers**

All pedestrian heads shall be 16 inch, single units, with countdown timers. Pedestrian head indications shall be illuminated L.E.D. type displaying graphical symbols of a walking person and/or upraised hand. The countdown module shall display the number of seconds beginning at the start of the flashing "DON'T WALK" interval, continue counting down through the flashing "DON'T WALK" interval, and blank out during the steady "DON'T WALK" interval. The countdown module shall be automatically set by the intersection controller based upon the "WALK" and "DON'T WALK" signal intervals only. The countdown module shall continuously monitor the intersection controller for any changes to the pedestrian phase timing, and reprogram itself automatically. All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination to reduce long-term degradation to the LEDs.

**Accessible Pedestrian Signal Pushbutton**

The Accessible Pedestrian Signal (APS) pushbutton shall provide information in non-visual formats (such as audible tones, speech messages, and/or vibrating surfaces). The APS pushbuttons shall be compliant with the 2009 MUTCD. At a minimum the APS pushbuttons shall be provided with the following features:

- Pushbutton locator tone
- A visible and audible indicator that the button press has occurred
- A vibro-tactile arrow
- An audible walk message indication

The APS pushbuttons shall provide visually disabled pedestrians with a locator tone that will allow them to find the pushbutton to activate the walk signal. Once the pushbutton call has been placed, the signal will provide both an audible and tactile response during the related “WALK” portion of the cycle. A sunlight visible LED latches “ON” to confirm the button has been pushed.

Housing and Pushbutton Unit – Shall meet the following minimum requirements:

- Constructed of cast aluminum with a powder coated finish (black).
- Highly vandal resistant and pressure activated with essentially no moving parts.
- Operating temperature range -34 degrees Celsius to 65 degrees Celsius.
- Operating voltage range 12 to 36 VDC.
- Button cap must be made of solid 316 stainless steel.
- Pushbutton must activate with 5 lbs of force or less.
- Unit must have an LED display to give indication that of pushbutton being pushed.
- Pushbutton must fully operate immediately after being completely immersed in water for 5 minutes (electrical terminals isolated from water).
- Pushbutton must not allow ice to form such that it would impede function of pushbutton or pushbutton cap.
- All switch electronics must be sealed within the housing.
- All sounds shall emanate from the back of the of the APS pushbutton unit via a weatherproof speaker that is protected by a vandal resistant screen.

Tactile Arrows and Locator Tones – Shall meet the following minimum requirements:

- APS pushbuttons shall incorporate a locator tone at the pushbutton the locator tone, measured at 3 feet from the APS pushbutton, shall be 2dB minimum and 5dB maximum above ambient noise level in standard operation and shall be responsive to ambient noise level changes. Tones shall consist of multiple frequencies with a dominant component of 880Hz. The duration of the locator tone shall be 0.15s and shall repeat at intervals of 0.15s.

- APS pushbuttons shall be a minimum of 2 inches across in diameter and shall contrast visually with their housing and mounting.
- APS pushbuttons shall include a vibro-tactile arrow aligned parallel to the crosswalk direction. The arrow shall be raised 0.03 inches minimum and shall be 1.5 inches minimum in length. The arrow head shall be open at 45 degrees to the shaft and shall be 33 percent of the length of the shaft. Stroke width shall be 10 percent minimum and 15 percent maximum of arrow length. The arrow shall contrast with the background.
- The arrow shall vibrate during the “WALK” portion of the cycle.

**Audible Walk Message** – The audible walk message shall be audible from the beginning of the associated crosswalk. The audible walk message and associated APS pushbuttons shall be as follows:

PEDESTRIAN PUSHBUTTON	AUDIBLE WALK MESSAGE
P1-P6	Walk sign is on to cross street

**Mounting Requirements** - A maximum mounting height of 42 inches above the finish sidewalk grade shall be used for APS pedestrian pushbuttons.

The Contractor is hereby notified that they are ultimately responsible for constructing all pedestrian push button elements (clear ground space, forward and side arm reaches) in strict compliance with the current AAB rules, regulations and standards.

All construction elements in this project associated with pedestrian push buttons are controlled by 521CMR – Rules and Regulations of the Architectural Access Board. Pushbutton Frame Extenders shall be used if approved or directed by the Engineer.

The Contractor shall establish clear ground space at all pedestrian push button locations, and shall set arm reach lengths according to the AAB rules (or to the details shown on the plans).

The project has been designed to conform to all AAB rules, and the Engineer is not aware of any required variances for the work presented on the design plans. The Contractor shall notify the Engineer of any project element related to the pedestrian push buttons that will not comply with 521 CMR prior to constructing said pedestrian push button elements.

**Installation** - The APS pushbuttons shall be installed by Contractor and as recommended by the manufacturer and documented in installation materials provided by the manufacturer. The Contractor shall be responsible for the proper programming of the APS pushbuttons, orientation of the pushbuttons, and all other work necessary to provide a complete and operational APS pushbutton system. The Contractor may be required to

adjust volume levels as directed by the Engineer. When the setup is complete and the APS pushbuttons are ready for operation, the values of all parameters that were set during the process shall be delivered to the Engineer in printed and computer-readable form.

Warranty - Each APS pushbutton shall be warranted free from defects in material and workmanship for a period of at least 2 years from the date of installation by the Contractor and acceptance from the owner.

During the warranty period, technical support shall be available from the supplier to the owner via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel without

### **Post and Base**

Signal posts and bases shall be steel shafts with transformer bases.

Signal base foundations shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired.

### **Software**

All local controller, malfunction management unit, and software shall be supplied with the latest available revision. Any software upgrades released by the manufacturer shall be supplied at no charge to the Owner for a period of five years after acceptance of the traffic signal installations.

### **Data Base Programming**

Each programmable local hardware component (i.e., controller, malfunction management unit, video detection; and preemption unit) shall be initially programmed by the Contractor based on information contained on the plans.

Three sets of hard copy programming per device shall be supplied by the Contractor.

### **Equipment Finish and Color**

Traffic signal equipment including but not limited to signal posts, bases, signal heads, visors, doors, mast arms, pushbutton saddles, controller cabinet (outside), service meter socket box, hardware, and rigid mounting brackets for signals and signs shall be colored **Semi-Gloss Black**, subject to the approval of the Town. The Contractor shall submit to the Engineer, and Town for approval, paint chips and sample finishes on aluminum and steel of the intended color prior to any work being done under this heading.

Signal heads, doors, visors, mounting brackets, and hardware supplied direct from the manufacturer in the color stipulated above may be acceptable provided it meets or exceeds the finish process for the material indicated below.



## **Steel Equipment**

### ***Galvanizing***

All bolts, screws, nuts, rods and washers shall be galvanized in accordance with AASHTO M232 and the Standard Specifications. The hardened machine screws may be electroplate galvanized. Stainless steel studs, bolts, screws, nuts, straps and washers shall not be galvanized. Galvanized hardware need not be painted; however, the ends of bolts, nuts, and washers shall be painted in the field according to section “Touch-up and Repairs.”

Immediately prior to galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The dry kettle galvanizing process shall be used.

All steel components, other than above, shall be galvanized after fabrication in accordance with AASHTO M111. The galvanizing bath shall contain nickel (0.05% to 0.09% by weight) in accordance with subsection 960.61 of the Standard Specifications.

Galvanized members requiring shop assembly shall be welded and drilled prior to galvanizing.

### ***Coating over Galvanized Steel***

Prior to painting, the applicator shall ensure that all components are smooth and without sharp protrusions that would present an injury hazard to pedestrians. Also, the fabricator shall ensure that all welds shall be cleaned thoroughly in accordance with good practice and according to AWD D1.5 and ASTM A123-89a and shall have a suitable surface to accept the galvanizing.

In preparation for the two coat painting system, the surface shall be blast cleaned in accordance with the requirements of SSPC SP7 “Brush-Off Blast Cleaning” or other method producing equivalent results and uniform profile, to achieve a 1.0 to 1.5 mils anchor profile as indicated by a Keane Tator profile comparator or similar device. The creation of the anchor profile shall be performed prior to the formation of “white rust” on the galvanized surface.

Following blast cleaning, the zinc coating thickness shall be measured to verify that the coating thickness is in accordance with AASHTO M111.

A two-coat painting system shall be applied by the Galvanizer in his own facility within twelve hours of galvanizing the steel components.

The prime coat material shall be a polyamide epoxy applied to minimum dry film thickness of 2.0 to 4.0 mils (0.002-0.004 in.) and force cured as given below for the finish coat.

The finish coat material shall be a two component, catalyzed aliphatic urethane applied by airless spray to a minimum dry film thickness of 4.0 mils.

The color shall be per the **Semi-Gloss Black**. The fabricator shall submit to the Engineer for approval, paint chips of the intended color prior to any work being done under this heading.

All finish coat material shall be applied under conditions within the following tolerances:

1. Air Temperature: 50°F min., 90°F max.
2. Surface Temperature: 50°F min., 100°F max.
3. Surface temperature must be at least 5°F above the dew point.

The finish coat shall be cured in a booth capable of maintaining 150°F for 2-4 hours.

#### *Touch-up and Repairs*

Should any damage occur to the galvanized coating during shipping or handling at the job site, the Contractor shall repair and touch-up any damaged areas to the satisfaction of the Engineer and the following:

Touch-up of galvanizing before the finish coat is applied shall be accomplished by applying galvanizing repair paint in accordance with Section M7.04.11. The dry film thickness of the applied repair paint shall not be less than 4.0 mils.

Applications shall be in accordance with the manufacturer's instruction.

Field touch-up procedures shall conform to the recommendations of the galvanizer. Touch-up of the finish coat shall be by applying a coating of a two-part urethane, as supplied by the Galvanizer, to achieve a dry film thickness of at least 4.0 mils. Prior to the application of the paint, remove all damaged coatings down to a solidly adhered coating and apply galvanizing repair paint as primer.

Allow the primer to dry for at least 4 hours prior to top coating.

The Contractor shall also use the touch-up paint material and procedures to paint the galvanized hardware used in field erection that has not been finish coated previously.

#### **Aluminum Equipment**

All aluminum equipment called for shall have a powder coat finish. The coating shall be a polyester-TGIC (triglycidyl isocyanurat) resin system conforming to the following:

<b>Quality</b>	<b>Test</b>	<b>Limits</b>
Abrasion	Taber abraser CS-10, 1000 gram load, 1000 cycle, ASTM D4060	100 mg. Maximum weight loss
Adhesion	ASTM D .59 Initial 1000 hours	5A 5A
Gloss	ASTM D 523 60° - 600 hours 60° - 1000 hours	82% retention 90% retention (washed)
Hardness	ASTM D 3363	2H – No Gouge
Impact	ASTM D 2794 Direct	Pass 80 inch-lb.
Salt Spray Resistance	ASTM B 177 ASTM D 1654 1000 hours unscribed 400 hours scribed	Table 2-10 Table 1-10
Weather Resistant	ASTM G 23, 1000 hours, 18 min. waterspray, 102 min. light	No film failure
Color	<b><u>Semi-Gloss Black</u></b>	
Identify	Infrared fingerprint	Match
Flexibility	180° bend; ½” dia, mandrel within 10 seconds	No breaks, flaking or cracks.  Tested with a Q-panel with 2 mils or less of coating
Humidity	ASTM D 2247, 1000 hours	No blister or film failure
Thickness		4 mils +/- 1 mils
Mar Resistance		Good

A Certificate of Compliance of the powder coating system is required for the Engineer’s approval.

**Wiring Diagram**

Three sets of wiring diagrams with both internal and external wiring for the traffic signal control cabinet and all accessories as actually used in the field shall be furnished to the Town, including one mylar reproducible copy for the controller cabinet when installed. All actual and potential terminal strip connections shall be shown. Accessory equipment includes flashers, switches, relays, logic modules, preempt phase selectors, video

detection, etc. All identification on the diagrams shall be as installed, and all field labeling shall be consistent with the diagram. Furthermore, the format symbols, identifications, operating sequence, etc., common to all the intersections wiring diagrams shall be standardized.

**Manuals and Keys**

The Contractor shall supply two (2) copies of operating and maintenance manuals (i.e., controller, malfunction management unit, preemption unit) and two (2) sets of cabinet keys to the Town.

**Ownership and Maintenance**

Upon acceptance of the traffic signal system by the Town, the Contractor shall turn over all guarantees and warranties to the Town, where applicable. In turn, the Town shall assume ownership and maintenance of the signal system.

**Item 852.11 – Temporary Pedestrian Barricade**

**Item 852.12 – Temporary Pedestrian Curb Ramp**

Work under these Items consist of furnishing, deploying, maintaining in proper operating conditions, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially-closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

**MATERIALS**

The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and eight (8) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

The Temporary Pedestrian Curb Ramp shall provide a 48-inch minimum width, with a firm, stable, and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous, contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp; if it leads to a protected path that does not conflict with vehicular traffic then a detectable pad shall not be used.

**CONSTRUCTION METHODS**

The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities” and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60 inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR. Turning areas shall be 60 inches by 60 inches minimum.

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental.

Item 860.104 – 4 Inch Reflectorized White Line (Painted)

Item 860.112 – 12 Inch Reflectorized White Line (Painted)

Item 861.104 – 4 Inch Reflectorized Yellow Line (Painted)

Work under these items shall conform to the relevant provisions of Section 860 of the Standard Specifications and the following:

All permanent pavement markings supplied under these items shall conform to the applicable MassDOT's standards for 6 Inch Reflectorized White Line (Painted) and 6 Inch Reflectorized Yellow Line (Painted).

The work under these items shall consist of providing, installing, maintaining the 4 inch wide reflectorized white and yellow pavement marking lines, as shown on the plans or as directed by the Engineer.

### Item 874.2 – Traffic Sign Removed and Reset

The work under this item shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following:

The Contractor shall carefully remove and reset at new locations all existing signs, attachment hardware and sign support posts not included under other sign items as shown on the drawings and as directed by the Engineer.

Signs, attachment hardware and sign support posts shall be satisfactorily stored and protected until reset in the proposed work.

Signs, attachment hardware and sign support posts lost, damaged or otherwise made unsuitable for reuse while being removed, transported, stored or reset shall be replaced with new materials at no additional cost to the Owner. New attachment hardware shall be furnished and installed as necessary to replace any missing or unusable existing hardware.

Included under Item 874.2 are Warning-Regulatory and Route Marker signs, and miscellaneous directional signs.



### Item 874.4 – Traffic Sign Removed and Stacked

The work under this item shall conform to the relevant provisions of Section 828 of the Standard Specifications and the following:

The work shall include the careful removal, transporting and stacking of traffic signs, attached hardware and supports from locations shown on the plans and as required by the Engineer, is salvageable.

Work shall also include excavation of existing foundations to a depth of at least 6 inches below grade, the supplying and placing of compacted gravel, and the restoration to original condition of any natural features disturbed in any way or manner by the operation.

The Contractor shall accept and hold entirely responsibility for the removal, handling and stacking at a location determined by the owner. Any signs and posts damaged or lost either directly or indirectly as a result of the Contractor's operations shall be replaced by the Contractor at no additional cost to the Owner.

The Contractor shall coordinate the removal of signs and posts with the City/Engineer prior to and at the completion of the above work. The Contractor shall coordinate with the Town to schedule drop-off time. Existing signs shall remain in place until proposed new signs are in place.

**APPENDIX A**  
**PREVAILING WAGE RATES**

**APPENDIX B**  
**PROJECT DRAWINGS**