

INVITATION TO BID
Town of Branford
Fueling Facility Installation
Branford Fire Headquarters

The Town of Branford is requesting bid proposals for the installation of a new Fueling Facility located at the Branford Fire Headquarters.

Contract Documents will be available for download on the Town of Branford website www.branford-ct.gov and the CT DAS website.

Bids are to be submitted in a sealed envelope marked **“Fueling Facility Installation”** to the Finance Department, Attention Purchasing Clerk, 1019 Main Street, Branford, CT 06405 by **Wednesday, January 17, 2024 at 11:00 AM**. No bids will be accepted after that time and date. Bids will be publicly opened immediately following the submission deadline in the conference room located on the basement floor of the Town Hall.

Bids must be held firm for ninety (90) days beyond the bid opening date.

CONTRACTOR’S shall be required to pay not less than the prevailing wage rates on the Project if the Bid amount exceeds one-million dollars (\$1,000,000), as established by the State of Connecticut. Copies of these wage rates are incorporated in the Contract Documents. Each CONTRACTOR or Subcontractor performing Work on this Project shall comply in all respects with all laws governing the employment of labor, Social Security, and Unemployment Insurance of both the state and federal government.

Prevailing Wage Rates will be included in a future addendum to this bid.

The Town of Branford has the right to accept or reject any and all bids.

CONTRACT DOCUMENTS



FUELING FACILITY INSTALLATION BRANFORD FIRE HEADQUARTERS

DECEMBER 1, 2023

TOWN OF BRANFORD
1019 MAIN STREET

BRANFORD, CT 06405

TABLE OF CONTENTS

Note: This Table of Contents has been prepared for the convenience of those using this contract with the sole express purpose of locating quickly the information contained herein; and no claims shall arise due to omissions, additions, deletions, etc., as this Table of Contents shall not be considered part of the contract.

Invitation to Bid

Section 1 – General Requirements for Bidding and Instructions to Bidders

Section 2 – Proposal

Section 3 – Technical Specifications

SECTION 1

GENERAL REQUIREMENTS FOR BIDDING AND INSTRUCTIONS TO BIDDERS

TOWN OF BRANFORD
OFFICE OF THE TREASUER



1019 Main Street
Post Office Box 150
Branford, CT 06405

(203) 488-8394
FAX: 315-3736

**General Requirements for Bidding
and
Instructions to Bidders**

NOTICE

Information provided in these specifications is ***CONFIDENTIAL*** and is to be used only for the purpose of preparing a proposal. It is further expected that each bidder will read these specifications with care, for failure to meet every one or a combination of specified conditions may invalidate the proposal.

The Town reserves the right to reject any or all bids or any portion thereof and to accept the bid deemed to be in the best interest of the Town of Branford.

Bidders are requested to submit quotations on the basis of these specifications. Alternate quotations will receive consideration providing such alternatives are clearly explained.

The information contained herein is believed to be accurate and is based upon the latest available information but is not to be considered in any way as a warranty.

Revised 5/2012
Standard Form

SECTION I - General Terms and Conditions

A. Compliance with Laws

The bidder shall at all times observe and comply with all laws, ordinances and regulations of the federal, state and local governments, which may in any way affect the preparation or the performance of the contract.

B. Timetable

Price quoted must be valid for **90** days. Delivery and installation completion dates must be included in the bid proposal.

C. Consideration of Proposals

The Board of Selectmen, or a majority of them, reserve the right to select or reject alternate proposals; to waive informality in proposals; and to reject any and all bids, or accept such bid as shall in its judgement be to the best interest of the Town of Branford.

D. Bid Bond

1. A certified check or bank draft made payable to the "Treasurer, Town of Branford", or a satisfactory bid bond executed by the bidder and a surety company in an amount no less than five percent (5%) of the base bid, is required with each proposal.
2. Checks or drafts will be returned to unsuccessful bidders within ten (10) business days of the bid award.

E. Performance Bond, Payment Bond

Successful bidders will be required to furnish a Performance Bond and a Payment Bond in the amount of 100% of the contract sum.

F. Protection of Work and Property

Successful bidders shall be responsible for protection of their equipment and materials against theft, damage or deterioration on the site.

G. Competency of Bidders

1. Bidders shall have had proven experience in the field of work.
2. Bidders shall submit with their bid a listing of recent work performed within the State of Connecticut of the size equal to or greater than the work being bid.

H. Alternates

1. Any alternates to specified materials or workmanship must be separately listed and described in detail.
2. Alternates will be considered in awarding the contract only if they provide, as a minimum requirement, all features contained in the specifications.
3. The Town of Branford reserves the sole right to determine through its agents the equality of alternate products and/or installation procedures.

I. Bid Requirements

1. Each bidder shall return two (2) hard copies and one (1) digital copy of the proposal sheet entitled "Bid Proposal" and addenda acknowledgment, if applicable. Each bid proposal must be signed by an authorized agent of the bidder.
2. Each bidder must complete and have notarized the "Non-Collusion Affidavit of Bidder" form. This form must accompany all bids being submitted.
3. Each bidder must be in good standing with the Town of Branford.
4. Successful bidders must obtain any required governmental approvals.

J. Specifications – General

The contract shall include all labor and materials, tools and equipment and services required for proper performance of the work as specified hereinafter and as may be required for proper completion of the work in accordance with the highest standards of the trades involved.

K. Examination of Site – Recommended, not required

Prior to submission of the bid, contractor shall visit the site and become thoroughly familiar with all conditions under which the work will be installed. The contractor will be responsible for any assumptions made regarding the site for the work to be performed.

L. Contract Times

The anticipated Notice to Proceed date is 2/1/2024. The bid work shall reach Substantial Completion within **120 calendar days** and shall be Completed and Ready for Final Payment within **135 calendar days**.

M. Liquidated Damages

For each calendar day that any work remains uncompleted after the date specified for the completion of the work provided in the Contract, the amount of **ONE THOUSAND DOLLARS (\$1000.00)** per calendar day will be deducted from any money due to the Contractor, not as a penalty but as liquidated damages.

SECTION II - Insurance Requirements

Town of Branford Professional Services – Insurance Requirements

Contractor/Vendor shall agree to always maintain in force during the contract the following minimum coverage and shall name the Town of Branford as an Additional Insured on a primary and non-contributory basis to all policies except Workers Compensation. All policies should also include a Waiver of Subrogation. Insurance shall be written with Carriers approved in the State of Connecticut and with a minimum AM Best's rating of "A-"VIII.

		(Minimum Limits)
General Liability	Each Occurrence	\$1,000,000
	General Aggregate	\$2,000,000
	Products/Completed Operations Aggregate	\$2,000,000
Auto Liability	Combined Single Limit	
	Each Accident	\$1,000,000
Excess/Umbrella Liability	Each Occurrence	\$1,000,000
	Aggregate	\$1,000,000
Professional Liability	Each Occurrence	\$1,000,000
	Aggregate	\$1,000,000
Cyber Liability ⁽¹⁾	Each Occurrence	\$1,000,000
	Aggregate	\$1,000,000
Workers' Compensation and Employers' Liability ⁽²⁾	WC Statutory Limits	
	EL Each Accident	\$500,000
	EL Disease Each Employee	\$500,000
	EL Disease Policy Limit	\$500,000

If any policy is written on a "Claims Made" basis, the policy must be continually renewed for a minimum of two years from the completion date of this contract. If the policy is replaced and/or the retroactive date is changed, then the expiring policy must be endorsed to extend the reporting period for claims for the policy in effect during the contract for two) years from the completion date.

Original, completed Certificates of Insurance must be presented to the Town of Branford prior to contract issuance. Contractor/Vendor agrees to provide replacement/renewal certificates at least 30 days prior to the expiration date of the policies. Should any policy be cancelled for nonpayment of premium, 10 days written notice must be provided to the Town. Should any of the policies be cancelled for other reasons, limits reduced or, coverage altered, 30 days written notice must be given to the Town.

Notes

- (1) Cyber Liability is required if Contractor is on Town's network or houses Town information on their network.
- (2) Workers Compensation is required if employees come onto Town property.

NON-COLLUSION AFFIDAVIT OF BIDDER

State of: _____

County of: _____, SS)

_____; being first duly sworn, deposes and
says that:

- 1) S/he is (owner, partner, officer, representative or agent) of _____
, the Bidder that has submitted the attached Bid:
- 2) S/he is fully informed regarding the preparation and contents of the attached Bid and of
all pertinent circumstances regarding such Bid:
- 3) Such Bid is genuine and is not a collusive or sham Bid:
- 4) Neither the said Bidder nor any of its officers, partners, owner, agents, representatives,
employees or parties in interest, including this affiant, has in any way colluded,
conspired, connived, or agreed, directly or indirectly with any other Bidder, firm or
person to submit a collusive or sham Bid in connection with the Contract for which the
attached Bid has been submitted or to refrain from bidding in connection with such
Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or
communication or conference with any other Bidder, firm or person to fix the price or
prices in the attached Bid or of any Bidder, or to fix any overhead, profit or cost element
of the bid price or the bid price of any other Bidder or to secure through any collusion,
conspiracy, connivance or unlawful agreement any advantage with the Owner or any
person interested in the proposed Contract.
- 5) The price quoted in the attached Bid is fair and proper and is not tainted by collusion,
conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its
agents, representatives, owners, employees, or parties in interest.

Signed: _____

Title: _____

Subscribed and sworn before me this _____ day of _____, 20____.

Notary Public: _____

My Commission expires _____, 20____.

SECTION 2

PROPOSAL

**TOWN OF BRANFORD
TOWN ENGINEERING
REQUEST FOR PROPOSALS**

PROPOSAL – FUELING FACILITY INSTALLATION BRANFORD FIRE HEADQUARTERS

The undersigned hereby declares that in regard to all conditions affecting the work to be done and the labor and materials required, this proposal is based on his investigations and findings, and the Town of Branford and the Engineers and their officers, agents and employees shall not in any manner be held responsible for the accuracy of, or be bound by any estimates, borings, water or underground conditions relative to the proposed work, indicated in this or in the other contract documents; that no warranty or representation has been made by the Town of Branford or the Engineers or their officers, agents and employees as to subsurface soil or rock conditions, ground water, or other underground and similar conditions; nor has any representation or warranty been so made that the estimated quantities to be used for comparison of proposals will even approximate the actual quantities or materials and work which the Contractor may be required to furnish or perform.

In compliance with your Advertisement for Proposals, Proposer hereby proposes for the **“FUELING FACILITY INSTALLATION BRANFORD FIRE HEADQUARTERS”** project in the Town of Branford, Connecticut together with all related incidental and appurtenant work as described in the specifications or outlined and/or shown on the exhibits. The work is to be done in strict accordance with the Specifications, Drawings and all Contract Documents, within the time set forth therein, and at the prices stated on the Proposal Schedule.

BID FORM - The base bid should represent a complete installation of the fueling system and associated site and utility improvements. All costs shall be distributed in the lump sum values shown below and Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Acknowledgement of Addenda

Proposer hereby acknowledges receipt of all Addenda through and including:

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Company _____

Authorized Signature _____

Print Name _____

SUPPLEMENTAL INSTRUCTIONS TO BIDDERS

SECTION 1. ADDENDA TO THE DOCUMENTS. Any explanation regarding the meaning or interpretation of contract drawings, specifications, or other contract documents must be requested in writing, with sufficient allowance of time for receipt of reply before the time of bid opening. Any such explanations or interpretations shall be made in the form of addenda to the documents and posted for all bidders, who shall be responsible for obtaining such addenda and who shall submit all addenda with their bids. Oral explanations and interpretations made prior to the bid shall not be binding.

Questions received less than ten (10) days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding.

The Contractor agrees to use the products and methods designated or described in the specifications as amended by the Addenda.

Questions regarding the bid shall be requested in writing to:

Jennifer Acquino, Assistant Town Engineer

Mailing Address:	1019 Main Street P.O. Box 150 Branford, CT 06405
Fax:	(203)315-2188
E-mail:	jacquino@branford-ct.gov

SECTION 2. EXAMINATION OF SITE. Bidders should visit the work site to ascertain by inspection pertinent local conditions such as location, character and accessibility of the site, availability of facilities, locations and character of existing work within or adjacent thereto, labor conditions, etc. The Owner shall make available to all prospective bidders, previous to the receipt of bids, information that they may have as to sub-soil conditions and surface topography at the work site. Such information shall be given, however, as the best factual information available without the assumption of responsibility for its accuracy or for any conclusions that the contract might draw therefrom.

SECTION 4. BID SECURITY. Security required, if any, shall be submitted with the Proposal, and failure to submit same shall be cause for rejection. The bidder, at his option, shall furnish a bid bon, certified check, bank draft, or bank cashier's check in the amount required. Security deposited by unsuccessful bidders will be returned as soon as practicable after the opening.

SECTION 5. PREPARATION OF BIDS. Bids shall be submitted on the forms provided, and must be signed by the bidder or his authorized representative. Any corrections to entries made on bid forms should be initialed by the person signing the bid, Bidders must quote on all items

appearing on the bid forms, unless specific directions in the advertisement, on the bid form, or in the special provisions allow for partial bids. Failure to quote on all items may disqualify the bid. When quotations on all items are not required, bidders shall insert the words "no bid" where appropriate. Alternative bids will not be considered unless specifically called for.

SECTION 6. APPROXIMATE QUANTITIES. Proposal quantities established in cases where any part or all of the bidding is received on a unit basis are approximate only, and each bidder shall make his own estimate from the contract drawings of the quantities required on each item and calculate his unit price bid for each item accordingly.

Bids will be compared on the basis of the stated number of units in the Proposal.

Payment on the contract will be based upon the actual number of units installed on the completed work.

SECTION 7. SUPPLEMENTAL UNIT PRICES. If the bidding schedule includes a supplemental schedule of unit prices for fixing cost basis for changes, the Owner reserves the right to reject any or all of such supplemental unit prices which it deems excessive or unreasonable.

SECTION 8. DEFINITION OF AWARD. The contract shall be deemed to have been awarded when the authorized officer of the Owner has served formal notice of award upon the intended awardee.

SECTION 9. CONTRACT, BONDS, AND INSURANCE. The bidder to whom the award is made shall enter into a written contract with the Owner within the time specified in the Proposal.

Performance and payment bonds shall be furnished at the time of signing the formal Agreement.

The Contractor shall secure and maintain such insurance policies as are required. A Certificate of Insurance must be provided to the Town of Branford and include the Town of Branford and the State of Connecticut as Additional Named Insured.

A performance and labor & materials bond in a sum equal to one hundred percent (100%) of the amount of the bid, with sureties to be approved by the Town of Branford for the faithful performance of the contract must be furnished by the successful bidder.

SECTION 10. SUBCONTRACTORS. A list of all Subcontractors, Suppliers and other persons and organizations, including those who are to furnish the principal item of material and equipment proposed for major portions of the Work including supplies of materials and any subcontractor comprising more than 5% of the Total Bid Price shall include company name, postal address, telephone number, and number of responsible individuals.

SECTION 11. WAGE RATES. CONTRACTOR'S shall be required to pay not less than the prevailing wage rates on the Project if the Bid amount exceeds one-million dollars (\$1,000,000), as established by the State of Connecticut. Copies of these wage rates are incorporated in the Contract Documents. Each CONTRACTOR or Subcontractor performing Work on this Project shall comply in all respects with all laws governing the employment of labor, Social Security, and Unemployment Insurance of both the State and Federal Government.

SUBMISSION OF BIDS:

All Bids shall be delivered to the Finance Department, 1019 Main Street, Branford, CT 06405 and must be received by 11:00 AM, Wednesday, January 17, 2024. No bids will be accepted after that time and date. Bids will be publicly opened immediately following the submission deadline in the conference room located on the basement floor of the Town Hall.

The Bid Proposal Sheet, Non-Collusion Affidavit and supporting documentation is to be submitted in a sealed envelope marked **"Fueling Facility Installation"**.

In addition to the Bid Proposal Sheet, all bid proposals should address the following:

A) Corporate Information

1. Name of the firm and parent firm, if any.
2. Nature of the firm's primary area of service
3. Address of the principal office
4. Name, address, and telephone number of the principal contact person to receive Notifications and to reply to Town inquiries.

B) Corporate Experience

All submitting firms should provide a description of recent similar projects, including pertinent information such as project type, size and scope of work performed. References should be provided.

LIST OF SUBCONTRACTORS

List here under the Subcontractors, Suppliers and other persons and organizations supplying material and work whose values is 5% or more of Total Bid Price, including those who are to furnish the principal items of materials and equipment, that the BIDDER intends to employ if awarded the Contract and the work to be done by them. Include Work BIDDER intends to subcontract even if a Subcontractor or Supplier has not yet been selected, Work for which a subcontractor is not listed shall be performed by the BIDDER.

<u>Name</u>	<u>Address</u>	<u>Class of Work</u>

ATTACHMENTS – Contractor is to attach the following:

- 1. Bid Bond**
- 2. Bid Proposal**
- 3. Non-collusion affidavit**

***Please attach a list of references with contact information & comparable work completed**

Signature of Authorized Representative

Date

FUELING FACILITY INSTALLATION BRANFORD FIRE HEADQUARTERS – Base Bid Pay Items				
Item Number	Item Name and Unit Bid Prices Written in Figures	Units	Estimated Quantity	Total Amount of Item (in figures)
001	Mobilization and Project Closeout, per LS, the price of: (\$)	LS	1	\$ _____
002	Site Demolition and Removals, per LS, the price of: (\$)	LS	1	\$ _____
003	Erosion and Sedimentation Control, per LS, the price of: (\$)	LS	1	\$ _____
004	Site Improvements (earthwork, grading, drainage, paving, etc.) per LS, the price of: (\$)	LS	1	\$ _____
005	Fuel System Installation per LS, the price of: (\$)	LS	1	\$ _____

TOTAL AMOUNT OF BASE BID

(\$ _____)
(In figures)

FUELING FACILITY INSTALLATION BRANFORD FIRE HEADQUARTERS – Unit Prices

For the following, such unit prices shall apply solely to additional work, if approved and directed by the Town. The Contractor shall furnish all labor, material, and equipment to perform the work, complete as described in the Contract documents and/or as directed by the Town, at the unit prices quoted in the bid proposal. The Contractor understands that the requirement for and possible additional quantities of these items are not known at time of bid. The Contractor also understands that these unit prices will not be used in determination of the total base bid. The Contractor will be paid for unit price work on the basis of actual measured quantities of work ordered in writing by the Town and satisfactorily performed.

Item Number	Item Name and Unit Bid Prices Written in Figures	Units	Unit Price (in words)	Unit Price (in figures)
006	Removal and Replacement of Unsuitable Fill	CY		
	Detailed Description: Price shall include the removal of unsuitable soil or material and the replacement with suitable compacted structural fill. Price shall include the procurement and delivering suitable material, and the removal and disposal of the unsuitable soil or material off site. See Specification Section 31 23 16.			
007	1.5" Mill and Overlay:	SY		
	Detailed Description: Price shall include the milling of existing pavement beyond the limits shown on the plans to a depth of 1.5" and overlay with 1.5" of HMA S0.375. Price shall include all labor, material, and equipment to perform the work. See Specification Section 32 12 16.			

PROPOSAL (continued)

Respectfully submitted,

Company Name By (Signature)

Address Print Name

Address Title

(SEAL-if proposal is by a corporation)

Note: Insert Proposer's name. If a corporation, give the State of Incorporation using the phrase, "A corporation organized under the laws of

_____, composed of officers as follows:

President Secretary

Vice President Treasurer

If a partnership, give names of partners, using also the phrase, "co-partners trading and doing business under the firm name and style of _____, composed of partners as follows:

EMAIL

END OF GENERAL BID

SECTION 3

TECHNICAL SPECIFICATION

SECTION 020100 - SITE PREPARATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to the work specified in this Section.

1.02 SECTION INCLUDES

- A. Work Included: Providing all Site Preparation as shown on the Drawings, and as specified, including, but not necessarily limited to the following:
 - 1. Review of existing conditions and subsurface data.
 - 2. Maintain existing fencing and provide and install new construction fence as necessary in locations as directed by the Owner and Engineer.
 - 3. Provide and install tree protection fence.
 - 4. Provide and install project signs as directed by the Owner and Engineer.
 - 5. Provide West Nile Virus protection measures as directed by the Owner and Engineer.

1.03 EXISTING CONDITIONS - It shall be the obligation of each bidder to satisfy himself by examination of the site that the existing conditions, elevation grades, and improvements shown are accurate. No claim for extra compensation for inaccuracies of existing conditions will be allowed.

1.04 ADDITIONAL INFORMATION - Upon award of contract, the Contractor may make their own subsurface and site investigations to substantiate existing subsurface soil conditions.

1.05 JOB CONDITIONS

- A. Contact Call Before You Dig services for Connecticut (1.800.922.4455) to locate underground utilities prior to commencing site preparation operations.
- B. No areas under construction shall be left accessible to pedestrians at any time. The Contractor shall take all necessary steps, as requested or approved by the Owner/Engineer, to secure the site. When making water, storm drainage, or any other utility connections, the Contractor is responsible for securing work areas which occur outside of the proposed construction fence line for the entire time construction is taking place.
- C. For construction access to the site, the Contractor shall use entrances shown on the Drawings for access and egress to the site. All damage to pavement and grounds to remain caused by vehicular access to the site shall be repaired at the Contractor's expense to the satisfaction of the Engineer and the Owner.
- D. The Contractor is responsible for protecting all survey monuments, benchmarks and property boundary pins within the contract limits shown. The Contractor shall locate, maintain, raise, lower, or remove and replace to suit the new field conditions or if damaged by Contractor's operations. State of Connecticut requirements and specifications for monument location and installation must be followed.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- E. Peripheral areas outside of the staging areas shown on the Drawings shall not be disturbed or used for storing or stockpiling materials without prior approval of the Owner and Engineer.
- F. Stockpiles shall be maintained in accordance with State of Connecticut DEEP best management practices.

PART 2 PRODUCTS

2.01 CONSTRUCTION FENCE

- A. Chain-Link Fencing: Minimum two (2) inch, 0.148 inch thick, galvanized steel, chain-link fabric fencing; minimum eight (8) feet high with galvanized steel pipe posts; minimum 2-3/8 inch OD line posts and 2-7/8 inch OD corner and pull posts, with 1-5/8 inch OD top rails.

2.02 TREE PROTECTION FENCE

- A. Tree Guard: Lumber shall be Yellow Pine, Douglas Fir or Spruce. Nails shall be galvanized. No Paint will be required.
- B. Tree Wrap: Tree wrap shall be snow fencing composed of commercially woven wood slats and wire.
- C. Line Post/Stake: Line post/Stake shall be 'Heavy Vinyl Guard Post', U shaped, 13 gauge, rustproofed steel, three (3'-0") foot height, manufactured by Boundary Fence and Rail Systems, Richmond Hill, NY or approved equal. Color to be Black.

PART 3 - EXECUTION

3.01 PUBLIC SAFETY

- A. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

3.02 PROJECT SIGNS

- A. Install Project Identification Signs as directed by the Owner and the Engineer. Install signs as indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
- B. Install temporary directional/information signs as directed by Owner and Engineer.
- C. Maintain signs throughout construction; remove at completion of Work.

3.03 TREE PROTECTION FENCE

- A. Protect existing trees and shrubs designated to remain.
- B. Install tree protection fencing and posts as specified herein and as indicated on the Drawings.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- C. Repair immediately any damage to tree crowns or root systems, as directed.

3.04 DISPOSAL

- A. All waste material shall be disposed of legally off site.
- B. No Burning or burying on-site will be allowed.

3.05 WEST NILE VIRUS PROTECTION MEASURES: Care shall be taken to prevent the ponding or pooling of standing water-on the ground, in buckets, on top of barrels, in tarps, etc. at all times within the contract limit line and areas designated for construction outside the contract limit line for the duration of the construction contract. Areas of pooled or ponded water shall be immediately drained.

END OF SECTION 020100

SECTION 024113 - SITE DEMOLITION AND REMOVALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 1 General Requirements and Specific Requirements, apply to this Section.

1.02 SUMMARY

- A. The work of this Section includes the following:
 - 1. Site demolition and removals as indicated on the Drawings.

1.03 RELATED SECTIONS

- A. Section 020100 - Site Preparation
- B. Section 312500 - Erosion and Sediment Controls

1.04 PROJECT CONDITIONS

- A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect site improvements on adjoining properties and on Owner's property to remain.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.
- C. Review and verify all limits of items to be removed with the Owner and Landscape Architect prior to commencing clearing and grubbing operations.
- D. Inspection: Verify existing condition of all plant material scheduled for clearing and grubbing removal. Do not proceed with any work that will result with unsafe conditions causing a continuing or permanent hazard. Ascertain that all work scheduled for clearing and grubbing can be safely accomplished in a proper time period.
- E. Benchmarks: Protect all survey monuments, benchmarks, and property boundary pins. Replace if destroyed by Contractor's operations at no cost to the Owner. Contractor to provide temporary offsets to benchmarks during clearing & grubbing and construction and provide new monuments as part of this construction.
- F. Permits/Fees: Coordinate with appropriate utility companies and pay any disconnect fees and permits as necessary.
- G. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated or directed.
- H. Provide 48 hours notice prior to conducting any site clearing and grubbing operation.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- I. Contact Call Before You Dig Services (1-800-922-4455) prior to commencing any demolition operations.

1.05 EXISTING SERVICES

- A. General: Indicated locations are approximate. Contractor is responsible for determining exact locations before commencing Work.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

- A. Demolish site features shown on the plans.
- B. Take care not to damage any features that are to remain. Repair existing features to remain that are damaged by demolition operations.
- C. All demolished features will become the property of the Contractor except as noted.

3.02 DISPOSAL

- A. All waste material shall be disposed of legally off site.
- B. Suitable excess earth materials, as determined by the Engineer, will be removed from the site or remain on site in a location directed by the Engineer.
- C. No burning or burying of materials on-site will be allowed.

END OF SECTION 024113

SECTION 033001 - PORTLAND CEMENT CONCRETE (SITE)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. "Form 818" shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 818 (latest edition and any supplemental specifications).

1.02 SUMMARY

- A. This Section includes specifications for cast-in-place concrete site walls and foundations.

1.03 RELATED SECTIONS

- A. Section 018113 -Volatile Organic Compound Limits
- B. Section 312316 - Earthwork
- C. Section 333000 - Sanitary Sewer
- D. Section 334000 - Storm Drainage

1.04 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.05 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For concrete pavement mix.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials. Contractor shall pay for all testing of concrete materials.
- D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials (i.e., traffic paint).
 - 6. Joint fillers.

1.06 QUALITY ASSURANCE

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- A. Materials and methods of construction shall comply with the following standards:
 - 1. American Society for Testing and Materials (ASTM)
 - 2. American Concrete Institute (ACI)
 - 3. State of Connecticut DOT Standard Specifications (Form 818)
- B. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source. Do not change source of brands of cement, aggregate materials, or batching plant during course of work.
- E. ACI Publications: Comply with all ACI requirements unless modified by the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 FORMS

- A. Conform to Article 8.11.03-3 and 9.21.03-3 of Form 818, latest revision.
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars and Tie Bars: ASTM A 615, Grade 60, deformed.
- B. Plain, Cold-Drawn Steel Wire: ASTM A 82.
- C. Steel Welded Wire Fabric: ASTM A 185.
- D. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- E. Supports for Reinforcement: Chairs, spacers, dowel bar supports and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Use wire bar-type supports complying with CRSI specifications.
 - 1. Use supports with sand plates or horizontal runners where base material will not support chair leg.
- F. Bending: All reinforcement shall be bent cold. Only competent mechanics shall be employed for cutting and bending, and proper appliances shall be provided for such work. The reinforcement shall be bent to the shapes shown on the plans. Bends for stirrups and ties shall be made around a pin having a diameter not less than two times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than six times the minimum thickness of the bar, except that for bar larger than one inch the pin shall not be less

than eight times the minimum thickness of the bar. Reinforcement shall be formed to the dimensions indicated on the plans before it is embedded in the concrete.

- G. Splices: All Splicing shall be as specified in American Concrete Institute (ACI) Building Code.
- H. Placing and Fastening: Placing and Fastening shall be as specified in ACI Standards. Before any concrete is placed, all mortar shall be cleaned from the reinforcement. No concrete shall be poured until the Engineer has inspected the placing of the reinforcing metal and permission to place concrete is granted. All concrete placed in violation of this provision shall be rejected and removed.

2.03 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Concrete: Conform to the requirements of Form 818, Article M.03.02, Class "A" "C" or "F" and ASTM C-94. Batch mixing at project site not acceptable.
- C. Compressive strength: Min. 4,000 psi at 28 days unless otherwise noted on the Plans.
- D. Entrained air: 4 to 6%.
- E. Reactive aggregates and calcium chloride are not allowed.
- F. Water: Potable.

2.04 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

2.05 CURING MATERIALS

- A. Conform to Article 4.01.03, Item F7 "Curing", Form 818.

2.06 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
 - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

2.07 CONCRETE MIX

- A. Prepare design mixes for each type and strength of normal-weight concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use a qualified independent testing agency for preparing and reporting proposed mix designs.
- B. Proportion mixes to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28-Day): Min. 4000 psi or as shown on Plans.
 - 2. Slump Limit at Point of Placement: 2 to 4 inches.

3. Air Entrainment of Between 4-6%. Air entrainment agent shall conform to ASTM C260.
- C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, project conditions, weather, test results, or other circumstances warrant.

2.08 EXPANSIONS JOINTS

- A. Premolded joint filler: ASTM D-994, premolded, resilient, non-extruding, joint filler, as distributed by A. H. Harris, New Britain, CT or approved equal.
 1. Expansion joint filler shall be preformed bituminous cellular type conforming to the requirements of ASHTO M213.
 2. Thickness: as indicated on the drawings.
 3. Depth: to match concrete section
- B. Joint Sealer (for non-colored concrete): Two component polyurethane elastomeric type complying with FS-TT-S-00227, self-leveling, designed for foot traffic, as manufactured by SIKA, Pecora, or approved equal.
 1. Color to match finished/cured concrete. Final color to be approved by Engineer.
 2. Provide backer rod and primer per manufacturer recommendation.

2.09 RELATED MATERIALS

- A. Epoxy Adhesive: ASTM C 881, two-component material suitable for dry or damp surfaces. Provide material type, grade, and class to suit requirements.
- B. Products: Subject to compliance with requirements, provide one of the following:
 1. Epoxy Adhesive:
 - a. Burke Epoxy M.V.; The Burke Co.
 - b. Resi-Bond (J-58); Dayton Superior.
 - c. Euco Epoxy System #452 or #620; Euclid Chemical Co.
 - d. Concrecive Standard Liquid; Master Builders, Inc.
 - e. Rezi-Weld 1000; W.R. Meadows, Inc.
 - f. Sikadur 32 Hi-Mod; Sika Corp.
 - g. R-600 Series; Symons Corp.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement in conformance with Section 312316, Earthwork.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.02 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.03 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

3.04 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 3. Provide tie bars at sides of pavement strips where indicated.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

4. Use a bonding agent or epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4 inch (6 mm).
 - b. Radius: 3/8 inch (10 mm).
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
1. Radius: 1/4 inch (6 mm).
 2. Radius: 3/8 inch (10 mm).

3.05 CONCRETE PLACEMENT

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at project site, or during placement.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Engineer.
- I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations.
- J. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- K. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- M. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.06 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Finishing: Finish shall be light sand-blast.

3.07 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Conform to Form 818.

3.08 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unlevelled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.09 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

C. Testing Services: Testing shall be performed according to the following requirements:

1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.

7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 8. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m), Engineer may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 10. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).
- D. Test results shall be reported in writing to, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as the sole basis for approval or rejection.
- F. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Engineer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

inspections.

END OF SECTION 033001

SECTION 312316 – EARTHWORK (SITE)

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, and Division One General Requirements apply to the work specified in this section.
- B. Form 818 shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 818 or its latest edition and any supplemental specifications.

1.02 SUMMARY

- A. This Section includes the following: All site excavating, not included under other sections, required for grading, trenching, paving, curbs, or any other subsurface structures. The Contractor shall place, compact and dispose of excess excavated materials in accordance with the plans, specifications and directions of the Engineer.
 - 1. Unclassified Excavation shall include the removal of existing pavements, curbs, earth, boulders, buried timber, broken concrete pieces, existing foundations (e.g. concrete block), brick and other materials of any nature that may be encountered.
 - 2. The Contractor shall construct and place fill and backfill material in accordance with this specification.
 - 3. The Contractor shall saw cut existing pavements and/or saw cut existing curbs in accordance with the plans, specifications and direction of the Engineer.

1.03 DEFINITIONS

- A. “Suitable Material” or “Acceptable Material”
 - 1. ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 6 inches in any dimension, debris, waste, frozen material, vegetation and other deleterious material.
 - 2. Any mineral (inorganic) soil, blasted or broken rock and similar materials of natural or man made origin, including mixtures thereof, are considered acceptable materials.
- B. “Unacceptable Material” - ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH and PT.

1.04 QUALITY ASSURANCE

- A. Material Standards: As defined in Form 818 inclusive of all supplements.
- B. Testing: Compaction tests may be required by the Owner and will be paid for by the Contractor. No specific testing schedule has been established at this time. If tests indicate that density requirements have not been achieved, the Contractor shall continue compacting. All re-testing in unsatisfactory areas shall be paid for by the Contractor.
- C. Density and Compaction Testing: The Contractor is responsible to schedule compaction tests as required by the Owner and to allow adequate time for the proper execution of said tests.

1.05 PROTECTION

- A. Dust Control: Use all means necessary to control dust on and near the construction areas caused by the Contractor's performance of the work in conformance with Form 818.

1.06 PROJECT CONDITIONS

- A. West Nile Virus Precautions: To stem the spread of West Nile Virus, the Contractor shall closely monitor the work of this section to prevent water from collecting and/or ponding within or adjacent to the work for any length of time, thereby reducing the opportunities for mosquitoes to breed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Backfill, Fill and Embankment Materials: Any acceptable material in accordance with the Geotechnical Report. Onsite material may need to be modified/supplemented in order to be accepted for reuse. Contractor shall submit a sample of onsite material to be reused for approval.
- B. Subbase Material: Conform to Form 818, Section M.02.02 - Subbase.
- C. Processed Aggregate Base: Conform to Form 818, Section M.05.01.
- D. Bedding Material: Sand or sandy soil, all of which passes a 3/8" sieve, and not more than ten percent (10%) passes a No. 200 sieve.
- E. Tank Backfill and Bedding & Pipe Bedding: All backfill material for underground tanks and for piping shall conform to ASTM C-33 paragraph 9.1 for quality and soundness. This material shall consist of washed pea gravel ranging from 1/8-inch to 3/4-inch in diameter, or washed stone crushings between 1/8-inch and 1/2-inch in diameter or a material which has been approved by the tank or pipe manufacturer. Not more than 3 percent of the aggregate shall pass a No. 8 sieve.
- F. Gravel Backfill: Well graded gravel conforming to Form 818, M.02.01 except, M.02.06 Grading C, not Grading A, shall be provided. Use bank run gravel backfill for all excavations where indicated on the plans or wherever specified.

2.02 BORROW SOIL FILL

- A. Conform to Form 818 Section 2.07 "Borrow".

2.03 WARNING TAPE

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.

5. Green: Sewer systems.

PART 3 EXECUTION

3.01 GENERAL

- A. The entire area of work shall be brought to the required lines and grades by excavation and filling. Excavated materials, acceptable in the opinion of the Engineer, shall be used in making embankments and filling the low areas of the work, and at such places as the Engineer may direct.
- B. Excavate to the limits shown on the Drawings to subgrade level. Compact subgrade level before placing fill, base or subbase materials.
- C. Construct base course to required depths and elevations below all concrete pads, foundations and bituminous concrete.
- D. Construct bedding course below all drainage and utility structures.
- E. Place suitable/ acceptable material below all lawn and landscaped areas. No rocks larger than 2 inches in any dimension shall be placed within 4 inches of the finished grade.

3.02 COMPACTION REQUIREMENTS

- A. Compact soil to not less than the following percentages of maximum dry density according to ASTM 1557:
 - 1. Under foundations, concrete pads, and pavements, compact the top 12 inches below subgrade and each layer of backfill or fill material at 95 percent maximum dry density.
 - 2. Under lawn or unpaved areas: see Section 329113 - Topsoil.

3.03 EXCAVATION

- A. Protect Structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. Any damage to existing structures or utilities that occurs as a result of the Contractor's operations shall be corrected by the Contractor at no additional cost to the Project.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion and control measures to prevent erosion or displacement of soils and discharge of soil-bearing water run-off or airborne dust to adjacent properties and watercourses, in accordance with the Sediment and Erosion Control Plan, details and as directed by the Engineer.
- D. Subgrade: All soft, boggy, clayey or other objectionable material below the proposed subgrade elevation shall be removed, and the area refilled with acceptable material.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- E. Boulders: The Contractor shall remove all boulders, stone or pieces of concrete, lumber, iron or other material that project above subgrade. Any stone larger than two (2) cubic feet in volume shall not be placed within two (2) feet of the finished surface.
- F. Excavating for Foundations: All excavations shall be cut accurately to required lines and dimensions for work on drawings and shall be large enough to provide adequate clearance for the proper execution of the work. See Specification 310800 Earthwork (Building) for additional information.
- G. Bottoms of Excavations: Level the bottoms of all excavations, to receive footings or other work supported on soil, accurately, to the lines and levels shown on the plans or as directed by the Engineer.

Where excavation for a foundation has been carried below the indicated level by error, fill the space between the incorrect and required depth with concrete at no additional cost to the Owner.

- H. Storage and Placement: All those excavated materials which in the opinion of the Engineer are suitable for backfill shall be stored or placed within the limits of the Contract, where directed by the Engineer.
- I. Surplus: All surplus materials and materials not suitable for backfill shall be removed from the site or placed within the site as directed by the Town Engineer or their designee. No additional payment will be made for this, but the cost thereof shall be deemed included in the price bid.
- J. Shoring: Wherever necessary to maintain the banks of excavation in a safe and stable condition, the Contractor shall furnish and install temporary sheet piling or planks, braces and shores of good sound timber of adequate strength, and shall remove such piling or shoring as the foundation work progresses.

Sheeting and bracing of a type approved by the Engineer, shall be installed when the Contractor's employees are required to enter into excavations which exceed four (4) feet in depth.

The foregoing shall include the construction and removal of sheeting and bracing, the excavation and maintenance of temporary ditches, and the furnishing and operation of pumps or other appliances needed to properly drain the work. No direct compensation will be made for this work, but payment therefore shall be deemed included in the price bid.

- K. Inspection: When the excavations have been carried to the required depth as shown on the drawings, the Contractor shall do no more work until after inspection by the Engineer, who shall order the foundation or other work to proceed, or further excavation, as the conditions indicate and no foundation or other work shall be done until the excavations have been approved by the Engineer.
- L. Bailing and Draining: The Contractor shall furnish all materials, appliances and labor required to keep the site of the work free from water, ice and snow during construction.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- M. Utilities and Services: When any sewer, water, gas, electric or other utility service connections are encountered in the excavation operations, the service shall not be interrupted or disturbed by the Contractor unless called for on the plans and/or directed by the Engineer. It is the Contractor's responsibility to detect and protect existing utilities (to remain) from damage during construction. The Contractor shall locate buried utilities, to the best of his ability, using electronic probes, or other methods, prior to the start of excavation. The Contractor shall then proceed cautiously and perform hand excavation, as necessary, to protect the utility as directed by the Engineer, at no extra cost to the Owner. If a utility is inadvertently damaged, it is the Contractor's responsibility to restore that utility to operating condition, equal to that existing prior to damage. The Contractor shall remain at the site with the damaged utility until it has been restored and there is no danger to the public (i.e. exposed live electrical wires, etc.).

Should the Contractor need to cut off utilities or services during the performances of the work, he shall notify the City Department or Utility Company owning or controlling services, to cut off these services. It is the Contractor's responsibility to provide sufficient advance notice to the Utility Company so that work not be delayed. The cost of any such delay in work shall be solely borne by the Contractor.

Any services cut off or interrupted by the Contractor's operations shall be restored at the Contractor's expense.

3.04 FILL

- A. Remove all vegetation, topsoil, debris, wet and unsatisfactory soil materials, obstructions, and deleterious materials from the ground surface prior to placing fills. Unsuitable subgrade material as determined by the Engineer may be removed in accordance with these Specification.
- B. Fill and Compacting shall be carried out as directed by the Engineer, and shall be constructed in successive horizontal layers not over 6 inches in depth. It shall be spread by a "Bulldozer", or other acceptable methods, and shall be thoroughly compacted by rolling with a self-propelling roller weighing not less than ten (10) tons and completed to the satisfaction of the Engineer. In places where the character of the material makes the use of this roller impracticable or where drains or other construction may be damaged a lighter one may be substituted, or the area shall be compacted by vibratory tamping, all with the approval, and to the satisfaction of the Engineer.
- C. All hollows and depressions which develop during the process of rolling and compacting shall be filled with acceptable material, and the subgrade shall again be compacted. This process of filling and compacting shall be repeated until no depressions develop.
- D. Plow, strip or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
- E. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.

3.05 BACKFILL

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- A. After inspection and approval of excavation which is to be covered by backfill, the excavated voids shall be filled with clean excavated material, puddled and rammed solid every 6" of depth.
- B. After areas and trenches have been excavated and structures constructed therein, the spaces around and above them shall be carefully backfilled with acceptable material. Backfill shall be placed on both sides of structures to approximately the same elevation at the same time. All backfill shall be thoroughly tamped and rammed in place in layers not over six (6) inches in depth, using rammers of a weight acceptable to the Engineer. If directed by the Engineer, the backfill shall be thoroughly saturated with water as it is placed.
- C. Backfilling around manholes, catch basins and dry wells shall not take place until the mortar has hardened and the possibility of movement is slight. Backfilling shall take place uniformly around all sides of the structure.
- D. When sheeting is being withdrawn, all cavities left thereby shall be filled with acceptable material, tamped in place so as to fill all voids thoroughly. Backfill inside of sheeting shall be placed before sheeting is removed.

3.06 UTILITY TRENCHES

- A. See Section 312333 - Trenching.

3.07 SAW CUTTING

- A. All saw cutting shall be carried out to the full depth of the pavement, curb or concrete walk to be cut. Saw cutting shall be done to accurate, neat and straight lines marked previous to commencement of work. Saw cutting shall be done with approved power saws specifically designed and manufactured for such a purpose. Compressor, backhoe or spade-cutting of the pavement will not be allowed.

END OF SECTION 312316

SECTION 312333 - TRENCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, and Division One General Requirements apply to the work specified in this section.
- B. Form 818 shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 818 (latest edition and any supplemental specifications).

1.02 DESCRIPTION OF WORK

- A. Work Included: Trenching, sheeting and dewatering as specified herein, and as needed for installation of storm drainage and appurtenances associated with the Work.

1.03 RELATED SECTIONS

- A. Section 018113 - Volatile Organic Compound Limits
- B. Section 312316 - Earthwork
- C. Section 334000 - Storm Drainage

1.04 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this Section.
- B. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.
- C. Comply with requirements and regulations of utility companies and governmental agencies having jurisdiction.
- D. Refer to Section 312316 - Earthwork for compaction requirements.

1.05 PROJECT CONDITIONS

- A. Contact Call Before You Dig services for Connecticut (1.800.922.4455) to locate under- ground utilities prior to commencing site preparation operations a minimum of 2 days before beginning any work at the site.
- B. West Nile Virus Precautions: To stem the spread of West Nile Virus, the Contractor shall closely monitor the work of this section to prevent water from collecting and/or ponding within or adjacent to the work for any length of time, thereby reducing the opportunities for mosquitoes to breed.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. As selected by the Contractor.

PART 3 EXECUTION

3.01 PROJECT CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed with the work of this section until unsatisfactory conditions are corrected.
- B. Finish Elevations and Lines:
 - 1. Locate and protect control points during progress of the Work.
 - 2. Preserve permanent reference points during progress of the Work.
 - 3. Do not change or relocate reference points or items of the Work without written approval from the Engineer.

3.02 EXECUTION

- A. Utilities:
 - 1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
 - 2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted. Inform Engineer of existing utility line before proceeding.
 - 3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
 - 4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer for review and written direction before proceeding with modifications to the work. Do not proceed with permanent relocation of utilities until written direction is received from the Engineer.
- B. Protection of Persons and Property:
 - 1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access to the work.
 - 2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
 - 3. Protect existing structures, utilities, sidewalks, pavements, fences and other facilities from damage caused by trenching, settlement, lateral movement, washout, and other hazards created by operations under this Section. All existing features affected and/or damaged by the work of this Section shall be brought back to their original conditions at no cost to the Owner.

C. Dewatering:

1. Remove all water, including rain water, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
2. Keep excavations and site construction free from water.

D. Dust Prevention:

1. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site in conformance with Standard Specifications.

E. Maintain access to the site at all times.

3.03 TRENCHING PROCEDURES

A. Trench Excavation:

1. Construction methods shall conform to Section 206 of Standard Specifications, where applicable.
2. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit.
3. Clearance: 12 inches minimum each side of pipe or conduit.
4. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
5. Place and compact bedding material on rock or other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Rock in Trench Excavation:

1. Excavation of trench shall be as described in Standard Specifications, Article 203-3.05, under the "Rock Excavation".

C. Comply with pertinent provisions of Section 312316 - Earthwork.

D. Provide sheeting and shoring as necessary for protection of the Work and for the safety of personnel.

1. Prior to backfilling, remove all sheeting.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

2. Do not permit sheeting to remain in the trenches except when field conditions or the type of sheeting or methods of construction such as the use of concrete bedding are such as to make removal of sheeting impracticable. In such cases, portions of sheeting may be cut off and remain in the trench as approved by the Owner.

E. Miscellaneous:

1. Short sections of a trench may be tunneled, subject to approval of the Engineer, if the conductor conduit and backfill can be installed and compacted properly into such tunnel.
2. Where it becomes necessary to excavate beyond the limits of normal excavation lines in order to remove boulders or other interfering objects, backfill and compact the voids remaining after removal of the objects in accordance with Section 312316 at no additional cost to the Owner.
 - a. If a void is below the subgrade for the utility bedding, use suitable earth materials and compact to a relative density of no less than 95%.
 - b. If a void is in the side of the utility trench of open cut, use suitable earth or sand compacted or consolidated to a relative density of no less than 90%.
3. Excavating for appurtenances:
 - a. Excavate for dry wells, hydrants and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.
 - b. Over depth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as approved by the Engineer, and at no additional cost to the Owner.
4. Trench to the minimum width necessary for proper installation of the utility, with sides as nearly vertical as possible. Accurately grade the bottom to provide uniform bearing for the utility.
5. Depressions:
 - a. Dig bell holes and depressions for joints after the trench has been graded. Provide uniform bearing for the pipe on prepared bottom of the trench.
 - b. Except where rock is encountered, do not excavate below the depth indicated or specified.
 - c. Where rock is encountered, excavate rock to a minimum over depth of 4" below the trench depth indicated or specified.

- F. Where utility trenching, piping and/or conduit traverses public property and/or is subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

requirements and/or regulations as set forth by authority having jurisdiction, but in no case shall the depth be less than that shown in the Contract Documents.

G. Cover:

1. Provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item below the finish grade or subgrade:
 - a. Storm drains: 18"
 - b. Sewer pipes: 36"
 - c. Raceways: 30"
 - d. Water pipes: 48"
 - e. Gas: 36"
2. Where utilities are under a concrete structure slab or pavement, the minimum depth need only be sufficient to completely encase the conduit or pipe sleeve, provided it will not interfere with the structural integrity of the slab or pavement.
3. Where the minimum cover is not provided, encase the pipes in concrete as indicated on the Drawings. Provide concrete with a minimum 28 day compressive strength of 4000 psi with entrained air 5 to 7 percent. Mechanically consolidate concrete.

3.04 BACKFILLING AND COMPACTION

- A. Excavations shall be backfilled and compacted in accordance with Section 312316.

END OF SECTION 312333

SECTION 312500 - EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 1 General Requirements and Specific Requirements, apply to this Section.
- B. "Connecticut Guidelines for Soil Erosion and Sediment Control", Connecticut Council on Soil and Water Conservation, May 2002, inclusive of all supplements and/or its latest revision or edition.

1.02 SECTION INCLUDES

- A. Hay bales, filter fabric fence, sediment barriers and sedimentation structures
- B. Temporary mulch
- C. Temporary sediment basins as required by field conditions

1.03 RELATED SECTIONS

- A. Section 018113 - Volatile Organic Compound Limits

1.04 QUALITY ASSURANCE

- A. All erosion and sediment control measures will be constructed in accordance with the standards and specifications of the "Connecticut Guidelines for Soil Erosion and Sediment Control".

1.05 PROJECT CONDITIONS

- A. Land disturbance will be kept to a minimum; re-stabilization will be scheduled as soon as possible. Temporary seeding or permanent hydro-seeding should take place immediately upon completion of grading. Permanent seeding will be scheduled during March 15 - June 15: August 15 - October 15.
- B. Erosion and sediment control measures will be installed prior to construction whenever possible and will be maintained in effective condition throughout the construction period.
- C. Hay bale filters will be installed at the base of all proposed slopes and on the downhill side of any area receiving new planting and as instructed by the Engineer.
- D. Additional control measures will be installed during the construction period as required by field conditions or as requested by the Engineer.
- E. Sediment removed from control structures will be disposed of on site in a manner approved by the Engineer.
- F. Mulch all new slopes 3% or greater. Use straw or hay (70-90 lbs. 1,000 sq. ft.), free of weeds or coarse matter. Chemical binder such as Petroset Terratack Hydro Mulch and Aerospray will be used as recommended by manufacturer to anchor mulch. Mulch must be inspected periodically, in particular, after rainstorms to check for rill erosion. Where erosion is severe, repair the eroded area and place additional mulch as required to control the erosion. Grasses shall not be considered established until a ground cover is achieved, which is mature enough to control soil erosion and to survive severe weather conditions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Hay bales:

1. Hay bales shall be made of hay with 40 lbs. minimum weight, and 120 lbs. maximum weight. The hay bales shall be sufficiently bound with either wire or nylon twine to resist breaking apart during their use, shipment or placement.
2. Stakes shall be wood, minimum two inches (2") by two inches (2") by three feet (3') long.

B. Filter fabric:

1. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester or ethylene filaments and shall be certified by the manufacturer or supplier as conforming to the following requirements:

Minimum Filtering Efficiency: 75%

Minimum Tensile Strength at 20% Elongation

for Extra Strength: 50 lbs./lin. in.

for Regular Strength: 30 lbs./lin. in.

Minimum Flow Rate: 0.3 gal./min./sq.ft.

- C. Temporary mulch: clean oat straw, wheat straw, timothy hay, a mixture of clover and timothy hay or other approved native or forage grasses; well-seasoned before bailing, free from mature seed-bearing stalks or roots of prohibited or noxious weeds.
- D. Crushed stone: crushed or broken stone conforming to the requirements of Section M.02.01-1 "Broken or Crushed Stone" of CTDOT Form 818. Gradation shall conform to No. 8 (1/4" stone) per Section M.01.01.

PART 3 EXECUTION

3.01 PREPARATION

- A. Conduct construction operations in compliance with all terms of regulation agency requirements, including requirements noted on the Contract Drawings.
- B. Retain all sediments within the contract limits, and within designated disposal areas.
- C. Install erosion control measures prior to beginning site disturbance. Maintain erosion control measures throughout construction period, install additional measures if necessary to retain all sediment on site. Install any additional erosion control measures which may be required by local regulatory officials.

3.02 SEDIMENT BARRIERS

FUELING FACILITY INSTALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

A. Sediment barriers shall be limited to hay bales and silt fencing for sheet flow applications installed in accordance with Item 1.01.B.

B. Hay Bales:

1. Bales shall be placed in a single row, with ends of adjacent bales tightly abutting one another. Bales shall be oriented lengthwise on the contour for sheet flow applications, perpendicular to the contour for channel flow applications, and in a square or rectangular shape around depressed catch basin inlets.
2. Bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales to prevent deterioration of the bindings.
3. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of the bale and the length of the proposed barrier to a minimum depth of four inches (4"). After the bales are staked and chinked, the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to four inches (4") against the uphill side of the barrier.
4. For channel flow applications, the barrier shall be extended to such a length that the bottoms of the end bales are higher in elevation than the top of the lowest middle bale to assure that sediment laden runoff will flow either through or over the barrier but not around it.
5. The areas immediately around catch basins may be excavated slightly to increase ponding of runoff water around catch basins.
6. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes shall be driven deep enough into the ground to securely anchor the bales.
7. The gaps between bales shall be chinked with straw to prevent water from escaping between bales.
8. In sloping areas where surface flow follows the bale line, perpendicular bale checks shall be installed at appropriate intervals (100 feet maximum).

C. Filter Fabric

1. Filter fabric shall be wrapped around all existing and proposed trench drain and catch basin and inlet grates to prevent sediment from entering the storm drainage system. The fabric shall be wrapped tightly around the outside of the grate structure and the grate placed securely back inside the receiving frame.
2. Where soil stockpiles are to be placed directly over trench drains or inlets, the fabric shall be wrapped a minimum of two (2) times around the grate structure.

3.03 TEMPORARY MULCH

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- A. Place mulch uniformly in a continuous blanket at a rate of 2½ tons per acre, or two 50 pound bales per 1,000 square feet of area. A mechanical blower may be used for mulch application. Do not spread/apply mulch by mechanical means or by hand on windy or gusty days.
- B. Crimp straw into soil by mechanical means.
- C. On all slopes 4:1 or steeper, anchor mulch with liquid tackifier applied uniformly at a rate of 60 gallons per acre.
- D. Protect buildings, paving, planting and all non-seeded areas from liquid tackifier over-spray.

3.04 INSPECTION AND MAINTENANCE

A. General

- 1. Inspection shall be frequent, and shall be made after each storm event. Repair or replacement shall be made promptly as needed.

B. Hay Bales

- 1. Cleanout of accumulated sediment behind the bales is necessary if ½ of the original height of the bales becomes filled with sediment.
- 2. Hay bales shall be replaced after their expected useful life of 60 days.
- 3. Bale barriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized and the completion of construction activities.

C. Filter Fabric Fence

- 1. Fabric placed around grates shall be replaced whenever the fabric becomes torn, stretched or otherwise damaged so that it can no longer perform its function.

D. Sedimentation Basins

- 1. Temporary sedimentation basins shall be cleaned-out once one-half of the basin volume becomes filled with sediment.

END OF SECTION 312500

SECTION 321123 - PROCESSED AGGREGATE BASE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, and Division One General Requirements apply to the work specified in this section.
- B. Form 818 shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 818 or its latest edition and any supplemental specifications.

1.02 DESCRIPTION OF WORK

- A. Work Included: Provide and install a processed stone aggregate base in two courses on a prepared subgrade as shown on the Drawings or as ordered by the Engineer, and as specified herein.

1.03 RELATED WORK

- A. Section 018113 - Volatile Organic Compound Limits
- B. Section 312316 - Earthwork

1.04 QUALITY ASSURANCE

- A. Material Standards: As defined in Form 818 inclusive of all supplements.
- B. Testing: Compaction tests may be required by the Owner and will be paid for by the Contractor. No specific testing schedule has been established at this time. If tests indicate that density requirements have not been achieved, the Contractor shall continue compacting. All re-testing in unsatisfactory areas shall be paid for by the Contractor.
- C. Density and Compaction Testing: The Contractor is responsible to schedule compaction tests as required by the Owner and to allow adequate time for the proper execution of said tests.

1.05 SUBMITTALS

- A. Submit certified test reports and materials certificates, for products specified in this Section, indicating compliance of all proposed materials with specified requirements.

1.06 PROTECTION

- A. Dust Control: Use all means necessary to control dust on and near the construction areas caused by the Contractor's performance of the work in conformance with Form 818.

PART 2 PRODUCTS

2.01 PROCESSED AGGREGATE BASE

- A. Conform to Article M.05.01, Form 818.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

PART 3 EXECUTION

3.01 SUBGRADE PREPARATION

- A. Prior to placing the bottom course of processed stone aggregate base, the prepared subgrade shall be maintained true to line and grade, at all times for a minimum distance of 200 feet in advance of the work. No placement of the processed aggregate is to commence until acceptance by the Engineer of the subgrade on which it is to be placed.
- B. The formation and protection of subgrade shall conform to the requirements of Form 818.

3.02 MATERIAL PLACEMENT/COMPACTION

- A. Install processed aggregate base material at the locations as shown on the Drawings and in accordance with Article 3.04.03 of Form 818. Dimensions specified are after compaction.
- B. Compact base material with vibratory roller to minimum 95% modified AASHTO laboratory density (ASTM D-1557, Method C).

END OF SECTION 321123

SECTION 321216 - BITUMINOUS CONCRETE PAVEMENT AND MARKINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 1 General Requirements and Specific Requirements, apply to this Section.
- B. "Form 818" shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 818 or its latest edition and any supplemental specifications.

1.02 SUMMARY

- A. This Section includes the materials, labor, installation and incidental costs for the installation of subbase material, base materials, bituminous concrete pavement and markings.
- B. Coordinate the work of this Section with Section 321313 - Portland Cement Concrete.

1.03 RELATED SECTIONS

- A. Section 018113 - Volatile Organic Compound Limits
- B. Section 321313 - Portland Cement Concrete Pavement and Curbing

1.04 SUBMITTALS

- A. Material Certificates: Provide material certificates signed by the material producer and the Contractor, certifying that materials and products comply with specified requirements.

1.05 QUALITY ASSURANCE

- A. Material and Methods of Construction: Shall comply with the following standards:
 - 1. American Society for Testing and Materials (ASTM).
 - 2. American Association of State Highway and Transportation Officials (AASHTO).
 - 3. Asphalt Institute (AI).
 - 4. State of Connecticut DOT Standard Specifications, Form 818, inclusive of all supplements.
- B. Testing: Compaction tests may be required by the Owner and shall be paid for by the Contractor. No specific testing schedule has been established at this time. If tests indicate that density requirements have not been achieved, the Contractor shall continue compacting. All retesting in these areas shall be paid for by the Contractor.
- C. Density and Compaction Testing: The Contractor is responsible to schedule compaction tests if required by the Owner and to allow adequate time for the proper execution of said tests.
- D. Allowable Tolerances: Final surface of base materials within 3/8" from a required grade. Final pavement thicknesses shall conform to specified requirements as shown in the Drawings. Test for smoothness using a ten (10) foot long straightedge. Surface shall not vary more than 1/4"

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

from straightedge when placed in any direction. In no case will water be allowed to stand or puddle on any finished pavement. All standing or puddling water conditions will be fixed at the Contractor's expense.

- E. Permits/Approvals: The Contractor shall obtain approval of construction and secure all permits for all work.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Transporting shipments of bituminous concrete material shall be made in tight vehicles previously cleaned of all foreign material, and delivered to the site, so that it will not become contaminated in any way.

1.07 PROJECT CONDITIONS

A. Weather Limitations

1. Base material shall not be placed on frozen or saturated subbase material.
2. Bituminous concrete paving material shall not be placed on frozen or saturated base material.
3. Cold weather: Bituminous concrete paving materials shall be mixed and placed in accordance with minimum placement temperature as specified in Article 4.06.03, Item 8 - Placing of Mixture, Form 818.
4. Precipitation or Moisture: Placement of bituminous concrete paving materials shall not be scheduled when weather conditions of fog or rain prevail nor when the pavement surface shows signs of any moisture.
5. Precipitation Probability: Placement of bituminous concrete paving materials shall not be scheduled when the Precipitation Probability, obtained by the Contractor from the U.S. Weather Bureau Within three (3) hours prior to the start of such operations, equals or exceeds fifty (50) percent. The Contractor shall notify the Engineer of the exact time at which the above information was obtained.

- B. Grade Control: Establish and maintain the required lines and grades for each course during paving operations.
- C. Provide temporary barricades and warning lights as required for protection of project work and pubic safety.
- D. Protect adjacent work from damage, soiling and staining during paving operations.
- E. Inspection Costs: All costs associated with material certifications, plant inspection and laboratory tests shall be borne by the Contractor and shall be deemed included in the price bid for asphalt pavement.

PART 2 PRODUCTS

2.01 BITUMINOUS CONCRETE PAVEMENT

- A. Conform to the requirements of Article M.04.01, Form 818 for HMA S0.375 and HMA S1.0.

2.02 TACK COAT

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- A. Conform to the requirements of Article M.04.01, Form 818. Tack Coat shall be Grade CSS-1H cationic emulsified asphalt, diluted with water at a 1:1 ratio.

2.03 PROCESSED STONE AGGREGATE

- A. Conform to the requirements of Article M.05.01, Form 818.

2.04 PAINT

- A. Paint shall be hot-applied, fast drying type in accordance with Form 818, Section M.07.21.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify that all existing utility openings, valves, and other project installations are at their proper finished grade elevations, within areas to be paved. Provide temporary closures and protection over openings until completion of rolling operations. Remove closures at completion of the work. Set covers to grade, flush with the surface of the adjoining pavement.

3.02 SUBGRADE PREPARATION

- A. Prior to placing the bottom course of processed stone aggregate base, the prepared subgrade shall be maintained true to line and grade, at all times for a minimum distance of 200 feet in advance of the work. No placement of the processed aggregate is to commence until acceptance by the Engineer of the subgrade on which it is to be placed.
- B. The formation and protection of subgrade shall conform to the requirements of Article 2.09.01 and 2.09.03, Form 818.

3.03 BASE COURSE MATERIAL PLACEMENT/COMPACTION

- A. Install processed aggregate base material at the locations as shown on the Drawings and in accordance with Article 3.04.03, Conn DOT Form 818. Dimensions specified are after compaction.
- B. Compact base material with vibratory roller to minimum 95% modified AASHTO laboratory density (ASTM D-1557, Method C).
- C. Insure thorough and proper compaction around all yard drains, catch basins, structures, utility valves, and other improvements that project above base material.

3.04 BITUMINOUS CONCRETE PAVEMENT

- A. General
 - 1. Install the bituminous concrete pavement to the lines, grades, and details shown on the Drawings. Neatly and cleanly meet and match abutting pavements. Remove all soft or yielding material below grade and replace with suitable material.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

2. Thicknesses after compaction shall conform to the details on the Drawings. The pavement shall consist of the number of courses and thickness as detailed. Remove and replace areas showing deficiencies in required thickness with new material as directed by the Engineer.
3. Protect existing abutting pavement during paving operations. Replace any abutting pavement damaged during paving operations at Contractor's expense. Joint between bituminous pavement and existing portland cement concrete pavement shall be tightly compacted and pavement edge shall be of equal density to other areas of pavement.
4. Provide a cross-pitch of 1/4" per foot for proper drainage. Ensure that there are no "low" spots that may trap water and create a slipping hazard.

B. Forms

1. Provide wood edge forms of an approved type and a minimum length of ten (10) feet for tangents and curves, unless otherwise shown on the plans. Wood forms shall be of a depth equal to the depth of the pavement and shall be securely staked and braced to the required line and grade. Note: Hand tamp edges and bevel if wood forms are not used.
2. Install wood forms along all edges of pavement to produce a clean vertical edge. Secure strips to allow for proper compaction of bituminous concrete. Do not remove edge screed strips until pavement is thoroughly compacted. Raveled edges will not be accepted. Wood forms are to be removed after the bituminous pavement has completely set.
3. All forms shall be straight, free from bends and warps at all times, and shall be cleaned thoroughly and oiled before pavement is placed against them, this cleaning and oiling being repeated daily as the forms are moved ahead.
4. The forms shall rest firmly upon the thoroughly compacted sub-grade throughout their entire length, shall be joined neatly and tightly and staked securely to line and grade, three (3) bracing pins or stakes, each ten (10) foot length of side form, so that they will resist the pressure of the pavement and the impact of the roller without springing.

C. Placing

1. Bituminous concrete pavement shall be constructed and compacted in conformance with Conn DOT Form 818 requirements.
2. Coat the edge of all abutting pavement with tack coat before installing bituminous concrete pavements. Insure that the abutting pavement has a sound, clean, straight edge. Feathering of edges and transitions between new and existing pavements is not acceptable. Protect surfaces of abutting pavement from tack coat overspray.
3. Each mixture shall be furnished and laid by means of a mechanical spreader of approved design to a depth which after final compaction shall be equal to the specified depth. In areas where the use of a mechanical spreader is impractical, as determined by the Engineer, other means of spreading and compacting may be permitted. The use of hand rakes will not be permitted. The Contractor shall use lutes where necessary.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

4. After placing and compacting binder course, tack coat shall be applied prior to placement of the wearing (top) course.
5. Each mixture shall be laid only where the surface to be covered is free from loose or foreign material, dry, and only when weather conditions, in the opinion of the Engineer, are suitable.
6. The Contractor shall provide suitable means for keeping all small tools clean and free from bituminous accumulations.
7. Pavement may be laid by hand. Pavement shall be compacted by making multiple passes with a roller weighing not less than 2,000 pounds. After compaction, the thickness shall be that as specified on the drawings.

D. Compacting

1. Upon completion of the spreading of each mixture, the material shall be consolidated thoroughly and uniformly with self-propelled tandem rollers. The top course shall be free from roller marks.
2. Rollers used for compacting the top course shall be well balanced, self-propelled, tandem rollers, weighing between seven (7) and eight (8) tons. The roller shall have a compression under the rear wheel of between 200 and 300 pounds per linear inch of roll at a rate not exceeding 800 square yards per hour per roller. Final compaction shall meet all Conn DOT Form 818 requirements.
3. Locations inaccessible to the roller, the compression shall be effected with iron tampers weighing not less than twenty-five (25) pounds and having a bearing area not exceeding forty-eight (48) square inches, or other impact type equipment.
4. Perform breakdown, second and finish rolling until the bituminous concrete mixture has been compacted to the required surface density and smoothness. Continue rolling until all roller marks are eliminated. Provide a smooth compacted surface true to thickness and elevations required.
5. After final rolling, do not permit vehicular traffic on the pavement until it has cooled and hardened, and in no case sooner than 8 hours.

E. Joints for New Construction and Between Existing Pavement:

1. Carefully make joints between old and new pavements, and between successive day's work, to ensure a continuous bond between adjoining work. Construct joints to have the same texture, density, and smoothness as other sections of the asphalt concrete course.
2. Construction shall be as nearly continuous as is possible. The roller shall pass over the end of the laid mixture only when a practical necessity.
3. When the operation of laying is interrupted, the end of the laid material shall be left unrolled until such time as work is resumed, in order that there be no joints throughout the project.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

4. If it is necessary to roll the end of the laid mixture during construction, thus consolidating it, the joint so made shall be cut back before recommencing the operation of laying, in order to present a fresh, clean surface for contract with the newly placed material.
5. The edges of such joints shall be painted with liquid asphalt (RC-70 or MC-70) and the use of hot smoothing irons in finishing such joints, shall not be permitted.

F. Finished Surface

1. The surface of the top course of the pavement after compression shall be smooth and true to crown and grade, free from depressions, waves, bunches, overlapping seams and unevenness in surface. All new surfaces shall meet existing surfaces smoothly and evenly.
 2. After the compaction of the top course, the Contractor shall check the entire paved area for depressions, using a ten (10) foot wood or metal straightedge. Any depressions greater than three-sixteenths (3/16) of an inch shall be corrected by removing the top course of the affected areas, and replacing with new material to form a true an even surface.
- G. Defects: Where defects in composition, compression or finish appear in the completed work, such finished areas shall be removed to the full depth of the course and the defective material replaced with the required thickness of pavement at the expense of the contractor.
1. Patching: Remove and replace mixtures that become mixed with foreign materials and all defective areas. Cut out such areas and fill with fresh hot asphalt concrete. Compact by rolling to the required surface density and smoothness. Remove deficient areas for the full depth of the course. Cut sides perpendicular and parallel to the directions of traffic with edges vertical. Apply a tack coat before placing asphalt concrete mixture.

3.05 PAINTED PAVEMENT MARKINGS

- A. Existing painted pavement markings shall be removed by sandblasting or milling. Painting over existing markings will not be allowed.
- B. Pavement areas to be painted shall be dry and sufficiently cleaned of sand, dust and road debris so as to provide an acceptable bond between the paint and the pavement.
- C. Fast drying paint shall be applied at a temperature of 120 F to 150 F at the spray gun.
- D. All paint shall be performed in a neat and workmanlike manner, using approved mechanical equipment. Lines shall be sharp and clear with no feathered edging or fogging and precautions shall be taken to prevent tracking by tires of the striping equipment. Paint shall be applied as shown on the plans with no unsightly deviations.
- E. After application, the paint shall be protected from crossing vehicles for a time at least equivalent to the drying time of the paint.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

3.06 PROTECTION/CLEAN-UP

- A. Protect all work until acceptance of the project. Replace or repair pavement if damaged prior to acceptance.
- B. Clean up all debris from installation procedures, including but not limited to bituminous concrete and base material overflow into/onto areas indicated to be lawn or other surfaces. Remove from site all excess materials, debris and equipment. Contractor shall dispose of debris material legally.
- C. Repair damage resulting from paving operation to other areas of the work.

END OF SECTION 321216

SECTION 329113 - TOPSOIL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to the work specified in this Section.

1.02 SUMMARY

- A. Testing, screening, amending, placing and finish grading all stockpiled and borrow topsoil as shown on the Drawings and specified herein.
 - 1. Provide all labor, materials, borrow topsoil, soil amendments and conditioners, compost, necessary equipment, and services to furnish and install topsoil for planting operations, for backing-up pavements and curbs installed under this Contract, and for repair of lawns and other areas damaged by construction necessary to properly complete all lawn and planting operations.
 - 2. Provide 6" minimum depth of topsoil in all lawn seeding areas.

1.03 RELATED SECTIONS

- A. Section 018113 - Volatile Organic Compound Limits

1.04 QUALITY ASSURANCE

- A. Topsoil

- 1. Testing: Representative samples of borrow topsoil and stockpiled topsoil shall be completely analyzed/ tested to determine:
 - a. Nutrient analysis using the Modified Morgan extractant for soil available P, K, Ca, and Mg.
 - b. Soil pH.
 - c. Organic matter content- determined by loss of weight on ignition.
 - d. Soil texture classification.
 - e. Particle size analysis - sand, silt, and clay - analysis shall be determined using the hydrometer or pipette methods of particle size analysis with size fractions based upon size limits established by USDA.
- 2. Before delivery of any borrow topsoil, furnish the Landscape Architect with a 1 gallon sample of tested topsoil material.
- 3. Topsoil testing costs shall be borne by the Contractor.
- 4. Testing laboratory shall be:

Soil Nutrient Analysis Laboratory
University of Connecticut

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

Department of Plant Science
6 Sherman Place, Box U-102
Storrs, CT 06269-5102
Tel: 860-486-4274

Soil testing performed by a substitute laboratory will not be accepted without prior approval by the Landscape Architect.

1.05 SUBMITTALS

- A. Submit topsoil test results for approval.
- B. Submit topsoil sample. Submit a 1 gallon sample of tested topsoil material. The topsoil submittal shall be a representative sample of topsoil from the stockpile and shall be a homogeneous mix of uniform material taken from no less than 10 samplings of equal quality from areas similar in color, location and type.
- B. Submit materials certificates and product data for the following items, clearly marked, to indicate proposed materials. Printed data shall state application rates and amount of product to be added, if applicable.
 - 1. Soil amendments and conditioners
 - 2. Compost
- C. Submit batch delivery tickets for the following items, indicating the trade name, the supplier/distributor's name and the amount of product delivered to the contracting firm/project site.
 - 1. Soil amendments and conditioners
 - 2. Compost
 - 3. Processed sand
- D. Submit materials certificate and certified test report for processed sand and gravel.

1.06 PRODUCT HANDLING: Coordinate delivery of borrow topsoil such that it is placed as delivered and no stockpiling is required.

1.07 PROJECT CONDITIONS:

- A. Verify that subsurface drains are complete and fully functional prior to beginning work of this Section. Protect subsurface drains from failure.
- B. Coordinate topsoil placement with irrigation equipment installation (if applicable).

PART 2 PRODUCTS

2.01 TOPSOIL

- A. Shall be clean, fertile, friable, and well draining; not to contain materials harmful to plant life. All topsoil to be free of any subsoil earth clods, sods, stones over 1/2 inch in any dimension, sticks, roots, weeds, litter and other deleterious material. Topsoil shall be uniform in quality and texture and contain specified organic matter and mineral elements necessary for sustaining healthy plant

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

growth. Stones and rock fragments shall not exceed two-percent by volume.

- B. Topsoil shall have a pH of 6.0 to 8.0.
- C. Organic Matter Content: 4 - 8%
- D. Nutrient levels shall be achieved by the Contractor's addition of amendments to the topsoil to meet the optimum nutrient levels specified in the testing laboratory report.
- E. All imported off-site topsoil shall be from a single source for all borrow topsoil required.
- F. Soil texture shall meet the USDA Soils Textural Classification percentage of sand, silt and clay for "loam" or "sandy loam" classifications, with not more than 75-percent sand and not less than 5-percent clay.
- G. Free of any toxic chemical, waste or any material or condition that would prevent the establishment of a suitable lawn.

2.03 AMENDMENTS/CONDITIONERS: Shall be as recommended by the Topsoil Test Report. Amend all topsoil to meet the optimum nutrient levels specified in the Topsoil Test Report.

2.04 COMPOST

- A. Compost shall be either Pioneer Valley Compost or Agresoil Premium Organic Compost as distributed by: Agresource, phone 800-313-3320 or approved equal.
- B. Compost shall be a stable, humus-like material produced from the aerobic decomposition of organic wastes. Compost residues may be derived from organic wastes such as food and agricultural residues, animal manures, yard wastes, source separated municipal solid waste and biosolids (treated sewage sludge) that meet all State Environmental Agency requirements.
- C. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth. Compost shall contain no visible free water.
- D. 100-percent of the compost material shall pass a 1/2-inch screen.
- E. Compost shall have the following properties:

<u>Parameters</u>	<u>Range</u>
pH	5.5 - 8.0
Moisture Content	35% - 55%
Soluble Salts	4.0 mmhos cm ⁻¹
C:N ratio	10:1 - 25:1
Particle Size	less than 1/2"
Organic Matter Content	at least 40% on an oven dray basis
Bulk Density	<1000 lbs./cubic yard
Foreign Matter	shall not exceed 1% (dry weight)

- F. Compost generator shall also provide testing of minimum available nitrogen and other macro and micro-nutrients to determine fertilizer requirements.
- G. Heavy Metals regulated by EPA measured in parts per million shall not exceed the following limits:

<u>Regulated Metals</u>	<u>Regulated Limits*</u>
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FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

Arsenic	41
Cadmium	39
Chromium	1200
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	36
Zinc	2800

*EPA 503 Regulations

Maximum Allowable Exceptional Quality P.P.M.

2.05 SAND: Processed to meet the following particle size criteria:

Description	Sieve Mesh	Diameter of sieve (mm)	Allowable range % retained
Gravel	10	2.00	0- 5%
Very coarse sand	18	1.00	0-20% combined with Gravel
Coarse	35	0.50	at least 60% in this range
Medium	60	0.25	at least 60% in this range
Fine	100	0.15	10% maximum
Very Fine	270	0.05	3% maximum
Silt		0.002	5% maximum
Clay		<0.002	3% maximum

In addition, there shall be 100% passing the No. 5 screen (4mm), and no more than 10% combined very fine sand, silt, and clay.

PART 3 EXECUTION

3.01 TOPSOIL PREPARATION

- A. Provide amendments and conditioners to bring topsoil into compliance with Project requirements to complete the work of this Section. Uniformly blend to produce a homogeneous mixture so that when placed, no layering within the soil profile will occur.
- B. Bulk-mix using an approved mechanical mixer, or fold-mix windrows with a loader.
- C. Mixture shall be kept dry at all times prior to final placement. Topsoil shall not be delivered in a frozen or muddy condition.

3.02 SHAPING AND GRADING OF SUBSOIL AT LAWN AREAS

- A. At completion of rough grading, shape and grade subgrade areas to lines and levels needed to achieve the finished grades indicated on the drawings.
- B. Shape subgrade areas to allow placement of uniform depth of topsoil. Adjustments may be

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

necessary due to field conditions. Provide all shaping adjustments at no additional cost to the owner.

- C. Harrow or otherwise loosen the subgrade soil to a depth of 4 inches. Protect loosened subgrades from compaction. Utilize small tracked equipment with low load bearing capacity.
- D. Remove all sticks, stones, or foreign material one-half (1/2) inch or greater in any dimension from surface. Remove debris and stone off-site.

3.03 SPREADING TOPSOIL AND TOPSOIL/COMPOST MIXES

- A. Do not apply topsoil materials to the scarified subgrade or gravel layer without approval by the Engineer. No vehicular traffic or rubber-tired equipment shall be allowed on finished subgrade. Topsoil materials shall not be spread until topsoil has been amended as required. Topsoil materials shall not be worked in a frozen or muddy condition. Do not handle soils when wet.
- B. Uniformly distribute and spread topsoil materials over all graded lawn areas to conform smoothly to the lines, grades, and elevations shown or otherwise required. Maintain consistent depths of material throughout the project area. Provide for a minimum thickness of 6-inches of topsoil.
- C. Manually supply topsoil around all trees to remain. Avoid damage to root systems. The depth of topsoil placed around existing trees shall be determined in consultation with the Engineer.
- D. Spread topsoil mixtures in two (2) equal lifts in all locations scheduled to receive 8" or more total topsoil thickness. Bottom lift shall be incorporated into the loosened subgrade or gravel layer as applicable, by disking, harrowing, or other approved means.
- E. Place topsoil in layers that will provide the scheduled thickness after natural settlement and light rolling.
- F. Spread topsoil from edges inward toward the middle of areas receiving topsoil. Do not allow equipment directly on the loosened subgrade.
- G. Do not over compact the topsoil. Do not allow rubber-tired equipment on topsoil areas. Use the lightest weight equipment practicable. Sequence operations to minimize the number of equipment passes required.
- H. Track topsoil slopes -parallel to the fall line.
- I. Place topsoil materials only when it can be immediately followed by seeding operations.
- J. Resupply and place topsoil to eroded, settled or damaged areas until all seeded areas are stabilized. Care shall be taken not to damage grass or pavement areas in the replacement to topsoil.
- K. Compact subgrade soils where fill is required to 80-85% maximum dry density.

3.04 PROTECTION

- A. Remove weeds prior to lawn development operations. No weeds shall be allowed to go to seed.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- B. Keep heavy equipment, trucks, etc. off topsoil areas at all times. Only light tractors will be allowed if necessary.
- C. If over compaction to topsoil occurs, scarify to the full depth of the topsoil and regrade topsoil.

3.05 EXCESS MATERIALS

- A. Excess material, including tailings from screening operations shall be legally disposed of offsite.

3.06 FIELD QUALITY CONTROL

- A. Following spreading of topsoil, and prior to the start of seeding operations, set grades as shown on the plans.

END OF SECTION 329113

SECTION 329200 - LAWN

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements apply to the work specified in this Section.

1.02 SECTION INCLUDES

- A. Contractor to provide all labor, materials, necessary equipment, and services to provide and establish all seeded lawns for backing-up pavements and curbs installed under this Contract, and for repair of lawns and other areas damaged by construction as shown on the Drawings and as specified herein, including:
 - 1. Fine grading and preparing the seed bed.
 - 2. Repair of seeded lawn areas damaged by the work of other sections of this Contract.
 - 3. Providing and incorporating soil amendments as indicated for good seeded lawn growth.
 - 4. Seed all areas identified on the Drawings as lawn.
 - 5. Providing and installing erosion control systems (erosion control blanket or salt hay mulch) as necessary.
 - 6. Mowing, watering, and maintaining the seeded lawn until established and accepted by the Owner.
 - 7. Protection, security and repair of damage to all seeded lawn areas until acceptance of all lawn areas.

Note: Contractor shall note that all chemical treating of all lawn areas to insure that lawn is free of weeds and crabgrass shall comply with State of Connecticut laws and regulations for application of these products on school grounds.

1.03 RELATED SECTIONS

- A. Section 018113 - Volatile Organic Compound Limits
- B. Section 329113 - Topsoil
- C. Section 329300 - Landscape Planting

1.04 QUALITY ASSURANCE

- A. Qualifications of Installers: Provide at least one person who shall be present at all times during execution of this portion of the Work, who shall be thoroughly familiar with the type of materials being installed and who shall direct all work performed under this Section.
- B. Preventatives and Controls: Prior to the application of the preventatives and controls specified, confirm that each of the materials is permitted in the State of Connecticut. Pesticides shall be applied by Connecticut-Certified Commercial Applicators.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

Note: Contractor shall note that all chemical treating of all lawn areas to insure that lawn is free of weeds and crabgrass shall comply with State of Connecticut laws and regulations for application of these products on school grounds.

- C. Installer's Qualifications: Engaged firm must be able to provide evidence to indicated five years documented experience in the installation of work specified herein.
- D. Comply with the requirements of the State Department of Environmental Protection. Hazardous Materials: Section 22A-54 of the Connecticut General Statutes.
- E. Comply with the requirements of the State Department of Agriculture: Commercial Fertilizer Law and Agriculture and Vegetable Seed Law.

1.05 REFERENCES

- A. American Society for Testing Materials (ASTM) publication: ASTM C602-95a (2001) "Agricultural Liming Materials".
- B. Federal Specifications (FS): FSO-F-241 C (1). Fertilizers: Mixed Commercial.
- C. Connecticut Commercial Fertilizer Law: Chapter 427A (P.A. 73-278) of Connecticut General Statutes, Revisions and Subsequent Amendments.
- D. Connecticut Agriculture and Seed Law: Chapter 424 of Connecticut General Statutes, Revised to 1979 as amended.

1.06 PROJECT CONDITIONS

- A. All pesticide treatments shall conform to State of Connecticut laws and regulations for application of these products on school grounds.
- B. Notify the Owner's representative and Engineer a minimum of two (2) days prior to scheduled pesticide applications.

1.07 PRODUCT HANDLING

- A. Delivery and Storage:
 - 1. Seed, fertilizer, lime, and other amendments shall be delivered in standard size unopened containers, showing weight, analysis, and name of manufacturer.
 - 2. Delivery and storage of chemical preventatives and controls shall be coordinated with and approved by responsible school officials and representatives prior to delivery. Materials must be delivered in standard size unopened containers, showing weight, analysis, and name of manufacturer. Plan for protection of materials shall be coordinated with and approved by responsible school officials and representatives prior to delivery.
 - 3. Protect materials from deterioration during delivery and while stored at the site.

1.08 GUARANTEE

- A. Duration of guarantee shall be until the completion of the specified maintenance period and until Owner's final acceptance of lawn areas.

1.09 SCHEDULE

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- A. Construct seeded lawns between April 1 and June 1 and between August 15 and October 1 unless otherwise permitted by the Owner's Representative.

1.10 EXISTING WORK

- A. Verify that topsoil surface is true to grade, smooth, free of irregularities, properly installed to the scheduled thickness and in good condition to receive the work of this Section.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

1.11 SUBMITTALS:

- A. Provide copies of a material certificate signed by the seed vendor and the Contractor, (stating botanical and common names, percentages by weight, and percentages of purity, germination and weed seed for each 'grass' seed species) certifying that the seed mixture complies with the specified requirements. All materials are to be approved by the Owner's representative and the Engineer prior to their use. These certifications shall comply with these specifications and where applicable with the Standards of the Association of Official Agricultural Chemists and Association of Official Seed Analysts.
- B. Submit materials certificates and product data for the following items, clearly marked, to indicate proposed materials. Printed data shall state application rates and amounts of product to be added, if applicable. All materials are to be approved by the Owner's representative and the Engineer prior to their use. These certifications shall comply with these specifications and where applicable with the Standards of the Association of Official Agricultural Chemists.
 - 1. Fertilizers
 - 2. Lime
 - 3. Chemical preventatives and controls: Selection and submittal of materials certificates and product data for chemical preventatives and controls shall conform to State of Connecticut laws and regulations for application of these products on school grounds.
- C. Submit batch delivery tickets for the following items, indicating the trade name, the supplier/distributor's name and the amount of product delivered to the contracting firm/project site. All material certificates and invoices on quantities of all materials delivered to the project site shall be submitted to the Owner's representative and the Engineer prior to their use for examination and approval of such materials.
 - 1. Fertilizers
 - 2. Seed mixes
- D. Test Results: Submit tests of determining bulk density (density) of the topsoil once in place using an appropriate method outlined in C.A. Black (ed.) Methods of Soil Analysis, Part I, American Society of Agronomy. 1965.

1.12 TOPSOIL TESTING

- A. Insure that topsoil has been tested in accordance with Section 32 91 13.
- B. Provide testing of bulk density (density) of the topsoil once in place using an appropriate method outlined as indicated above in Article 1.11 Submittals, Item D. Contractor shall be responsible for contracting and payment of testing.

1.13 INSPECTION AND ACCEPTANCE OF LAWN AREAS

- A. Submit written notice requesting inspection at least 10 days prior to the anticipated date.
- B. Maintenance responsibilities end with final acceptance which shall be a minimum 90 consecutive calendar days from the date of seeding. Seeded areas will not be accepted in 'pieces'

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

unless otherwise shown on the Drawings or specifically agreed to by the Owner. No seeded areas will be accepted prior to the substantial completion of this Contract and prior to the completion of a minimum of 5 mowings.

- C. A satisfactory stand of acceptable grass is defined as:
 - 1. Consisting of a uniform dense stand of established permanent grass species. Engineer will be the judge. Any part of the seed lawn that does not show a uniform dense lawn grass shall be reseeded. Lawns must be free of weeds, crabgrass, and other undesirable plants, and with no diseases present.
- D. Final acceptance will not be made until all damaged areas, including areas outside the property limits, have been restored to their original conditions by topsoiling, seeding, and other necessary operations.
- E. Upon stabilization of seeded lawn areas, erosion control devices and protection fencing shall be removed and disposed of off-site.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

1.14 PROTECTION AND SECURITY

- A. Provide protection and security as necessary to prevent damage to lawn areas by any cause, including malicious vandalism and unauthorized usage, prior to acceptance of lawn by Owner.

PART 2 PRODUCTS

2.01 LIME: ground dolomitic limestone, 98% passing through a number 20 mesh screen and at least 75% passing through a 100 mesh screen. Limestone shall have a calcium carbonate equivalency of 85% or higher. Application rate to be determined by the topsoil testing.

2.02 FERTILIZER:

- A. Topsoil Fertilizer: complete at the ratios recommended in the topsoil test reports.
- B. Starter Fertilizer: guaranteed analysis of 10.20.10.
- C. Secondary Fertilizer: guaranteed analysis of 15.15.15.

2.03 LAWN SEED

- A. Provide fresh, clean, new-crop seed; blue tag certified complying with the tolerance for purity and germination established by the Office of Seed Analysis of North America. Provide seed of the grass species, proportions and maximum percentages of weed seed. Provide seed in cleaned, sealed, properly labeled containers.
 - 1. Grass seed delivered to the site must be fully labeled according to the seed laws and regulations of the State of Connecticut.
 - 2. A letter from the seed supplier is to accompany the seed mixture delivered to the site certifying that the seed in the bags are the cultivars listed on the label.
 - 3. The seed mixture is to be inspected by the Owner or the Owner's representative prior to its acceptance. Seed that is wet, moldy, or otherwise damaged will not be accepted.
- B. Seed shall be handled in accordance with the manufacturer's recommendations for exposure to extremes of heat, cold, or moisture.
- C. LAWN SEED QUALITY:
 - 1. Weed Seed: maximum of 0.50%, no noxious weed seed.
 - 2. Purity: minimum 97% pure.
 - 3. Crop: maximum 0.50%
 - 4. Germination Rate: minimum 80%
- D. SEED MIXTURE: "Hart's Wear 'n Tear" prepared and packaged by the Chas. C. Hart Seed Co., P.O. Box 9169, Wethersfield, CT 06129. Tel: 860-529-2537. Grass seed mix is listed below showing percent by weight:
 - 35% Kentucky Bluegrass
 - 35% Creeping Red Fescue

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

- 20% Fiesta 3 Perennial Ryegrass
- 10% Express Perennial Ryegrass

- 2.04 SALT MARSH HAY: Air-dry condition and of proper consistency for placing with commercial mulch blowing equipment. Provide only salt marsh hay for lawn areas.
- 2.05 HYDROMULCH: "Hydro Mulch" manufactured by Conwed Fibers, Soil Guard Bonded Fiber Matrix as manufactured by Weyerhaeuser or approved equal.
- 2.06 EROSION CONTROL BLANKET: DS150 Erosion Control Blanket manufactured by North American Green, 14649 Highway 41 North, Evansville, IN 47711. Include staples as required by manufacturer for complete installation.
- 2.07 CHEMICAL PREVENTATIVES AND CONTROLS: Selection of materials and products for chemical preventatives and controls shall conform to State of Connecticut laws and regulations for application of these products on school grounds.
- 2.08 PRE-EMERGENCE CRABGRASS CONTROL: Selection of materials and products for pre-emergence crabgrass control shall conform to State of Connecticut laws and regulations for application of these products on school grounds.
- 2.09 WATER: Potable.

PART 3 EXECUTION

3.01 SEEDED LAWN: RATES OF APPLICATION

<u>Material</u>	<u>Application Rate</u>
Topsoil Fertilizer, Lime and Topsoil Conditioners	As recommended by the topsoil test report.
Grass Seed	5 lbs./1,000 S.F. (250 lbs./acre)
Hydromulch	As recommended by manufacturer.
Starter Fertilizer	10 lbs./1,000 S.F.
Secondary Fertilizer	6.5 lbs./1,000 S.F.
Crabgrass Preventative	See the State of Connecticut laws and regulations for application of these products on school grounds.
Lawn Pest/Disease Control	See the State of Connecticut laws and regulations for application of these products on school grounds.

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

<u>Material</u>	<u>Application Rate</u>
Soil Insect Control	See the State of Connecticut laws and regulations for application of these products on school grounds.
Broad Leaf Weed Control	See the State of Connecticut laws and regulations for application of these products on school grounds.

3.02 SEEDED LAWN: BED PREPARATION

- A. Apply lime, topsoil fertilizer, and other recommended conditioners at the rates recommended by the topsoil tests in all areas where topsoil and topsoil/compost mix have been installed. Cultivate topsoil to a 4" depth by spring-toothed harrow or other approved methods to thoroughly incorporate amendments into the topsoil. Maintain a loose friable seed bed. At no time will rubber tired loaders or graders having greater compaction than a small farm tractor be allowed on topsoil. Keep all heavy equipment and trucks off prepared topsoil. Do not prepare while ground is wet or frozen.
- B. Provide additional topsoil where and as required to properly meet all proposed finish grades.
- C. Remove any weeds, debris, foreign matter and stones having any dimension greater than 3/4". Remove from property.
- D. Fine grade to a smooth uniform surface. The entire area shall present an even grade with no depressions where water will stand. Grades shall be within 1/2" of designated elevation. Any protective fencing around existing trees shall be removed and disposed of by the Contractor at this time. Topsoil shall be smoothly blended to existing finish grades around trees, erosion control devices and adjacent existing conditions, maintain existing surface drainage patterns. Smoothly round-off all top and toe of slopes. Reinstall erosion control devices and protective fencing as required.
- E. Approval of surface by Engineer shall be obtained before seeding operations begin.
- F. All areas to receive seed shall be compacted evenly and uniformly using a two-hundred-pound (200 lb.) roller.
- G. Perform bulk density and compaction tests to monitor degree of soil compaction/seed bed friability where directed. Where required, loosen the seed bed to obtain no greater than 70% of the ASTM D-1557 modified optimum density.

3.03 SEEDED LAWN: DEVELOPMENT

- A. All disturbed areas not developed otherwise shall be developed as lawn with six (6) inches of topsoil as indicated on the drawings and as specified.

3.04 SEEDED LAWN: SEEDING PROCEDURE

- A. Seeding shall be done when wind does not interfere with uniform distribution of hydroseeding mixture.
- B. Apply starter fertilizer, seed and maximum 10% of mulch in one operation by the use of an approved spraying machine. Avoid spraying mix on adjacent surfaces, walks, building walls, and curbs.
- C. Apply remaining 90-100% of the mulch in a second separate application.
- D. Mix materials with water. Keep in an agitated state so that the materials are uniformly suspended in the water. Apply all materials at the specified rates.
- E. Do not overseed with unapproved quick-germinating species.

3.05 SEEDED LAWN: ESTABLISHMENT

- A. Maintain a moist seed bed at all times. Water seed bed so that the topsoil is wet to a depth of 2". Apply complete coverage to the seeded area as necessary to insure proper germination conditions.
- B. Protect all lawn areas with barricades, if necessary, to keep all traffic off the area. Repair all damage to lawn areas including topsoil replacement, at no additional cost to owner.
- C. Re-seed all areas which have failed to show a uniform stand of grass after the initial plants have appeared. All areas disturbed/prepared for reseeded in spring or summer shall receive crabgrass preventative.

3.06 SEEDED LAWN: MAINTENANCE

- A. Maintenance Period Required: Contractor shall maintain lawn from immediately after seeding and shall continue maintenance until final acceptance.
- B. Provide all reseeding, watering, mowing, weeding, insect or disease control, re-fertilizing, repair of washouts and other maintenance procedures which are necessary to produce a uniform stand of grass. The contractor shall provide all irrigation equipment and water as necessary to irrigate the seeded areas daily with ¼ acre inch of water per day using three (3) sets to keep the surface moist and to maintain soil moisture at or near field capacity so that the seed bed does not dry out and adequate rooting takes place. The amount of water and the number of sets may be adjusted at the request of the Owner. The irrigation schedule shall further be adjusted with the approval of the Owner after the seedling plants are well rooted. The quantity of water used per day shall be recorded and reported in writing daily to the Owner and Engineer for the first three weeks from seeding and weekly thereafter.
- C. Grass shall be maintained at a height of 1 1/2" using a reel mower set at the height of 1 1/2"

FUELING FACILITY INSALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS
BRANFORD, CONNECTICUT

(bench setting) in which the clip of the reel matches the mowing height. The reel blades and bed knife shall be kept sharp and evenly matched to provide a clean cut. The mower shall be operated within the speed range recommended by the manufacturer. Mowing frequency shall be at five (5) day intervals commencing as soon as the seedlings in the seeded areas reach 2 inches high and must be adequate to insure that no more than 1/4 of the grass blade height is removed at any one time. Remove heavy clippings.

D. Secondary Fertilization: Apply secondary fertilizer 14 days after seeding. Apply per manufacturer recommendations.

3.07 EROSION PREVENTATIVES: Install erosion control system in any seeded areas which receive concentrated run-off water and areas as required by the Owner or Owner's Representative. Erosion control materials shall be secured as recommended by the manufacturer or as indicated on the Drawings.

3.08 CRABGRASS AND BROADLEAF WEED CONTROL

A. Treat any lawn areas infested with crabgrass or broadleaf weeds with weed control products in conformance with State of Connecticut laws and regulations for application of these products on school grounds.

3.09 DISEASE CONTROL

A. Treat any diseased lawn areas with disease control product, as required after diagnosis of disease organisms in conformance with State of Connecticut laws and regulations for application of these products on school grounds.

3.10 PROJECT CLEAN-UP

A. Upon completion of all lawn areas, remove all excess soil, debris, and other materials resulting from work operations of this Section. Restore all improvements to original condition. Broom clean all walks and pavements. All clean-up shall be completed at the end of each working day.

B. Upon stabilization of lawn areas, remove all erosion control systems. Re-seed as required.

END OF SECTION 329200

SECTION 136000

MOTOR FUEL ABOVEGROUND STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

- A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
- B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with the contract documents.
- C. In general, the work of this Section includes furnishing labor, equipment, and materials necessary to perform the excavation, bedding, backfilling, and installation of aboveground storage tanks specified or indicated in the Contract Documents.
- D. Related work specified in other Sections includes, but is not necessarily limited to:
 - 1. Section 136010 Motor Fuel Piping and Related Systems
 - 2. Section 136020 Motor Fuel Electrical System
 - 3. Section 136025 Rigid Metal Canopy

1.2 REFERENCES

- A. American Petroleum Institute:
 - 1. API 2000 - Venting Atmospheric and Low-Pressure Storage Tanks: Non-refrigerated and refrigerated.
- B. ASTM International:
 - 1. ASTM C136: Standard Test Method for Sieve Analyses of Fine and Coarse Aggregates.
 - 2. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics Using Modified Effort
- C. National Fire Protection Association:
 - 1. NFPA 30 - Flammable and Combustible Liquids Code.
 - 2. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages.
 - 3. NFPA 70 – National Electrical Code
- D. International Code Council
 - 1. International Fire Code
- E. Petroleum Equipment Institute:
 - 1. PEI RP200 - Recommended Practices for Installation of Aboveground Storage Systems for Motor Vehicle Fueling

2. PEI RP1200 - Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities

F. Underwriters Laboratories Inc.:

1. UL 567 - Pipe Connectors for Flammable Liquids and Combustible Liquids and LP-Gas.
2. UL 971 – Standard for Nonmetallic Underground Piping for Flammable Liquids
3. UL 2085 – Standard for Protected Aboveground Tanks for Flammable and Combustible Liquids

G. American Concrete Institute

1. ACI 301- Specifications for Structural Concrete for Buildings.
2. ACI 305, ACI 306, ACI 318, Building Code Requirements for Reinforced Concrete
3. ACI Detailing Manual, Latest Edition.
4. ACI 347 Recommended Practice for Concrete Form Work
5. ACI 304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete

H. Concrete Reinforcing Steel Institute (CRSI)

1. Manual of Standard Practice

1.3 DEFINITIONS

- A. Degree of Compaction: Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, for general soil types, abbreviated as percent laboratory maximum density.

1.4 SUBMITTALS

- A. Comply with Section 013300 General Requirements.
- B. Shop Drawings: Submit original copies of product data submittals for materials and equipment in Part 2 of this section including, but not limited to:
1. Aboveground Storage Tanks with dimensioned fittings and tank accessories
 2. Tank stairs
 3. Tank spill containment
 4. Anchors and supports.
- C. Test Reports: Submit written test results for all tests as outlined in this specification.
- D. Manufacturer's Field Reports: Submit report of each visit of manufacturer's representative to provide technical assistance during installation.
- E. State Installer Certification: Certify tank installers employed on the Work, verifying that all workers meet State installer requirements.
- F. Record Drawings: Submit record drawings in accordance with Section 013300.
- G. Operation and Maintenance Manuals: Submit copies of the Operation and Maintenance Manual in compliance with Closeout Submittals.
- H. Manufacturer certifications: Submit manufacturer certifications and/or proof of training for aboveground storage tank, underground piping and environmental monitoring system installers.

1.5 CLOSEOUT SUBMITTALS

- A. Comply with pertinent provisions of Section 017704. In addition, comply with the specifics and additional provisions of this chapter. For the purposes of this section, the terms "Manuals and Instructions" and "Closeout Documents" are used interchangeably.
- B. Coordinate closeout submittals with Sections 136010 and 136020 to provide a single package for the project.
- C. Format of Closeout Documents, including Operation and Maintenance Manuals and Record Document
 1. Provide Electronic (pdf format for documents and jpeg format for photos) of all closeout documents, record documents, drawings, manuals, operating instructions, warranties, and all other documents referenced in this and related sections. Submission shall be on CD-ROM discs or owner-approved USB (thumb) drive readable by Windows operating system. Files should be organized in logical folders and subfolders.
 2. In addition, provide bound manuals with all closeout documents, including record documents and drawings. Provide two (2) bound manuals/sets of documents. Bind manuals in hardcover, three-ring binders, and provide identified dividers with tabs. Use multiple volumes as needed. Do not use three ring binders larger than 3 inches. **Copies of faxed pages are unacceptable.**
 3. Obtain at time of purchase of equipment, two (2) copies of operation, lubrication, and maintenance manuals for all items. Assemble these manuals in the three ring binders above and provide electronic versions.
 4. Furnish electronic closeout documents for the fuel system to the Engineer for approval and distribution to Owner within 30 days of completion of the fuel system. Included shall be 8 hours of training and review at which time the contractor shall review the contents of closeout documents with fuel system operating personnel.
- D. Manuals, Instructions, and Closeout Documents shall include the following items. Items shall be for the new fuel system facility:
 1. A minimum of 96 high resolution (no less than 4 mega-pixels) digital (.jpeg format) photographs depicting the installation at each critical construction phase. Particular attention should be paid to underground, buried, and normally inaccessible components.
 2. AST installation/warranty checklist with proof of delivery to manufacturer.
 3. Environmental Monitoring System final setup printout.
 4. All sump test records (dispenser and transition sumps)
 5. Copies of any State/Local approvals, authorizations, permits, and registrations.
 6. Tank Test Results and Test Results for all secondary containment structures or annuluses and all containment sumps.
 7. Records of all other inspections and tests.
 8. Tank certificate, licenses, and/or registration.
 9. Warranties for all equipment and apparatus. In general, any product/manufacturer documentation that was provided with the equipment shall be provided as part of the closeout documents. Any warranty requiring forms or checklists shall be completed and fully executed.
 10. Copies of fuel management system registration and confirmation of help desk support registration.
 11. Training certification for instruction seminars signed by the individuals trained on these systems.
 12. All instruction bulletins, preventive maintenance schedules, operational instructions, and parts lists provided with the tanks, and all other systems.
 13. Waste disposal documentation (if any).
 14. Other environmental information or permits (if any).
 15. Copies of receipts for any keys, locks, or other equipment turned over to the Owner.
 16. Operating and installation manuals and instructions for each piece of equipment that was provided with manuals or instructions, including but not limited to the tank installation instructions.

1.6 QUALITY ASSURANCE

- A. Qualifications: Use adequate numbers of skilled, licensed individuals who are thoroughly trained and experienced in the installation and testing of the specified systems and who are completely familiar with the requirements and the methods needed for proper performance of the work of this Section.
- B. Substitutions: Comply with Section 016000.
- C. Materials and Equipment shall be manufactured, installed, and tested as specified in latest editions of applicable publications, standards and ruling of:
 - 1. Local and State building, plumbing, mechanical, electrical, fire and health department codes.
 - 2. National Fire Protection Association (NFPA).
 - 3. Occupational Safety and Health Act (OSHA).
 - 4. Factory Mutual Association (FM).
 - 5. Underwriter's Laboratories (UL).
 - 6. American Petroleum Institute (API).
- D. The most recent editions of applicable specifications and publications of the following organizations form part of the Contract Documents:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. National Electric Manufacturers Association (NEMA).
 - 4. American Society for Testing of Materials (ASTM).
 - 5. American Welding Society (AWS).
 - 6. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
- E. Tests of all Contractor secured materials and products being submitted for approval to determine conformance with all requirements of the Contract Documents, including borrowed materials proposed for use, shall be performed by an independent testing laboratory retained and compensated by this Contractor.
- F. As materials are incorporated into the project, on-site and off-site quality control tests shall be performed during construction to determine conformance with the Contract Documents by an independent testing laboratory retained and compensated by this Contractor.
- G. Quality assurance testing to validate results of quality control tests performed by the Contractor's testing laboratory shall be performed by an independent testing laboratory retained and compensated by the Owner.
- H. Complete the gasoline and diesel system installation(s) in accordance with the requirements of the State of Connecticut.
- I. Comply with the testing and field quality control requirements elsewhere in this section.

1.7 PERMITS AND SUBMISSIONS

- A. The Contractor shall be responsible for submitting or assist in submitting all permits and notifications required by State and Local codes and regulations.
- B. Specifically at a minimum, the Contractor shall make the following submissions:
 - 1. Town of Branford Building Permit and ALL other applicable AST installation / registration permit(s).

- C. Copies of all submissions and permits/registrations received shall be provided as part of the closeout documentation.

1.8 QUALIFICATIONS

- A. Manufacturer: Utilize companies specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Tank Installer: Company specializing in performing Work of this section with minimum five years documented experience. The Contractor installing the fuel System shall be a licensed tank installer. The Contractor shall be trained by the manufacturer.

1.9 GENERAL CONDITIONS

- A. Disposition of Utilities
 1. Adequately protect from damage all active utilities and remove or relocate only as indicated, specified, or directed.
 2. Report inactive and abandoned utilities encountered in excavating and grading operations to the Engineer. Remove, plug or cap as directed by the Engineer.
 3. Provide a minimum of a 48-hour notice to the Engineer and receive written notice to proceed before interrupting any utility.
- B. Stockpiling of topsoil and other excavated materials will be permitted on-site within the project limits on a case by case basis provided the stockpiles are constructed and maintained in a manner that does not create a foreign object damage risk or adversely affect any other ongoing construction or operation at the site.
- C. During windy or wet conditions and at the conclusion of each day's work period, cover all excavated material to prevent it from becoming saturated or being displaced by wind or rain. Anchor all sides of covering as required to hold the covering firmly in place. In all cases, provide additional measures as necessary to prevent erosion, sedimentation, and wind-borne displacement of excavated materials from their stockpiled location.
- D. Before beginning any work specified in this Section, the Contractor shall make certain that all applicable soil erosion and sediment control requirements are compiled with and the proper authorities have been informed of the construction schedule.
- E. The Contractor shall restore all disturbed areas to original conditions including curbing, utility lines, etc. Concrete and pavement thickness shall be in accordance with the construction drawings.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Comply with All manufacturer requirements.
- B. Protect equipment, materials and specialties from elements and other damages caused during shipment, storage and erection until final acceptance from the Owner.
- C. Contractor shall verify upon delivery that the tank size, tank bungs, and configuration of mounting locations and openings meet the project design requirements.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Comply with all Branford and CT DEEP requirements.

1.12 FIELD MEASUREMENTS

- A. Verify field measurements prior to tank fabrication. Coordinate anchoring requirements from tank shop drawings with other contractors to ensure anchor pads are installed to align with tank support locations.

1.13 WARRANTY

- A. All tanks shall carry a 30-year warranty and shall be installed to manufacturer's requirements and supervised by a manufacturer's trained installer.

PART 2 - PRODUCTS

2.1 ABOVEGROUND STORAGE TANKS

- A. Manufacturer:
 - 1. Highland Tank
 - 2. Containment Solutions
 - 3. Modern Welding Co.
 - 4. Convault
- B. Aboveground storage tank shall be rectangular, double-walled, constructed of steel and listed in accordance with Underwriters Laboratories Inc. Standard 2085 for insulated, protected, secondary containment aboveground tanks for flammable and combustible liquids. Protected type. This 2-hour fire rating shall exceed all requirements of the National Fire Protection Association Sections 30 and 30A for "fire resistant" tanks and meet all requirements of the Uniform Fire Code Articles 52 and 79. Provide tank with nominal capacity, dimensions, and fittings as shown on the contract drawings. Alternate tank dimensions are not acceptable.
- C. Primary tank:
 - 1. The standard primary storage tank shall be rectangular in design. It shall be manufactured in accordance with UL-142 as referenced by UL 2085 and shall have seams with continuous welds.
 - 2. The primary storage tank shall be constructed of ASTM A-569 or A-36 carbon steel and designed to store gasoline and diesel fuel(s).
 - 3. Refer to construction drawings for number and orientation of tank top fittings. Provide stainless steel bungs for all threaded tank top fittings.
 - 4. The primary tank shall be pressure tested to UL 2085 Standard at the factory and shall be field tested by the contractor to a maximum 3 psi.
- D. Tank Secondary Leak Containment Tank:
 - 1. The secondary leak containment tank shall be rectangular in design and shall be manufactured in accordance with UL-142 as referenced by UL 2085 secondary aboveground tanks for flammable and combustible liquids, protected type.
 - 2. The fire protective material shall be of monolithic pour, poured at the factory and allow liquid leaking from the primary tank to penetrate the material and communicate with the leak detection tube according to UL 2085 requirements.

FUEL FACILITY INSTALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS

3. The secondary tank shall be tested liquid tight at the factory (minimum 3 to maximum 5 psi), and shall also be field tested by the contractor to a maximum 3 psi, or in accordance with manufacturer requirements.
 4. The secondary tank shall provide reinforcement for the lightweight concrete to remain in place around the primary tank.
 5. The secondary tank shall provide true 360° Radius "pressure testable" containment for the primary tank.
 6. The port openings in the top of the secondary tank shall be constructed with full welds to prevent moisture from seeping between the fire proofing material and secondary and primary tanks.
 7. The top of the secondary tank shall be sloped and provide positive drainage such that water will not accumulate on top of the tank.
 8. The secondary tank shall have a two (2) inch monitoring port including a tube which provides a means to detect product leakage from the primary tank into fire protection material that directly surrounds the primary tank.
- E. Coatings:
1. The exterior surface of the secondary tank shall be cleansed of foreign material and coated with a corrosion resistant industrial epoxy-polyamide coating with urethane topcoat (minimum 6 mils DFT epoxy and 2 mils DFT urethane).
- F. The standard color shall be desert sand or white.
- G. Tank Appurtenances:
1. The tank shall be equipped as shown on the construction drawings, which includes, but is not limited to:
 - a. The tank shall have an interstitial monitor for the tank interstitial space into the fuel system environmental monitoring system, as shown on the drawings.
 - b. The tank shall be equipped with a spill box mounted to the top of the tank containing fill connections, as shown on the construction drawings. Fill connection shall have a shutoff valve located within the fill box. Provide a pump inside the fill box.
 - c. The fill port bungs shall be sized to accommodate overfill protection devices.
 - d. The tank shall be equipped with a steel primary working vent with vent cap. Vents shall be sized IAW UL listing for the tank.
 - e. The tank shall be equipped with primary and secondary emergency vents, one for the primary tank and one for the interstice.
 - f. The tank shall be equipped with level gauges depicting gallons of product in the tank, as shown on the construction drawings.
 - g. The tank shall be equipped with electronic level probes. Coordinate with Section 136020.
 - h. The tank shall be equipped with all code and industry standard safety and identification signage.
 - i. The tank shall be equipped with galvanized steel stairs with landing as shown on the drawings.
 - j. Underwriters Laboratories label shall be permanently affixed to each tank.
 - k. Gauge Stick: The tank shall be provided with an appropriately sized gauge stick calibrated in inches.
 - l. Mounting brackets welded to tank for rigidly attaching fuel piping to tank.
 - m. Provide lifting lugs at balancing points to facilitate handling and installation.
- H. Tank Top Equipment
1. Fittings: The Contractor shall provide stainless steel threaded fittings on top of the tank of size and number as specified on the construction drawings.
 2. Drop Tube

- a. The Contractor shall provide drop tube extension into the tank, as specified on the construction drawings. The drop tube shall include an automatic shutoff valve set to stop the filling process at 95 percent of the actual tank capacity.
- 3. Fill Pipe
 - a. The fill pipe shall conform to specifications on construction drawings.
 - b. All primary tanks shall be vented with an atmospheric vent cap. Tanks are designed for operation at atmospheric pressure only.

PART 3 - EXECUTION

3.1 GENERAL

- A. The installation of the aboveground storage tank and all fuel system equipment shall be conducted in strict accordance with the manufacturer's installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.
- B. Install aboveground tanks and all fuel system equipment in accordance with the requirements of all State and Local codes and regulations including, but not limited to the State of Connecticut Building and Fire Safety Code, Town of Brandford, Branford Fire Department, and NFPA 30A.
- C. Prior to construction, the contractor shall provide a private utility locate (Quality Level B) to identify all underground structures, in addition to legally required one-call locate services.

3.2 CONCRETE

- A. Transition sump concrete shall be crowned to prevent storm water from entering manways.
 - 1. Dimension and report any discrepancies to the Engineer before proceeding with the work.

3.3 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavated.

3.4 INSTALLATION – ABOVEGROUND TANKS

- A. The installation of aboveground storage tanks shall be conducted in strict accordance with the tank manufacturer's installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.
- B. Check factory installed equipment and accessories for loosening during transit.
- C. Install piping connections to tanks with unions and swing joints. Provide venting in accordance with API 2000.
- D. Seal unused tank openings using threaded steel pipe plugs, flanges, or caps.
- E. Tank Accessories:
 - 1. Install tank accessories shipped loose with tank.
 - 2. Install tank accessories as indicated on drawings.

3. Anchor all Aboveground Storage tanks with concrete anchors in accordance with manufacturer specifications.
4. Ground and bond the tank in accordance with the manufacturer's specifications and the drawings.

F. Storing and Handling of Tank/Tank Equipment

1. Tank should not be dropped or impacted. Tank shall be stored, prior to installation, on smooth ground, free from rocks and foreign objects.
2. Store pump(s) and electrical equipment in a clean, dry, enclosed area, prior to installation.
3. Piping shall be stored with end caps to prevent the internal accumulation of water or debris. Handle piping to prevent impacts that could damage pipe. Do not use chain or cable around piping.
4. Handle tank in accordance with manufacturer's instructions.
5. Only use lifting equipment sufficient in size to handle the tank weight. Use only lifting lugs provided to lift tank. Use guidelines at each end of the tank to guide tank. Do not use chains or cables tied around tanks.

G. Tank Testing Requirements

1. An air pressure test must be performed on the primary tank to detect any leaks that may exist. The Tank shall be tested per manufacturer requirements. In the absence of manufacturer requirements, test per PEI recommended practices.
2. Documentation of a passing test shall be submitted to the Owner within 3 days of the test and included in the closeout documents.
3. Additional Requirements
4. The Contractor shall install any additional equipment and appurtenances necessary for a complete and certifiable functional installation.
5. The complete installation shall conform to the configuration indicated on the Drawings.
6. The Contractor shall permanently mark all tank fill ports to identify the product inside the tank. These markings must include text description and shall be consistent with the color and symbol code of the American Petroleum Institute (API Recommended Practice 1637) as follows:
7. DIESEL: Yellow
8. GASOLINE: Black Cross on White Background
9. STAGE I VR (Gasoline Compartment Only): Orange

H. FIELD QUALITY CONTROL

1. Coordinate with Sections 136010 and 136020.
2. Notify the Engineer at least ten (10) working days prior to final backfill of underground electrical conduits. The Engineer may be present during pre-backfill inspection of underground components, and piping shall not be backfilled until the Engineer has had the opportunity to observe.
3. In addition to the requirements outlined above, hydrostatically test all dispenser and transition sumps by filling each sump with water to within six (6) inches of the top and monitoring the water level of two (2) hours. This test shall be conducted by a 3rd party testing agency and the results reported to the Engineer within 24 hours of completion.
4. Provide documentation of all tests signed by certified personnel to the owner prior to the operation of the facility and in the closeout documents.
5. Complete the manufacturer's overfill prevention valve installation record sheet, and any other manufacturer's forms.

3.5 INITIAL FUEL DELIVERY

- A. When the tank(s) are ready for fuel for startup and calibration activities, the Contractor shall submit a written request for fuel delivery to the Owner certifying the system is physically and legally ready for fuel and indicating a requested quantity. The Contractor shall be present during the initial fuel delivery.

3.6 TANK AND SYSTEM REGISTRATION

- A. Submit all forms, notifications, and reports as required by the State and Town, and provide copies to the owner prior to operation of the system, and in the closeout documents.

3.7 COMMISSIONING

- A. Coordinate commissioning activities with the commissioning activities required in Sections 136010 and 136020. A single commission program, combining the requirements of all sections shall be coordinated.
- B. The Contractor shall commission the motor fuel systems. Commissioning shall include all testing, start-up, calibration, programming, and documentation. At the conclusion of the commissioning, the facility shall be ready for the owner and tenants to conduct unrestricted operations and use all systems to their full intended and designed capacity.
- C. The Contractor shall submit a system commissioning plan to the owner and engineer for approval at least 30 days prior to commissioning the system. The plan, at a minimum shall include health and safety, testing, calibration, startup, and operational testing procedures for all operation and safety equipment. The plan shall also include all testing and commissioning procedures specifically outlined in this section. The contractor shall be responsible for any fluids other than fuel and commodities required to startup and calibrate systems. The plan may be combined with commissioning plans for other vehicle service equipment systems.
- D. Fuel or flammable/combustible liquids shall not be introduced into the aboveground tanks until the environmental monitoring and leak detection system is fully programmed, operational, and tested. Fuel shall not be introduced into the dispensing system until all safety (including emergency stop, emergency valves, etc.) and leak detection devices have been tested and fire extinguishers are installed. All state and local testing and inspections must be completed prior to introducing fuel to the systems.
- E. Notify the engineer no less than 14 days prior to the completion of Commissioning. When Commissioning is completed, the Contractor shall facilitate a final inspection by the engineer. The Contractor shall have all necessary trade personnel on-site to operate equipment, open containment areas, and open electrical enclosures and equipment during the engineer's final Commissioning inspection. That final inspection shall include, but not be limited to:
 - 1. Operational test of all systems.
 - 2. Operational test of all safety devices (e-stop switches, emergency valves, overfill alarms);
 - 3. General review of the installation against plans, specs, and manufacturer requirements;
 - 4. Review of all test reports and manufacturer start-up reports;
 - 5. Test of all leak detection sensors;
 - 6. Closeout document requirements review;
 - 7. Tank registration form review, to include all outstanding regulatory reports;
 - 8. Inspection of all tank level probes to verify 90% setting;
 - 9. Inspect of mechanical overfill protection devices to verify/measure 95% setting;
 - 10. Inspect of all sumps and containment areas;
 - 11. Review and validation of the environmental monitoring system programming;
 - 12. Operational test of the fuel management system and verification that the system is recording transactions and that the operator is able to generate fuel invoices;
 - 13. Confirmation that system training has been completed; and
 - 14. Verification that remote monitoring for the Environmental Monitoring System is programmed and functioning properly.

3.8 MANUFACTURER'S FIELD SERVICES

- A. The Contractor's field superintendent supervising the installation of all underground petroleum carrying components shall be factory or manufacturer certified to perform such installation. Additionally, the field supervisor shall carry any State or Local certifications to install underground tanks and petroleum components.

END OF SECTION

SECTION 136010

MOTOR FUEL PIPING AND RELATED SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
- B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with the contract documents.
- C. In general, the work of this Section includes furnishing labor, equipment, and materials necessary to perform the excavation, trenching, de-watering, bedding, backfilling, compaction, shoring and off-site disposal of excess and unsuitable materials during installation of fuel piping, underground storage tanks, transition sump pits, fuel related electrical conduit, and all other related utilities specified or indicated in the Contract Documents.
- D. Related work specified in other Sections includes, but is not necessarily limited to:
 - 1. Section 136000 Motor Fuel Aboveground Storage Tanks
 - 2. Section 136020 Motor Fuel Electrical System
 - 3. Section 136025 Rigid Metal Canopy

1.2 REFERENCES

- A. American Petroleum Institute:
 - 1. API 12P - Fiberglass Reinforced Plastic Tanks.
 - 2. API 1615 - Installation of Underground Petroleum Storage Systems.
 - 3. API 1626 – Storing and Handling Ethanol and Gasoline-Ethanol Blends at Distribution Terminals and Service Stations
 - 4. API 1637 - Color Code
 - 5. API 2000 - Venting Atmospheric and Low-Pressure Storage Tanks: Non-refrigerated and Refrigerated.
- B. ASTM International:
 - 1. ASTM C136: Standard Test Method for Sieve Analyses of Fine and Coarse Aggregates.
 - 2. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics Using Modified Effort
- C. National Fire Protection Association:
 - 1. NFPA 30 - Flammable and Combustible Liquids Code.
 - 2. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages.
- D. International Code Council
 - 1. International Fire Code

- E. Petroleum Equipment Institute:
 - 1. PEI RP100 - Recommended Practices for Installation of Underground Liquid Storage Systems.
 - 2. PEI RP200 - Recommended Practices for Installation of Aboveground Liquid Storage Systems for Motor Vehicle Fueling.
 - 3. PEI RP1200 - Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities
- F. Underwriters Laboratories Inc.:
 - 1. UL 567 - Pipe Connectors for Flammable Liquids and Combustible Liquids and LP-Gas.
 - 2. UL 971 - Nonmetallic Underground Piping for Flammable Liquids.

1.3 DEFINITIONS

- A. Degree of Compaction: Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, for general soil types, abbreviated as percent laboratory maximum density.

1.4 SUBMITTALS

- A. Comply with Section 013300 General Requirements.
- B. Shop Drawings: Submit original copies of product data submittals for materials and equipment in Part 2 of this section including, but not limited to:
 - 1. Pipe bedding and backfill material
 - 2. Piping, penetrations, and fittings
 - 3. Underground Warning Tape
 - 4. Valves
 - 5. Spill Containment
 - 6. Caps and Adaptors
 - 7. Mechanical Overfill Device
 - 8. Dispensers
 - 9. Nozzles
 - 10. Hoses
 - 11. Breakaways
 - 12. Swivels
 - 13. Submersible Turbine Pumps
 - 14. Signage
 - 15. Island Forms
 - 16. Solenoid Valves
- C. Test Reports: Submit written test results for all tests as outlined in this specification.
- D. Manufacturer's Field Reports: Submit report of each visit of manufacturer's representative to provide technical assistance during installation.
- E. State Installer Certification: Certify tank installers employed on the Work, verifying that all workers meet State installer requirements.
- F. Record Drawings: Submit record drawings documenting all piping, conduit routing and equipment, clearly labeled in pdf format for review and approval of Engineer and Town.
- G. Operation and Maintenance Manuals: Submit copies of the Operation and Maintenance Manual in compliance with Closeout Submittals.

1.5 CLOSEOUT SUBMITTALS

- A. Coordinate closeout submittals with Sections 136000 and 136020 to provide a single package for the project.
- B. Format of Closeout Documents, including Operation and Maintenance Manuals and Record Document
 1. Provide Electronic (pdf format for documents and jpeg format for photos) of all closeout documents, record documents, drawings, manuals, operating instructions, warranties, and all other documents referenced in this and related sections. Submission shall be on CD-ROM discs or owner-approved USB (thumb) drive readable by Windows operating system. Files should be organized in logical folders and subfolders.
 2. In addition, provide bound manuals with all closeout documents, including record documents and drawings. Provide two (2) bound manuals/sets of documents. Bind Manuals in hardcover, three-ring binders, and provide identified dividers with tabs. Use multiple volumes as needed. Do not use three ring binders larger than 3 inches. **Copies of faxed pages are unacceptable.**
 3. Obtain at time of purchase of equipment, two (2) copies of operation, lubrication, and maintenance manuals for all items. Assemble these manuals in the three ring binders above and provide electronic versions.
 4. Furnish electronic closeout documents for the fuel system to Engineer for approval and distribution to Owner within 30 days of completion of the fuel system. Included shall be 8 hours of training and review at which time the contractor shall review the contents of closeout documents with fuel system operating personnel.
- C. Manuals, Instructions, and Closeout Documents shall include the following items. Items shall be for the new fuel system facility:
 1. A minimum of 96 high resolution (no less than 4 mega-pixels) digital (.jpeg format) photographs depicting the installation at each critical construction phase. Particular attention should be paid to underground, buried, and normally inaccessible components.
 2. Underground piping manufacturers' installation checklists with proof of delivery to manufacturer.
 3. Environmental Monitoring System final setup printout.
 4. Containment sump test records (dispenser, and intermediate/transition sumps)
 5. Dispenser registration documentation and proof of transmittal to manufacturer.
 6. Dispenser calibration documentation.
 7. A copy of the Weights and Measures jurisdiction calibration report.
 8. Copies of any State/Local approvals, authorizations, permits, and registrations.
 9. Piping Test Results, and Test Results for all secondary containment structures or annuluses and all containment sumps.
 10. Records of all other inspections and tests.
 11. Automatic line leak detector test results and electronic release detection equipment (sensors and probes) test results on state regulatory agency forms.
 12. Warranties for all equipment and apparatus. In general, any product/manufacturer documentation that was provided with the equipment shall be provided as part of the closeout documents. Any warranty requiring forms or checklists shall be completed and fully executed.
 13. Training certification for instruction seminars signed by the individuals trained on these systems.
 14. All instruction bulletins, preventive maintenance schedules, operational instructions, and parts lists provided with the tanks, dispensers, monitoring system, and all other systems.
 15. Waste disposal documentation (if any).
 16. Other environmental information or permits (if any).
 17. Copies of receipts for any keys, locks, or other equipment turned over to the Owner.
 18. Operating and installation manuals and instructions for each piece of equipment that was provided with manuals or instructions, including but not limited to the tank installation instructions.

1.6 QUALITY ASSURANCE

- A. Qualifications: Use adequate numbers of skilled, licensed individuals who are thoroughly trained and experienced in the installation and testing of the specified systems and who are completely familiar with the requirements and the methods needed for proper performance of the work of this Section.
- B. Substitutions: Where permitted, comply with Section 016000.
- C. Materials and Equipment shall be manufactured, installed, and tested as specified in latest editions of applicable publications, standards and ruling of:
 - 1. Local and State building, plumbing, mechanical, electrical, fire and health department codes.
 - 2. National Fire Protection Association (NFPA).
 - 3. Occupational Safety and Health Act (OSHA).
 - 4. Factory Mutual Association (FM).
 - 5. Underwriter's Laboratories (UL).
 - 6. American Petroleum Institute (API).
- D. The most recent editions of applicable specifications and publications of the following organizations form part of the Contract Documents:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. National Electric Manufacturers Association (NEMA).
 - 4. American Society for Testing of Materials (ASTM).
 - 5. American Welding Society (AWS).
 - 6. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
- E. Tests of all Contractor secured materials and products being submitted for approval to determine conformance with all requirements of the Contract Documents, including borrowed materials proposed for use, shall be performed by an independent testing laboratory retained and compensated by this Contractor.
- F. As materials are incorporated into the project, on-site and off-site quality control tests shall be performed during construction to determine conformance with the Contract Documents by an independent testing laboratory retained and compensated by this Contractor.
- G. Quality assurance testing to validate results of quality control tests performed by the Contractor's testing laboratory shall be performed by an independent testing laboratory retained and compensated by the Owner.
- H. Fuel system equipment shall be compatible with the applicable fuel per the table above in Section 1.4.
- I. Complete the gasoline and/or diesel system installation in accordance with the requirements of the State of Connecticut.
- J. Comply with the testing and field quality control requirements elsewhere in this section.

1.7 PERMITS AND SUBMISSIONS

- A. The Contractor shall be responsible for submitting or assist in submitting all permits and notifications required by State and Local codes and regulations.
- B. Copies of all submissions and permits/registrations received shall be provided as part of the closeout documentation.

1.8 QUALIFICATIONS

- A. Manufacturer: Utilize companies specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Leak Detection Systems: The installing contractor of the Environmental Monitoring System shall be the highest level manufacturer installer certification.
- C. Tank Installer: Company specializing in performing Work of this section with minimum five years documented experience. The Contractor installing the Motor Fuel Piping System shall be a State certified installer when required.
- D. Provide a manufacturer certified installer to supervise the installation of the underground UL-971 piping systems.

1.9 GENERAL CONDITIONS

- A. Disposition of Utilities
 - 1. Adequately protect from damage all active utilities and remove or relocate only as indicated, specified, or directed.
 - 2. Report inactive and abandoned utilities encountered in excavating and grading operations to the Engineer. Remove, plug or cap as directed by the Engineer.
 - 3. Provide a minimum of a 48-hour notice to the Engineer and receive written notice to proceed before interrupting any utility.
- B. Stockpiling of topsoil and other excavated materials will be permitted on-site within the project limits on a case by case basis provided the stockpiles are constructed and maintained in a manner that does not create a foreign object damage risk or adversely affect any other ongoing construction or operation at the site.
- C. During windy or wet conditions and at the conclusion of each day's work period, cover all excavated material to prevent it from becoming saturated or being displaced by wind or rain. Anchor all sides of covering as required to hold the covering firmly in place. In all cases, provide additional measures as necessary to prevent erosion, sedimentation, and wind-borne displacement of excavated materials from their stockpiled location.
- D. Before beginning any work specified in this Section, the Contractor shall make certain that all applicable soil erosion and sediment control requirements are compiled with and the proper authorities have been informed of the construction schedule.
- E. The Contractor shall restore all disturbed areas to original conditions. Concrete and pavement thickness shall be in accordance with the construction drawings.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment, materials and specialties from elements and other damages caused during shipment, storage, and erection until final acceptance from the Owner.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Do not install underground piping when bedding is wet or frozen. Follow manufacturer's instructions regarding installation of piping in hot or cold environments and to protect from UV exposure.
- B. Comply with all Branford and CT DEEP requirements .

1.12 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 EARTHWORK MATERIALS

- A. Underground Pipe Bedding and Backfill Material
 - 1. Provide underground pipe bedding and backfill material in strict accordance with the UL-971 piping manufacturer's installation instructions.
 - 2. Provide a laboratory Certificate of Sieve Analysis (ASTM Method C136) to the Owner for approval prior to backfilling.
- B. Granular Fill
 - 1. Crushed stone and similar base materials shall be material that will compact and adequately bond under watering and rolling. Base course materials are to be placed in one or more layers, rolled thoroughly, and compacted until the material does not creep or wave ahead of the roller. All coarse aggregates shall be removed and the finish surface of the base must be firm and free of loose material.
 - 2. Crushed gravel or crushed rock shall be 1-1/2" minus, free from dirt, clay balls, and organic material, well graded from coarse to fine, containing sufficient finer material for proper compaction, and less than 8% by weight passing the No. 200 sieve.
- C. Geotextile Fabric
 - 1. Provide geotextile fabric for all underground piping installations.
 - 2. Geotextile fabric shall be "Mirafi 140NL" approved equal, or as specified by the piping manufacturer.

2.2 CONCRETE

- A. Concrete shall be air entrained, have a minimum 28-day compressive strength of 4000 psi, with a maximum slump of 4 inches. Concrete shall be broom finished and sealed. Seal shall be Spray-Lock Concrete Protection or approved equal.
- B. Reinforcing bar shall comply with ASTM A-615.

2.3 MOTOR FUEL PIPING

- A. MOTOR FUEL PIPING – UNDERGROUND FLEXIBLE
 - 1. Manufacturer:
 - a. Franklin Fueling Systems (APT-XP)
 - b. Approved Equal
 - 2. Flexible below grade piping shall meet the UL-971 standard, designed for direct burial, and shall not have underground joints outside of sumps or containment areas.
 - 3. Provide pipe diameters and fittings as shown on the drawings.

4. Fittings and couplers shall be stainless steel, compatible with gasoline/ethanol blends up to 85% ethanol and diesel/biodiesel blends up to 100% biodiesel.
5. Fittings and couplers shall be OEM only and UL-971 listed.
6. Provide 4" APT-XP pipe ducting
7. Use APT brand Ducted Rigid Entry Boot for all sump penetrations.

B. MOTOR FUEL PIPING – FLEXIBLE CONNECTORS

1. Manufacturer
 - a. Franklin Fueling Systems (Fireflex)
 - b. Approved Equal
2. Provide UL listed, stainless steel flexible connector. Provide stainless steel end fittings as shown on the Drawings, EZ-FIT where applicable.

C. MOTOR FUEL PIPING – WITHIN CONTAINMENT SUMPS

1. All motor fuel piping within containment sumps shall be 304L or 316L stainless steel, schedule 40S. Fittings shall be "EZ-FIT" or 150# stainless steel.

2.4 MOTOR FUEL SYSTEM VALVES AND FITTINGS

A. Ball Valves

1. Manufacturer
 - a. Franklin Fueling Systems (FLEX-ING)
 - b. Approved equal
2. Threaded ends, stainless steel body, blow-out proof stem, steel lever handle, UL-842 listed for flammable liquids, full port, with EZ fit adaptors as shown on drawings (where applicable).
3. Ball valves shall be compatible with gasoline/ethanol blends up to 85% ethanol and diesel/biodiesel blends up to 100% biodiesel.

B. Emergency Shear Valve

1. Manufacturer
 - a. OPW (10 Plus Series)
 - b. Approved equal
2. Vertical, double poppet, 1.5" check valve with protective shear groove bladder, coated cast iron, fusible link that closes poppet at 165°F, with union-top.
3. Provide with stabilizer bar to hold valve rigidly in place and allow for proper shearing action.

C. Fittings

1. Manufacturer
 - a. Franklin Fueling Systems (EZ Fit)
 - b. Approved equal

2.5 MOTOR FUEL SPILL CONTAINMENT

- A. The tank shall be equipped with a stainless steel spill box containing fill and vapor recovery connections, as shown on the construction drawings. Fill connection shall have a shutoff valve and check valve located within the fill box. Provide a pump inside the fill box.

2.6 MECHANICAL OVERFILL PROTECTION DEVICE

A. Mechanical Overfill Protection Device

1. Manufacturer
 - a. Morrison Brothers 9095AA,

- b. OPW (61fSTOP) or equal
- c. Approved Equal
- 2. Mechanical overfill protection device shall be
 - a. UL listed
 - b. Provide 2" Overfill Prevention Valve design for mounting in 4" tank fitting.
 - c. Rated for pressurized deliveries up to 100 psi with minimum flow rate of no more than 25 GPM.
 - d. Provided with integral anti-siphon valve
 - e. Compatible with gasoline and diesel fuel

2.7 MOTOR FUEL SYSTEM SUBMERSIBLE TURBINE PUMP

- A. Manufacturer
 - 1. FE Petro (STP)
 - 2. Veeder Root – Red Armor STP
 - 3. Approved Equal
- B. General Requirements
 - 1. Turbine pump shall be constructed of corrosion resistant materials and be compatible with diesel and gasoline.
 - 2. Provide quantity with appropriate hp as indicated on the drawings, fixed speed.
 - 3. Provide with manufacturer supplied pump controller.
 - 4. Provide with the appropriate shaft length.
 - 5. Provide with pressure relief port.

2.8 MOTOR FUEL SYSTEM DISPENSERS

- A. Manufacturer:
 - 1. Wayne Select configured with Fuel Management System
- B. Self-contained, UL listed two-hose, single product electronic dispensers with lane-oriented nozzle boots, proportional solenoid valves and (1) 100:1 electronic pulse outputs per nozzle.
- C. For each hose, backlit 1" liquid crystal (LCD) gallons display on side with correlating nozzle boot.
- D. Non-resettable Electromechanical Totalizer
- E. Display backup for a minimum of 15 minutes in the event of power loss.
- F. Sealed metal vapor provided to separate Class 1 area from electronics above. Louvered cabinet vents in lieu of sealed vapor barrier is not acceptable.
- G. Dispenser shall be compatible with diesel and gasoline.
- H. Filter shall be external canister type with spin on filter.
- I. Dispenser doors, sheathing, and panels shall be stainless steel.
- J. Label all dispensers by fueling position in lighted brand panel area.
- K. Provide four (4) dispenser keys per dispenser to the owner at project conclusion.

- L. Provide primary and spare dispenser filters for dispenser startup described later in this section compatible with diesel and gasoline.
- M. Provide all applicable required stickers and labels, ULSD, 87 Octane, product labels, and all other required safety labels.
- N. Provide high hose post-mounted retractor option.

2.9 DISPENSER CONTAINMENT

- A. Provide aboveground dispenser containment piping sumps as shown on the construction drawings and compatible with dispenser footprint.
- B. Manufacturers:
 - 1. Morrison Bros.
 - 2. Approved equal.

2.10 DISPENSER EQUIPMENT

- A. Hose Retrievers
 - 1. Manufacturers/Models:
 - a. Morrison Bros provided high post retractor Model 610
 - b. Universal Valve
 - c. Approved Equal.
- B. Nozzles
 - 1. Manufacturers/Models:
 - a. Husky: Model 1AS.
 - b. Approved Equal.
 - 2. Provide UL listed, pressure-activated nozzle with hold-open clip compatible with diesel and gasoline.
 - 3. Provide with spout and fill guard.
 - 4. Diesel nozzle hand warmers shall be colored green.
 - 5. Gasoline nozzle hand warmers shall be colored black.
- C. Hoses
 - 1. Manufacturers/Models:
 - a. All gasoline hoses shall be low permeation hoses.
 - b. Continental Flexsteel Futura
 - c. Approved Equal.
 - 2. .
- D. Breakaways
 - 1. Manufacturers/Models:
 - a. OPW 68EZR-1010
 - b. Husky: Safe-T-Break.
 - c. Approved Equal.
 - 2. Provide 1" UL listed reconnectable breakaway compatible with diesel.
- E. Hose Swivels
 - 1. Manufacturers/Models:
 - a. OPW: Model 241 TPS-0492.
 - b. Approved Equal.
 - 2. Provide UL listed single-plane hose swivel compatible with diesel and gasoline.

2.11 SPARE DISPENSER EQUIPMENT

The Contractor shall provide the a complete sets of spare diesel gasoline dispenser equipment in accordance with the design drawings and the following.

- A. Hose Retrievers
 - 1. Manufacturers/Models:
 - a. Morrison Bros provided high post retractor Model 610
 - b. Universal Valve
 - c. Approved Equal.
- B. Nozzles
 - 1. Manufacturers/Models:
 - a. Husky: Model 1AS.
 - b. Approved Equal.
 - 2. Provide UL listed, pressure-activated nozzle with hold-open clip compatible with diesel and gasoline.
 - 3. Provide with spout and fill guard.
 - 4. Diesel nozzle hand warmers shall be colored green.
 - 5. Gasoline nozzle hand warmers shall be colored black.
- C. Hoses
 - 1. Manufacturers/Models:
 - a. All gasoline hoses shall be low permeation hoses.
 - b. Continental Flexsteel Futura
 - c. Approved Equal.
 - 2. .
- D. Breakaways
 - 1. Manufacturers/Models:
 - a. OPW 68EZR-1010
 - b. Husky: Safe-T-Break.
 - c. Approved Equal.
 - 2. Provide 1" UL listed reconnectable breakaway compatible with diesel.
- E. Hose Swivels
 - 1. Manufacturers/Models:
 - a. OPW: Model 241 TPS-0492.
 - b. Approved Equal.
 - 2. Provide UL listed single-plane hose swivel compatible with diesel and gasoline.

2.12 FIRE EXTINGUISHERS

- A. Provide 4-A:80-B:C, 10 pound fire extinguishers, metal cabinets, and signage at locations shown on the construction drawings.

2.13 MOTOR FUEL SYSTEM IDENTIFICATION

- A. Nameplates
 - 1. Manufacturers:
 - a. Craftmark Identification Systems
 - b. Safety Sign Co.
 - c. Seton Identification Products

- B. Valve Tags
 - 1. Manufacturers:
 - a. Craftmark Identification Systems
 - b. Safety Sign Co.
 - c. Seton Identification Products
- C. Underground Pipe Markers
 - 1. Manufacturer:
 - a. Tek ID
 - b. Approved equal

2.14 ABOVEGROUND PIPING AND FITTINGS

- A. All aboveground product piping, primary containment fittings, and tanktop risers, shall be 304 or 316 stainless steel.
- B. Piping shall conform to ASTM A312 and ASME B 36.19, schedule 40S.
- C. Fittings shall meet ASTM-A-351, ANSME B1.20.1, MSS-SP-114, Class 150 threaded, welded or flanged..

2.15 THREAD SEALANT

- A. Manufacturer:
 - 1. Gasoila E-Seal
 - 2. Approved equal
- B. Thread sealant shall be compatible with gasoline/ethanol blends up to 85% ethanol and diesel/biodiesel blends up to 100% biodiesel and shall be used for motor fuel pipe connections within containment sumps and on fill and ATG riser connections.

PART 3 - EXECUTION

3.1 GENERAL

- A. The installation of piping and all fuel system equipment shall be conducted in strict accordance with the manufacturer's installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.
- B. Install all piping and all fuel system equipment in accordance with the requirements of all State and Local codes and regulations including, but not limited to, the Connecticut State Fire Safety Code, CT Department of Energy and Environment Protection, and NFPA 30A.
- C. Prior to construction, the contractor shall provide a private utility locate to identify all underground structures, in addition to legally required 1-call locate services.

3.2 PIPE TRENCHES

- A. Excavate to the dimensions indicated in the Contract Drawings. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement. Tamp if necessary, to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length. Rock, where encountered, shall be excavated to a depth of at least six (6) inches below the bottom of the pipe.

3.3 BACKFILL AND FILL MATERIAL PLACEMENT OVER PIPES

- A. Backfilling shall not begin until construction below finish grade has been approved, underground utilities or fuel and related piping installations have been inspected, tested, and approved.

3.4 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavated.

3.5 INSTALLATION - BURIED PIPING SYSTEMS

- A. All piping to be installed by manufacturer certified personnel in strict accordance with manufacturer installation instructions.
- B. Verify connection size, location, and inverts are as indicated on Drawings.
- C. Establish elevations of buried piping with not less than 18 inches of cover unless otherwise specified.
- D. Remove scale and dirt on inside of piping before assembly.
- E. Install filter fabric in all pipe trenches.
- F. Install pipe to elevation as indicated on Drawings.
- G. Place bedding material at trench bottom to provide uniform bedding for piping, level bedding materials in one continuous layer not exceeding 4 inches compacted depth; compact to 95 percent maximum density.
- H. Install pipe on prepared bedding.
- I. ***All underground product piping and vent piping shall have a continuous 1% (1/8" per foot) slope down to a monitored sump. The piping shall be installed such that there are no traps or liquid collection points. At the conclusion of final testing, back off all test boots and install drain tubing on all Schrader valves and test fittings such that any product entering the secondary containment space in the piping system will drain to the monitored tank sump.***
- J. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- K. Install shutoff and drain valves at locations indicated on Drawings.
- L. Install magnetic utility warning tape continuous over top of pipe buried 12-24 inches below finish grade.
- M. Pipe Testing Requirements:
 - 1. Test piping per manufacturer's and State of Connecticut requirements and specifications.

2. Maintain the required pressure for a minimum of 2 hours after the backfill process has been completed.

N. Pipe Cover and Backfilling:

1. Backfill trench in accordance with the.
2. Maintain optimum moisture content of fill material to attain required compaction density.
3. After pneumatic test, evenly backfill entire trench width by hand placing backfill material and hand tamping in 4 inches compacted layers to 12 inches minimum cover over top of jacket. Compact to 95 percent maximum density.
4. Evenly and continuously backfill remaining trench depth in uniform layers with backfill material.
5. Do not use wheeled or tracked vehicles for tamping.

3.6 SPILL AND OVERFILL EQUIPMENT

- A. Install spill and overfill equipment in accordance with manufacturer requirements and the construction drawings.
- B. Color fill connection covers in accordance with API 1637.
- C. Submit mechanical overfill prevention valve setpoint calculations to the Engineer for approval.
- D. Demonstrate operability/measure all overfill prevention devices in the presence of the Engineer.
- E. Submit written test results.

3.7 INSTALLATION – DISPENSERS

- A. Dispensers shall be installed in strict accordance with manufacturer instructions.
- B. The Contractor shall furnish and install filters for each gasoline and diesel dispenser. Activate each dispenser and inspect filter for leaks. Allow approximately 100 gallons of product to flow through the filter, then remove and replace filter.
- C. The Contractor shall perform the following electrical circuit test for the dispensers:
 1. Turn off all circuit breakers controlling the pumps and check to assure that all pumps are not running.
 2. Confirm that all nozzles are in the dispenser boot with the boot electrical switch off.
 3. Turn on circuit breaker controlling one pump and on each dispensing pump:
 4. Remove nozzle, turn operating handle on, and dispense product to confirm hose is pressurized.
 5. If circuit disconnection or other problems are detected using the above procedure, make correction and repeat entire system checkout.
- D. The Contractor shall add all required and appropriate stickers to the appropriate dispensers, as and if applicable.
- E. Dispensers must be properly anchored.
- F. Each meter shall be calibrated and verified in accordance with CT Department of Consumer Protection weights and measures requirements.

3.8 INSTALLATION – FIRE EXTINGUISHERS

- A. Install fire extinguishers, cabinets, and signage in accordance with NFPA and State Fire Code requirements, in locations shown on the construction drawings.
- B. Coordinate location of extinguisher mounts so as not to conflict with other fuel island equipment.

3.9 FIELD QUALITY CONTROL

- A. Coordinate with Sections 136000 and 136020.
- B. Test all piping systems, sumps, interstitial spaces in accordance with State of Connecticut requirements, manufacturer requirements and guidelines, and PEI-RP100. All test results shall be submitted to the engineer within 24 hours of completion. The primary and secondary chambers of all product carrying vessels shall be tested prior to and after final backfill. The test pressure on the interstitial piping space shall be maintained through the final backfill process and verified after backfill is complete.
- C. Notify the Engineer at least ten (10) working days prior to setting the tanks into the excavation and ten (10) working days prior to final backfill of the tank top and underground piping. The Engineer may be present during tank setting and for a final-pre-backfill inspection of all underground components, and neither of these evolutions shall be conducted until the has had the opportunity to observe.
- D. In addition to the requirements outlined above, hydrostatically test all sumps by filling each sump with water to within six (6) inches of the top and monitoring the water level of two (2) hours. This test shall be conducted by a testing agency and the results reported to the Engineer within 24 hours of completion.
- E. Provide documentation of all tests signed by certified personnel to the owner prior to the operation of the facility and in the closeout documents.
- F. Complete an operational test of all leak detection and level monitoring systems. Test in accordance with State and Manufacturer requirements. Submit completed state leak detection and sensor test forms to the owner prior to the operation of the facility, and in the closeout documents.
- G. Test all safety devices, including but not limited to emergency shear valves, emergency stop devices, and leak detection devices, in the presence of the engineer. Provide a written report of all tests.
- H. Commission and calibrate the fuel dispensers using the services of a manufacturer certified service organization. Provide a report of startup and calibration from that agency.
- I. The Contractor shall be responsible for contacting the Connecticut Department of Consumer Protection, Weights & Measures Division to provide registration of the dispensers, if required.
- J. Adjust/calibrate/commission the submersible pump controllers, adjusting output pressures as required to achieve the desired flowrate performance.
- K. Test the flowrate of fuel at each dispenser in the presence of the engineer and owner. Flowrate shall be 9-10 gallons per minute for each nozzle.

3.10 INITIAL FUEL DELIVERY

- A. When the tank(s) are ready for fuel for startup and calibration activities, the Contractor shall submit a written request for fuel delivery to the Owner certifying the system is physically and legally ready for fuel and indicating a requested quantity.

3.11 TANK AND SYSTEM REGISTRATION

- A. Submit all forms, notifications, and reports as required by the State, and provide copies to the owner prior to operation of the system, and in the closeout documents.

3.12 COMMISSIONING

- A. Coordinate commissioning activities with the commissioning activities required in Sections 136000, and 136020. A single commission program, combining the requirements of all sections shall be coordinated.
- B. The Contractor shall commission the motor fuel systems. Commissioning shall include all testing, start-up, calibration, programming, and documentation. At the conclusion of the commissioning, the facility shall be ready for the owner and tenants to conduct unrestricted operations and use all systems to their full intended and designed capacity.
- C. The Contractor shall submit a system commissioning plan to the owner and engineer for approval at least 30 days prior to commissioning the system. The plan, at a minimum shall include health and safety, testing, calibration, startup, and operational testing procedures for all operation and safety equipment. The plan shall also include all testing and commissioning procedures specifically outlined in this section. The contractor shall be responsible for supplying all fluids and commodities required to startup and calibrate systems. The plan may be combined with commission plans for other vehicle service equipment systems.
- D. Fuel or flammable liquids shall not be introduced into the underground tanks until the environmental monitoring and leak detection system is fully programmed, operational, and tested. Fuel shall not be introduced into the dispensing system until all safety (including emergency stop, emergency shear valves, etc.) and leak detection devices have been tested and fire extinguishers are installed.
- E. Back off all test boots and remove all test fittings from piping systems at the conclusion of testing, to allow for the free flow of product from the piping secondary into the monitored containment sump in the case of primary pipe failure.
- F. Notify the engineer no less than 14 days prior to the completion of Commissioning. When Commissioning is completed, the contractor shall facilitate a final inspection by the engineer. The contractor shall have all necessary trade personnel on-site to operate equipment, open containment areas, and open electrical enclosures and equipment during the engineer's final Commissioning inspection. That final inspection shall include, but not be limited to:
 - 1. Operational test of all systems.
 - 2. Operational test of all safety devices (e-stop switches, emergency shear valves, overfill alarms);
 - 3. General review of the installation against plans, specs, and manufacturer requirements;
 - 4. Review of all test reports and manufacturer start-up reports;
 - 5. Test of all leak detection sensors;
 - 6. Closeout document requirements review;
 - 7. Tank registration form review, to include all outstanding regulatory reports;
 - 8. Inspection of all tank level probes to verify 90% setting;
 - 9. Inspect of mechanical overfill protection devices to verify/measure 95% setting;
 - 10. Inspect of all sumps and containment areas;
 - 11. Review and validation of monitoring system programming;
 - 12. Operational test of the fuel management system and verification that the system is recording transactions and that the operator is able to generate fuel invoices;
 - 13. Confirmation that system training has been completed; and
 - 14. Verification that remote monitoring for the Environmental Monitoring System is programmed and functioning properly.

3.13 MANUFACTURER'S FIELD SERVICES

- A. The Contractor's field superintendent supervising the installation of all underground petroleum carrying components shall be factory or manufacturer certified to perform such installation. Additionally, the field supervisor shall carry any State or Local certifications to install underground tanks and petroleum components.
- B. Furnish factory training representatives to provide up to 8 hours of training on each major piece of equipment or system.

END OF SECTION

SECTION 136020

MOTOR FUEL AND VEHICLE FLUID ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
- B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with the contract documents.
- C. In general, the work of this Section includes furnishing labor, equipment, and materials necessary to perform the excavation, trenching, de-watering, bedding, backfilling, compaction, shoring and off-site disposal of excess and unsuitable materials during installation of fuel piping, underground storage tanks, transition sump pits, fuel related electrical conduit, and all other related utilities specified or indicated in the Contract Documents.
- D. Related work specified in other Sections includes, but is not necessarily limited to:
 - 1. Section 136000 Motor Fuel Aboveground Storage Tanks
 - 2. Section 136010 Motor Fuel Piping and Related Systems
 - 3. Section 136025 Rigid Metal Canopy

1.2 REFERENCES

- A. American Petroleum Institute:
 - 1. API 1615 - Installation of Underground Petroleum Storage Systems.
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA WD 1 - General Requirements for Wiring Devices.
 - 3. NEMA WD 6 - Wiring Devices-Dimensional Requirements.
 - 4. NEMA FG 1 - Nonmetallic Cable Tray Systems.
 - 5. NEMA VE 1 - Metal Cable Tray Systems.
 - 6. NEMA VE 2 - Metal Cable Tray Installation Guidelines.
- C. National Fire Protection Association:
 - 1. NFPA 30 - Flammable and Combustible Liquids Code.
 - 2. NFPA 30A - Code for Motor Fuel Dispensing Facilities and Repair Garages.
 - 3. NFPA 70 - National Electric Code
- D. International Code Council
 - 1. International Fire Code
- E. Petroleum Equipment Institute:
 - 1. PEI RP100 - Recommended Practices for Installation of Underground Liquid Storage Systems.

2. PEI RP200 - Recommended Practices for Installation of Aboveground Liquid Storage Systems.
3. PEI RP400 - Testing Electrical Continuity of Fuel Dispensing Hanging Hardware
4. PEI RP1200 - Recommended Practices for the Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities

F. Underwriters Laboratories Inc.:

1. UL 913 - Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations.

1.3 SUBMITTALS

- A. Comply with Section 013300 General Requirements.
- B. Shop Drawings: Submit original copies of product data submittals for materials and equipment in Part 2 of this section including, but not limited to:
 1. Panels and circuit breakers.
 2. Leak detection and monitoring equipment.
 3. Audible/Visual Overfill Alarm
 4. Sensors.
 5. Probes.
 6. Underground Warning Tape.
 7. Emergency Stop Actuators.
 8. Emergency Stop Disconnects.
 9. Dispenser Hook Isolation Devices.
 10. Submersible Turbine Pump (STP) Controllers.
 11. Surge suppression.
 12. Sump conduit entry fittings.
- C. Test Reports: Submit written test results for all tests as outlined in this specification.
- D. Manufacturer's Field Reports: Submit report of each visit of manufacturer's representative to provide technical assistance during installation.
- E. State Installer Certification: Certify tank installers employed on the Work, verifying that all workers meet State installer requirements.
- F. Record Drawings: Submit record drawings documenting locations of all above ground and below ground equipment.
- G. Operation and Maintenance Manuals: Submit copies of the Operation and Maintenance Manual in compliance with Closeout Submittals.

1.4 CLOSEOUT SUBMITTALS

- A. Comply with pertinent provisions of the appropriate Division I regarding - Contract Closeout. In addition, comply with the specifics and additional provisions of this chapter. For the purposes of this section, the terms "Manuals and Instructions" and Closeout Documents" are used interchangeably.
- B. Format of Closeout Documents, including Operation and Maintenance Manuals and Record Document
 1. Provide Electronic (pdf format for documents and jpeg format for photos) of all closeout documents, record documents, drawings, manuals, operating instructions, warranties, and all other documents referenced in this and related sections. Submission shall be on CD-ROM discs or owner-approved

- USB (thumb) drives readable by Windows operating system. Files should be organized in logical folders and subfolders.
2. In addition, provide bound manuals with all closeout documents, including record documents and drawings. Provide two (2) bound manuals/sets of documents. Bind manuals in hardcover, three-ring binders, and provide identified dividers with tabs. Use multiple volumes as needed. Do not use three ring binders larger than 3 inches. **Copies of faxed pages are unacceptable.**
 3. Obtain at time of purchase of equipment, two (2) copies of operation, lubrication, and maintenance manuals for all items. Assemble these manuals in the three ring binders above and provide electronic versions.
 4. Furnish electronic copies of closeout documents for the fuel system to Engineer for approval and distribution to Owner within 30 days of completion of the fuel system. Included shall be 8 hours of training and review at which time the contractor shall review the contents of closeout documents with fuel system operating personnel.
- C. Manuals, Instructions, and Closeout Documents shall include the following items. Items shall be for the new fuel system facility:
1. A minimum of 96 high resolution (no less than 4 mega-pixels) digital (.jpeg format) photographs depicting the installation at each critical construction phase. Particular attention should be paid to underground, buried, and normally inaccessible components.
 2. Environmental monitoring system warranty registration and checkout form/Intrinsic Safety Checklist with proof of delivery to manufacturer.
 3. Laminated 11" x 17" diagram showing all sensor, probe locations throughout system with corresponding labels to match environmental monitoring system.
 4. Environmental Monitoring System final setup printout.
 5. Records of all other inspections and tests.
 6. Warranties for all equipment and apparatus. In general, any product/manufacturer documentation that was provided with the equipment shall be provided as part of the closeout documents. Any warranty requiring forms or checklists shall be completed and fully executed.
 7. Training certification for instruction seminars signed by the individuals trained on these systems.
 8. All instruction bulletins, preventive maintenance schedules, operational instructions, and parts lists provided with the tanks, dispensers, monitoring system, and all other systems.
 9. Copies of receipts for any keys, locks, or other equipment turned over to the Owner.
 10. Operating and installation manuals and instructions for each piece of equipment that was provided with manuals or instructions, including but not limited to the tank installation instructions.

1.5 QUALITY ASSURANCE

- A. Qualifications: Use adequate numbers of skilled, licensed individuals who are thoroughly trained and experienced in the installation and testing of the specified systems and who are completely familiar with the requirements and the methods needed for proper performance of the work of this Section.
- B. Substitutions: Where permitted. All substitutions shall be reviewed by Engineer and Town. Do not purchase, bid, or install substitutions without approval.
- C. Materials and Equipment shall be manufactured, installed, and tested as specified in latest editions of applicable publications, standards and ruling of:
1. Local and State building, plumbing, mechanical, electrical, fire and health department codes.
 2. National Fire Protection Association (NFPA).
 3. Occupational Safety and Health Act (OSHA).
 4. Factory Mutual Association (FM).
 5. Underwriter's Laboratories (UL).
 6. American Petroleum Institute (API).

- D. The most recent editions of applicable specifications and publications of the following organizations form part of the Contract Documents:
 - 1. American National Standards Institute (ANSI).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. National Electric Manufacturers Association (NEMA).
 - 4. American Society for Testing of Materials (ASTM).
 - 5. American Welding Society (AWS).
 - 6. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS).
- E. Tests of all Contractor secured materials and products being submitted for approval to determine conformance with all requirements of the Contract Documents, including borrow materials proposed for use, shall be performed by an independent testing laboratory retained and compensated by this Contractor.
- F. As materials are incorporated into the project, on-site and off-site quality control tests shall be performed during construction to determine conformance with the Contract Documents by an independent testing laboratory retained and compensated by this Contractor.
- G. Quality assurance testing to validate results of quality control tests performed by the Contractor's testing laboratory shall be performed by an independent testing laboratory retained and compensated by the Owner.
- H. Fuel system equipment shall be compatible with the applicable fuel per the table above in Section 1.3.
- I. Complete the system installation in accordance with the requirements of the State of Connecticut Electrical Code and the National Electrical Code.
- J. Comply with the testing and field quality control requirements elsewhere in this section.

1.6 PERMITS AND SUBMISSIONS

- A. The Contractor shall be responsible for all permits and notifications required by State and Local codes and regulations.
- B. Copies of all submissions and permits/registrations received shall be provided as part of the closeout documentation.

1.7 QUALIFICATIONS

- A. Manufacturer: Utilize companies specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Leak Detection Systems: The installing contractor of the Environmental Monitoring System shall be the highest-level manufacturer installer certification.
- C. The motor fuel electrical system shall be installed by a State of Connecticut Licensed Master Electrician with at least 5 years of demonstrated experience with petroleum fuel systems.

1.8 GENERAL CONDITIONS

- A. Lines and grades shall be as indicated. Establish and maintain temporary benchmarks on the site for reference. All vertical dimensions shall be verified from these benchmarks.

- B. All permanent benchmarks shall be protected from disturbance or destruction. Any point disturbed or destructed shall be immediately replaced by a qualified surveyor at this Contractor's expense. Documentation of any such relocation or replacement shall be given to the Engineer.
- C. Disposition of Utilities
 - 1. Adequately protect from damage all active utilities and remove or relocate only as indicated, specified, or directed.
 - 2. Report inactive and abandoned utilities encountered in excavating and grading operations to the Engineer. Remove, plug or cap as directed by the Engineer.
 - 3. Provide a minimum of a 48-hour notice to the Engineer and receive written notice to proceed before interrupting any utility.
- D. Stockpiling of topsoil and other excavated materials will be permitted on-site within the project limits on a case by case basis provided the stockpiles are constructed and maintained in a manner that does not create a foreign object damage risk or adversely affect any other ongoing construction or operation at the site.
- E. During windy or wet conditions and at the conclusion of each day's work period, cover all excavated material to prevent it from becoming saturated or being displaced by wind or rain. Anchor all sides of covering as required to hold the covering firmly in place. In all cases, provide additional measures as necessary to prevent erosion, sedimentation, and wind-borne displacement of excavated materials from their stockpiled location.
- F. Before beginning any work specified in this Section, the Contractor shall make certain that all applicable soil erosion and sediment control requirements are compiled with and the proper authorities have been informed of the construction schedule.
- G. Contractor shall restore all disturbed areas to original conditions. Concrete and pavement thickness shall be in accordance with the construction drawings.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with all manufacturers requirements.
- B. Protect equipment, materials and specialties from elements and other damages caused during shipment, storage, and erection until final acceptance from the Owner.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Comply with all Branford and CT DEEP requirements.
- B. Do not install underground conduit when bedding is wet or frozen.

1.11 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 ELECTRICAL SYSTEM CONDUITS

- A. Electrical conduits shall comply with the following:
 - 1. Rigid Conduit: Conduits shall be new rigid galvanized steel sized in accordance with NFPA 70, but no smaller than 3/4" diameter. Rigid non-metallic conduit shall be allowed in accordance with the requirements of Article 514 of the NEC. In areas of acidic soil and when required by local code, provide non-metallic conduit or PVC wrapped rigid metal conduit.
 - 2. Flexible Conduit: Flexible conduit in NEC, Class I, Division 1 Classified Areas shall be Crouse-Hinds, flexible couplings type "ED" series or equal. Flexible conduit in NEC, Class I, Division 2 or Non-Classified Areas shall be liquid-tight metallic-core galvanized steel, grounding type with extruded PVC cover. Adapters and connectors shall be liquid-tight Crouse-Hinds "LT" type connectors or equal.
 - 3. Conduct Penetrations: Use Franklin Rigid Entry fitting at all sump electrical penetrations.
 - 4. Magnetic safety tape shall be used above all underground conduit and installed in accordance with the construction drawings.

2.2 ELECTRICAL SYSTEM GROUNDING

- A. Grounding Conductors
 - 1. All grounding conductors shall be 2/0 AWG, stranded copper.
 - 2. Grounding ring conductors shall be 2/0.
- B. Grounding Rods
 - 1. All Grounding Rods shall be 3/4" diameter copper clad and 10 feet minimum in length.
 - 2. All electrical wire and cable for circuits shall be properly sized to conform to NFPA 70.
 - 3. Ground wires and bonds shall be #2 AWG stranded copper cable with approved type solderless connectors and lugs.
- C. Connectors
 - 1. Make connections in accordance with NFPA 70.

2.3 ELECTRICAL SYSTEM CONDUCTORS WIRE AND CABLE

- A. General
 - 1. Provide wire with a minimum insulating rating of 600 volts, except for wire used in 50 volts or below in applications for control of signal systems, use 300-volt minimum or 600 volt where permitted to be incorporated with other wiring systems.
 - 2. All wire and cable installed within conduits that exit, enter, or go through a hazardous area must conform to NEC, Article 501-13 for conductor insulation.
- B. Conductor
 - 1. Electrical grade annealed copper, tinned if rubber insulated, and fabricated in accordance with ASTM standards. Minimum size AWG # 12 for branch circuits.
 - 2. The conductors illustrated on the drawings are copper except as otherwise noted.
 - 3. All conductors shall be THHN or THWN except as noted.
 - 4. All conductors shall be petroleum resistant and nylon jacketed.
- C. Stranding.
 - 1. Conductors #10 AWG and smaller may be solid. Conductors #8 AWG and larger shall be stranded in accordance with ASTM Class B stranding designations.

2. Control wires stranded in accordance with ASTM Class B stranding designations.
- D. Insulated Single Conductors
1. Type THHN/THWN - Frame retardant: Heat-resistant thermoplastic insulation, nylon jacket rated for 90 C dry/75C wet operation. Use for branch circuit wiring.
 2. Use type THHN/THWN or XHHW-2 for feeder circuits.
- E. Multi-Conductor Data Cable
1. Supply data cable as required and appropriate by dispenser, fuel management, and environmental monitoring system manufacturers.
- F. Multi-Conductor Power Cable
1. Not authorized on this project.
- G. Color Coding
1. Provide consistent color coding of all circuits as follows:
 - a. 120/208 volts code
 - 1) Phase A - Black.
 - 2) Phase B - Red.
 - 3) Phase C - Blue.
 - 4) Neutral - White.
 - 5) Ground - Green.
 - b. 277/480 Volt Code
 - 1) Phase A - Brown.
 - 2) Phase B - Orange.
 - 3) Phase C - Yellow.
 - 4) Neutral - Gray.
 - 5) Ground - Green.
 2. Color-code wiring for control systems installed in conjunction with mechanical and/or miscellaneous equipment in accordance with the wiring diagrams furnished with the equipment. Factory color code wire number 6 and smaller. Wire number 4 and larger may be color coded by color taping of the entire length of the exposed ends.
 3. Multi-Conductor Control, Signal, and Communication (100 conductors or fewer per cable): In accordance with Table 5-1, Part 5 of ICEA Pub. S-61-402 (NEMA WC 5).
 4. Substitutions for Color-Coded Wire: with approval of Owner's Representative and where color coding cannot be readily provided because of limited quantities involved, either of the following:
 - a. Plastic tape applied spirally and half-lapped over exposed portions of conductors within manholes, boxes, and similar enclosures.
 - b. Colored tubing cut and inserted over ends of wire prior to installing terminals.
 5. Substitutions for Color Coding for Multi-Conductor Control Cable: Printed conductor identification instead of color-coding is acceptable.

2.4 ELECTRICAL SYSTEM CONNECTORS

- A. Make connections, splices, and taps and joints with solderless devices, mechanically and electrically secure. Protect exposed wires and connecting devices with electrical tape or insulation to provide protection not less than that of the conductor.

2.5 OUTLET, JUNCTION, AND PULL BOXES

- A. All exterior, sump, and fuel component outlet boxes not in a designated electrical room, shall carry a NEMA 4 or NEMA 4X rating unless otherwise indicated elsewhere in these specifications or construction drawings. All outlet boxes in the Hazard areas shall be rated in accordance with Chapter 5 of NFPA 70.

- B. Cast Type Conduit Boxes, Outlet Bodies, and Fittings
 - 1. Provide surface mounted outlet and junction boxes, in indoor locations, where exposed to moisture and in outdoor locations.
 - 2. Use Ferrous Alloy boxes and conduit bodies with Rigid Steel or IMC.
 - 3. Use Ferrous Alloy or cast aluminum boxes and conduit bodies with Electrical Metallic Tubing.
 - 4. Covers: Cast or sheet metal unless otherwise required.
 - 5. Tapered threads for hubs.
- C. Galvanized Pressed Steel Outlet Boxes
 - 1. General
 - a. Pressed steel, galvanized or cadmium-plated, minimum of four (4") inches, octagonal or square, with galvanized cover or extension ring as required.
 - 2. Plug any open knockouts not utilized.
- D. Sheet Steel Boxes Indoors
 - 1. No. 12 USS gauge sheet steel for boxes with maximum side less than forty (40") inches, and maximum area not exceeding 1,000 square inches; riveted or welded 3/4 inch flanges at exterior corners.
 - 2. No. 10 USS gauge sheet steel for boxes with maximum side forty (40") to sixty (60") inches, and maximum area 1,000 to 1,500 square inches; riveted or welded 3/4 inch flanges at exterior corners.
 - 3. No. 10 USS gauge sheet steel riveted or welded to 1-1/2 by 1-1/2" by 1/4" welded angle iron framework for boxes with a maximum side exceeding sixty (60") inches and more than 1,500 square inches in area.
 - 4. Covers
 - a. Same gauge steel as box.
 - b. Subdivided single covers so no section of cover exceeds fifty (50) pounds.
 - c. Machine bolts, machine screws threaded into tapped holes, or sheet metal screws as required; maximum spacing twelve (12") inches.
 - 5. Paint
 - a. Rust inhibiting primer; ANSI No. 61 light gray finish coat.
 - 6. Where size of box is not indicated, size to permit pulling, racking, and splicing of cables.
 - 7. For boxes over 600 Volts
 - a. Provide insulated cable supports and removable steel barriers to isolate each feeder. Stencil cable voltage class in red letters on the front cover of the box.
 - b. Braze a ground connector suitable for copper cables to the inside of the box.
- E. Pull and Splice Boxes, Outdoors
 - 1. Aluminum reinforced, with removable covers secured by brass machine screws.
 - 2. Where size of box is not indicated, size to permit pulling, racking, and splicing of the cables.
 - 3. Braze a ground connector suitable for copper cables to the inside of the box.
- F. Junction Box, Sidewalk Type
 - 1. Cast iron, hot-dipped galvanized with threaded conduit entrance hubs, flanged, reinforced checkered cover, gasketed with pry bar slots and countersunk stainless-steel screws.

2.6 ELECTRICAL SYSTEM FIRESTOPPING

- A. Manufacturers:
 - 1. Dow Corning Corp.
 - 2. Fire Trak Corp.
 - 3. Hilti Corp.
 - 4. International Protective Coating Corp.
 - 5. 3M fire Protection Products.

6. Specified Technology, Inc.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.

1. Silicone Firestopping Elastomeric Firestopping: Multiple component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Multiple component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

2.7 ELECTRICAL SYSTEM NAMEPLATES

- A. Unless otherwise noted, nameplates shall be black lamacoid plates with white engraved upper-case letters enclosed by white border on beveled edge.
- B. Nameplates for equipment, supplied by the emergency system (if installed) shall be red lamacoid with white lettering.
- C. All nameplates shall be engraved and must be secured with rivets, brass or cadmium plate screws. The use of Dymo tape or the like is unacceptable.
- D. Nameplate inscriptions shall bear the name and number of equipment to which they are attached as indicated on the Drawings. The engineer reserves the right to make modifications in the inscriptions as necessary.

2.8 ELECTRICAL SYSTEM CABLE TAGS AND WIRE IDENTIFICATION LABELS

- A. Cable tags shall be flameproof secured with nylon ties.
- B. Wire markers shall be preprinted cloth tape type or approved equivalent.

2.9 ELECTRICAL SYSTEM IDENTIFICATION LABELS

- A. Acceptable Manufacturers
 1. W.H. Brady Company (Style A)
 2. Thomas & Betts Company (T&B), Style A.
 3. Approved Equal
- B. Plasticized Cloth
 1. Non-conductive.
 2. Waterproof.
 3. Capable of withstanding continuous temperatures of 235 degrees F and intermittent temperatures to 300 degrees F.

- 4. Overcoating for protection against oil, solvents, chemicals, moisture, abrasion, and dirt.
- C. Heavy, thermo-resistant industrial grade adhesive, for adhesion of label to any surface without curling, peeling or falling off.
- D. Label Designations, Nominal System Voltages label designations shall be applied to the covers of all medium and low voltage pull, splice and junction boxes.
- E. Machine printed.

2.10 ELECTRICAL SYSTEM UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. TEK ID
 - 2. PRESCO
 - 3. Approved equal.
- B. Description: 3-inch-wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines. The warning tape shall list the utility covered, e.g., "CAUTION BURIED ELECTRIC LINE BELOW", TEK ID MODEL # DULT-1-3.

2.11 SEAL-OFF FITTINGS

- A. Cable seals shall be listed for Class I Division 1 and 2 areas and shall be installed in accordance with the NEC.
- B. Seal off fittings shall be the 40% fill type.

2.12 EMERGENCY STOP ACTUATOR

- A. The emergency stop actuator shall be a flush momentary switch.
- B. Provide manufacturer/OEM cover for push button to prevent inadvertent actuation.

2.13 DISPENSER ISOLATION DEVICES

- A. Provide dispenser isolation devices as shown on the construction drawings to provide disconnecting means for all power and data inputs/outputs to/from the dispensers.
- B. In addition, provide Dispenser Hook Isolation (DHI) boxes in the electrical panel to provide optical isolation of the dispenser circuits when indicated by the design drawings.

2.14 MOTOR FUEL ENVIRONMENTAL MONITORING SYSTEM

- A. Manufacturers:
 - 1. Franklin Fueling EVO 6000 (environmental monitoring console)
 - 2. No substitutions are allowed.

FUEL FACILITY INSTALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS

- B. The Contractor shall connect new sensors, probes, and alarms to the monitoring consoles. Sensors and probes for gasoline and diesel systems must be compatible with the compatibility table in 1.3 above and with the environmental monitoring console.
- C. The monitoring equipment must be compatible with the tank installed, the environmental monitoring console, and include all wiring, sensors, and components for a complete operational system.
- D. The environmental monitoring console shall be capable of performing in-tank leak detection functions, continuous statistical leak detection (CSLD), automatic tank calibration and charting, and external leak detection functions. The controller shall be supplied with a keypad and integral printer. The controller shall be supplied with an internal TCP/IP port. Via the TCP/IP port the system shall be capable of generating notifications via fax modem upon operator specified alarm or inventory conditions. The controller shall include all software and interface modules required for probes, sensors, alarms, modems, and other input/output devices required for a complete system. The controller shall be capable of monitoring 1-12 tanks and 0-32 sensors. The controller shall be provided with two RS-485 input ports.
- E. The interstitial tank sensor shall be capable of detecting a change of liquid level in the tank interstitial space.
- F. The internal tank sensor shall be capable of measuring water level, fuel level, and product high and low levels.
- G. The sump sensor shall be capable of sensing any liquid that has entered the piping containment sump.
- H. Multiple overfill alarms may be required as indicated in the contract drawings.
- I. The overfill alarm horn sign shall be constructed in accordance with the construction drawings with the words "OVERFILL ALARM WHEN ALARM SOUNDS TANK IS FULL" and with other language as specified on the construction drawings. Size the sign and lettering in accordance with the construction drawings for easy reading from ground level.
- J. The automatic tank gauge (ATG) shall be capable of monitoring 0.1 GPM. Length of ATG shall be compatible with the tank to be installed. Provide float kits appropriate for the product which the probe will be monitoring and are compatible with the correct environmental monitoring console.
- K. Provide necessary software to access console with onsite computer.

PART 3 - EXECUTION

3.1 GENERAL

- A. The installation of underground and aboveground storage tanks and all fuel and vehicle fluid system equipment electrical and monitoring components shall be conducted in strict accordance with the manufacturer's installation instructions. Nothing in this specification is intended to supersede or contradict those instructions.
- B. Install underground and aboveground tanks and all fuel and vehicle fluid system equipment in accordance with the requirements of all State and Local codes and regulations including, but not limited to, the State of Connecticut Building Code, the State of Connecticut Electrical Code, and NFPA 30A.

3.2 ELECTRICAL SYSTEM – EXAMINATION

- A. Prior to device installation, verify outlet boxes are installed at proper height.
- B. Prior to device installation, verify wall openings are neatly cut and completely covered by wall plates.
- C. Prior to device installation, verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- D. Prior to making equipment connections, verify equipment is ready for electrical connection, for wiring, and to be energized.

3.3 ELECTRICAL SYSTEM INSTALLATION – EQUIPMENT CONNECTIONS

- A. Make electrical connections.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations, including in all sumps and fueling equipment areas.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- E. Install terminal block jumpers to complete equipment wiring requirements.
- F. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

3.4 HAZARDOUS LOCATIONS

- A. Install electrical wiring and components in strict accordance with Chapter 5 and Articles 514 and 515 of the NEC.

3.5 ELECTRICAL SYSTEM - WIRE AND CABLE

- A. Provide a complete system of conductors in raceway system. All conductors of all systems shall be installed in a raceway system.
- B. Use No. 12 AWG, minimum.
- C. Do not install wire in incomplete conduit runs or until after the concrete work and plastering is completed and moisture is swabbed from conduits. Eliminate splices wherever possible. Where necessary, splice in readily accessible pull, junction, or outlet box.
- D. Flashover or insulation value of joints shall be equal to that of the conductor. Provide Underwriters' Laboratories listed connectors rated to 600 volts for general use and 1,000 volts for use between ballasts and lamps or gaseous discharge fixtures.
- E. Use terminating fittings, connectors, etc., of a type suitable for the specified cable furnished. Make bends in cable at termination prior to installing compression device. Make fittings tight.

- F. Extend wire sizing for the entire length of a circuit, feeder, etc. unless specifically noted otherwise.

3.6 ELECTRICAL SYSTEM WIRE INSTALLATION

A. General

1. Provide tools, equipment, and materials to pull all wire and cable into place and to make required splices and termination.

B. Wire and Cable in Conduit, Duct or Wireway

1. Utilize roller bearing swivel to prevent twisting of cable entering conduit or duct.
2. Take precautions to avoid entrance of dirt and water into conduit and ducts.
3. Clean existing conduits and ducts to remove any pulling compound prior to pulling new cables.
4. Do not damage conductor insulation, braid jacket or sheath.
5. Do not bend conductors to less than manufacturer's recommended radius.
6. Make splices only in pull boxes, junction boxes and outlet boxes.
7. Utilize cable reels on jacks for pulling through pull boxes, ducts and conduits so bends will not be excessive, and conductors will not touch sharp edges; use feeding tube where required.
8. For large diameter cables, utilize properly sized pulling grips (endless woven basket two to four feet long of ductile steel).
9. Do not exceed maximum recommended pulling tension of wire and cable.

C. Splices, Terminations, and Connections

1. General: Except where lugs are furnished with equipment, provide terminals and connectors suitable for quantity, conductor size and direction of entry (top or bottom).
2. Insulated Flanged Terminals: Install for connection of conductors No. 12 AWG and smaller to device terminals; do not exceed three terminals at single connections.
3. Circumferential Compression Type Connectors: Install for splices and connections No. 4 AWG and larger.
 - a. Use for incoming and outgoing cable connections at enclosures and for ground connections.
 - b. Use manufacturer's approved tool and correct hex head that embosses die number on connector lug.
 - c. Make crimped indentations parallel with conductor.
 - d. Fill voids and irregularities with insulation putty.
 - e. Cover neatly with four (4) layers of vinyl plastic tape except where insulated covers are permitted; half-lap tape in two directions.
 - f. Use spring-held bakelite covers over splices or taps only with approval of Owner's Representative.
4. Conductor Arcproofing
 - a. Cover two or more power feeder cables occurring in the same switchboard section, junction box or pull box (including pull boxes over switchboards) with arcproof and flameproof tape.
 - b. Provide tape "Scotch" Irvington Tape No. 7700 or Plymouth Rubber Co. Slipknot No. 30 to provide an insulation capable of withstanding a 200-amp arc for not less than 30 seconds.
 - c. Apply tape in a single layer, half lapped, or as recommended by the manufacturer to conform to the above requirements. Apply with a random wrap of 1/2 inch (15mm) wide pressure-sensitive, plastic film tape color coded as specified in the "conductor identification" paragraph.

3.7 FIELD QUALITY CONTROL – WIRE

A. Testing

1. Test system wiring for continuity, grounds and short circuits prior to connection of any equipment.
2. Test final equipment connections for continuity of grounds and short circuits.

3. Insulation Resistance of Feeders and Subfeeders
 - a. Test with megger for insulation resistance.
 - b. Correct faults and replace sections with faulty insulation.
 - c. Demonstrate installation is free of grounds and short circuits and that insulation resistance complies with ICEA values.
4. Test direct burial cables after completion of backfilling.

3.8 ELECTRICAL SYSTEM INSTALLATION – DEVICES

- A. Locations
 1. Comply with layout drawings for general location; contact Owner's Representative for questions about locations and mounting methods.
 2. Relocate outlets obviously placed in a location or manner not suitable to the room finish.
 3. Avoid placing outlets behind open doors.
- B. Align devices vertically and horizontally. Device plates shall be aligned vertically with a tolerance of 1/16". All four edges of device plates shall be in contact with the wall surface.
- C. Mounting Heights as indicated on the Drawings and according to ADA requirements.
- D. Fastening - securely fasten devices into boxes and attach appropriate cover plates.
- E. Install device plates on all outlet boxes. Provide blank plates for all empty, spare and boxes for future devices.
- F. Caulk around edges of outdoor device plates and boxes when rough wall surfaces prevent a rain tight seal. Use caulking material as approved by the Architect/Engineer.

3.9 ELECTRICAL SYSTEM FIELD QUALITY CONTROL – DEVICES

- A. Inspect each wiring device for defects.
- B. Operate and test each device.
- C. Make electrical connections.
- D. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- E. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- F. Install terminal block jumpers to complete equipment wiring requirements.
- G. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- H. Install all connections within the Classified Areas in accordance with Chapter 5 of the NEC.

3.10 SEAL OFF FITTINGS

- A. Install seal off fittings as shown on the construction drawings and as required by NFPA 70 and 30A, for systems associated with Class I Hazardous Locations
- B. IN ADDITION, INSTALL SEAL OFF FITTINGS ON ALL FUEL SYSTEM CONDUITS, AS IF THE SYSTEM IS TREATED AS A CLASS I HAZARDOUS LOCATION. The intent is to allow the owner to minimize the work associated with changing products in the future.

3.11 EMERGENCY STOP SYSTEM TESTING

- A. The emergency stop system shall be tested in the presence of the Engineer.
- B. A report of emergency stop system testing shall be provided in closeout documents.

3.12 DISCONNECT

- A. The Contractor shall install disconnecting means for each individual dispenser. Install dispenser area disconnecting devices as shown on the construction drawings, which provide both power and data disconnects.
- B. In addition, install DHI boxes to provide optical isolation of the dispensing circuits, as shown on the construction drawings.

3.13 DISPENSER TESTING

- A. The Contractor shall perform the following electrical circuit test for the facility dispensers:
 - 1. Turn off all circuit breakers controlling the pumps and check to assure that all pumps are not running.
 - 2. Confirm that all nozzles are in the dispenser boot with the boot electrical switch off.
 - 3. Turn on circuit breaker controlling one pump and on each dispensing pump:
 - a. Remove nozzle, turn operating handle on, and dispense product to confirm hose is pressurized.
 - b. Assure that only the correct pump turns on.
 - 4. If circuit disconnection or other problems are detected using the above procedure, more correction and repeat entire system checkout.

3.14 INSTALLATION - ENVIRONMENTAL MONITORING SYSTEM

- A. The Contractor's monitoring system installer shall be a certified environmental monitoring system technician and installer.
- B. The environmental monitoring system shall be configured in strict accordance with the construction drawings.
- C. The Contractor shall install all monitoring equipment, including monitor console and communications module, magnetostrictive probes, leak sensors, DIMs, and hydrostatic sensors, in strict accordance with the environmental monitoring system installation instructions.
- D. The Contractor shall verify the overall accuracy of the Automatic Tank Gauging (ATG) system in accordance with API's Manual of Petroleum Measurement Standards, Chapter 3, Section 1B.

- E. The environmental monitoring system must be programmed with, at a minimum, the following parameters:
 - 1. Proper tank size, product, and gallonage.
 - 2. Water level warning at 1.5".
 - 3. High water level limit at 2.0".
 - 4. High product limit – 95%.
 - 5. Tank overfill level limit-90%
 - 6. Delivery limit – 30%.
 - 7. Low Product level – 25%.
 - 8. Leak test – Continuous Statistical Leak Detection
 - 9. The audible timer shutoff on the monitoring system overfill alarms shall be set at 60 seconds.
 - 10. The system shall be programmed for single shift with a start time at midnight.
 - 11. All liquid sensors shall be identified as to their location. If multiple sensors are used, Contractor will post a laminated drawing adjacent to the monitor to indicate the location of the sensors by name and number. Contractor shall coordinate with owner for sensor naming. In addition, the Contractor shall fabricate and mount a sign stating "Tank Monitoring System" adjacent to the monitoring system console.
 - 12. The Contractor shall be responsible for confirming the above parameters with each system operator and programming the environmental monitoring system to meet each operator's specific needs.
 - 13. Used oil tanks shall be programmed to have high product warning at 70%.
- F. The Contractor shall provide, as part of the closeout documentation, the monitoring system final setup print-out.
- G. The Contractor shall locate all monitoring equipment, including the environmental monitoring console and all sensors, in accordance with the construction drawings for each location.
- H. The Contractor shall complete and submit to the manufacturer the environmental monitoring system Warranty Registration and Checkout form as well as the Intrinsic Safety Checklist. A copy of the completed checklist as well as confirmation of delivery of the checklist to the manufacturer shall be submitted as part of the closeout documentation.
 - 1. MANUFACTURER'S WRITTEN CERTIFICATION OF A COMPLETE AND FUNCTIONAL INSTALLATION FOR THE LEAK DETECTION AND INVENTORY CONTROL SYSTEM SHALL BE PROVIDED BY THE CONTRACTOR.
- I. Connect the environmental monitoring system to the fuel management system such that the fuel management system receives monitoring system output signals.
- J. Connect the environmental monitoring system to the fuel management PC and provide remote access to the monitoring console. Provide all software necessary for direct access from the PC to the console. Connection to PC shall be hard wired.
- K. The Contractor shall supply, as part of the closeout documentation, any instruction bulletins, preventative maintenance schedules, operational instructions and parts lists associated with the environmental monitoring system.

3.15 SENSOR AND LEVEL PROBE TESTING

- A. Complete functionality of the environmental monitoring system shall be tested. In the presence of the engineer, put each sensor into an alarm condition and manually raise the probe float to simulate an overfill condition.
- B. All sensors and probes shall be tested in the presence of the Engineer.

- C. Provide the monitoring system printout of each alarm from the test sequence (depicting each sensor alarming) to the owner prior to operating the system.
- D. Complete State electronic release detection form reporting test results to the owner. Coordinate testing with other Motor Fuel System sections.

3.16 COMMISSIONING

- A. Coordinate commissioning activities with the commissioning activities required in Sections 136000, and 136010. A single commission program, combining the requirements of the sections shall be coordinated.
- B. The Contractor shall commission the motor fuel systems. Commissioning shall include all testing, start-up, calibration, programming, and documentation. At the conclusion of the commissioning, the facility shall be ready for the owner and tenants to conduct unrestricted operations and use all systems to their full intended and designed capacity.
- C. The Contractor shall submit a system commissioning plan to the owner and engineer for approval at least 30 days prior to commissioning the system. The plan, at a minimum shall include health and safety, testing, calibration, startup, and operational testing procedures for all operation and safety equipment. The plan shall also include all testing and commissioning procedures specifically outlined in this section. The Contractor shall be responsible for supplying all fluids and commodities required to startup and calibrate systems. The plan may be combined with commission plans for other vehicle service equipment systems.
- D. Fuel or flammable/combustible liquids shall not be introduced into the underground tanks until the environmental monitoring and leak detection system is fully programmed, operational, and tested. Fuel shall not be introduced into the dispensing system until all safety (including emergency stop, shear valves, etc.) and leak detection devices have been tested and fire extinguishers are installed.
- E. Notify the engineer no less than 14 days prior to the completion of Commissioning. When Commissioning is completed, the Contractor shall facilitate a final inspection by the engineer. The Contractor shall have all necessary trade personnel on-site to operate equipment, open containment areas, and open electrical enclosures and equipment during the engineer's final Commissioning inspection. That final inspection shall include, but not be limited to:
 - 1. Operational test of all systems.
 - 2. Operational test of all safety devices (e-stop switches, emergency shear valves, overfill alarms);
 - 3. General review of the installation against plans, specs, and manufacturer requirements;
 - 4. Review of all test reports and manufacturer start-up reports;
 - 5. Test of all leak detection sensors;
 - 6. Closeout document requirements review;
 - 7. Tank registration form review, to include all outstanding regulatory reports;
 - 8. Inspection of all tank level probes to verify 90% setting;
 - 9. Inspect of mechanical overfill protection devices to verify/measure 95% setting;
 - 10. Inspect of all sumps and containment areas;
 - 11. Review and validation of monitoring system programming;
 - 12. Operational test of the fuel management system and verification that the system is recording transactions.
 - 13. Confirmation that system training has been completed; and
 - 14. Verification that remote monitoring for the Environmental Monitoring System is programmed and functioning properly.

3.17 MANUFACTURER'S FIELD SERVICES

- A. The Contractor's field superintendent supervising the installation of all underground petroleum carrying components shall be factory or manufacturer certified to perform such installation. Additionally, the field supervisor shall carry any State or Local certifications to install underground tanks and petroleum components.
- B. Furnish factory training representatives to provide up to 8 hours of training on each major piece of equipment or system.

END OF SECTION

SECTION 136025

RIGID METAL FUEL SYSTEM CANOPY

PART 1 - GENERAL

1.1 SUMMARY

- A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
- B. Furnish, assemble, and install a fueling canopy, including concrete footings and lighting, in accordance with the Drawings, these specifications, and in strict accordance with manufacturer's specifications. The gross dimensions of the canopy, including length, width, overhead clearance, and number of columns, shall be in accordance with the Drawings.
- C. **The canopy colors, architecture and materials shall compliment the adjacent Town of Branford Fire Department Headquarters building located at 45 North Main Street, Branford, CT. Prior to bidding, procurement and construction, the contractor shall provide submittals for all materials and colors for Town approval.**
- D. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with the contract documents.
- E. Related work specified in other Sections includes, but is not necessarily limited to:
 - 1. Section 136000 Motor Fuel Aboveground Storage Tanks
 - 2. Section 136010 Motor Fuel Piping and Related Systems
 - 3. Section 136020 Motor Fuel Electrical System

1.2 REFERENCES

- A. Connecticut State Building Code
 - 1. Applicable Sections of Adopted Codes, IBC, IMC, IPC, IFC, NEC
 - 2. Connecticut Amendments
- B. American Society of Mechanical Engineers
 - 1. Sec. 6 – Welding and Brazing Qualifications
- C. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures
- D. ASTM International:
 - 1. ASTM D4021: Glass Fiber Reinforced Polyester Underground Petroleum Storage Tanks.
 - 2. ASTM C136: Standard Test Method for Sieve Analyses of Fine and Coarse Aggregates.
 - 3. ASTM D1557: Standard Test Methods for Laboratory Compaction Characteristics Using Modified Effort

- E. National Fire Protection Association:
 - 1. NFPA 30 - Flammable and Combustible Liquids Code
 - 2. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages
 - 3. NFPA 70 – National Electrical Code
- F. International Code Council
 - 1. International Fire Code
- G. Petroleum Equipment Institute:
 - 1. PEI RP100 - Recommended Practices for Installation of Underground Liquid Storage Systems

1.3 SUBMITTALS

- A. Shop Drawings: Submit original copies of product data submittals for materials and equipment in Part 2 of this section including, but not limited to:
 - 1. Fuel system canopy and associated appurtenances
- B. Contractor's certificates certifying that installers are licensed and qualified to install equipment as required by the Project.
- C. No welder will be employed on the work who has not been fully qualified under the herein specified procedures and so certified by the local chapter of the National Certified Pipe Welding Bureau or similar testing authority.
- D. Each operator's certificate must be on file at the site and must be made available upon request.
- E. The Contractor must obtain State, Town of Branford, and other authorities having jurisdiction, permits and certificates required for canopy installation.
- F. Manufacturer's Field Reports: Submit report of each visit of manufacturer's representative to provide technical assistance during installation.
- G. Record Drawings: Submit record drawings in accordance with the General Requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Coordinate closeout submittals with Sections 136000, 136010, and 136020 to provide a single package for the project.

1.5 QUALITY ASSURANCE

- A. Regulatory requirements from the following agencies must be followed as minimum requirements for equipment required by the Project. Stricter requirements indicated in the Contract Drawings or the Specifications must have precedence over the requirements listed below:
 - 1. Materials and Equipment shall be manufactured, installed, and tested as specified in latest editions of applicable publications, standards and ruling of:
 - a. Local and State building, plumbing, mechanical, electrical, fire and health department codes.
 - b. National Fire Protection Association (NFPA).

FUEL FACILITY INSTALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS

- c. Occupational Safety and Health Act (OSHA).
 - d. Factory Mutual Association (FM).
 - e. Underwriter's Laboratories (UL).
 - f. Manufacturer recommendations and requirements.
- 2. The most recent editions of applicable specifications and publications of the following organizations form part of the Contract Documents:
 - a. American National Standards Institute (ANSI).
 - b. American Society of Mechanical Engineers (ASME).
 - c. National Electric Manufacturers Association (NEMA).
 - d. American Society for Testing of Materials (ASTM).
 - e. American Welding Society (AWS).
- 3. The contractor shall provide a 3rd party testing firm to document all concrete, rebar, bolting, fasteners, footings and general assembly in accordance with the plans. All testing and reports shall be in accordance with CT Building Code and Town of Branford requirements. Reports shall be provide to Owner's Engineer within 5 business days of inspection, test results, observation or other applicable construction milestones.
- B. Specific reference is made to the following Standards of the National Fire Protection Association (NFPA) which shall govern provision of work as specified and as required by codes and authorities:
 - 1. NFPA 1 – Fire Code.
 - 2. NFPA 30A – Code for Motor Fuel Dispensing Facilities.
 - 3. NFPA 70 – National Electric Code
- C. Qualifications: Use adequate numbers of skilled, licensed individuals who are thoroughly trained and experienced in the installation of the specified systems and who are completely familiar with the requirements and the methods needed for proper performance of the work of this Section.
- D. Tests of all Contractor secured materials and products being submitted for approval to determine conformance with all requirements of the Contract Documents, including borrow materials proposed for use, shall be performed by an independent testing laboratory retained and compensated by this Contractor.
- E. As materials are incorporated into the project, on-site and off-site quality control tests shall be performed during construction to determine conformance with the Contract Documents by an independent testing laboratory retained and compensated by the Contractor.
- F. Complete the canopy installation in accordance with the requirements of the Connecticut State Building Fire, and Electrical Code.
- G. Qualifications:
 - 1. Manufacturer: Utilize companies specializing in manufacturing products specified in this section with minimum five years documented experience.
 - 2. Canopy Installer: Company specializing in performing Work of this section with minimum ten years documented experience. The Contractor installing the Fuel System shall be a Certified tank installer in accordance with Local and State requirements.

1.6 PERFORMANCE REQUIREMENTS

- A. Provide pre-engineered canopy that is capable of withstanding the effects of gravity loads and the following loads.
 - 1. CT State Building Codes
 - 2. Wind loads designed per ASCE 7, chapter 6.

3. Snow loads designed per ASCE 7, chapter 7
4. Seismic performance per ASCE 7, chapter 11-13.

- B. Thermal Movements: Provide pre-engineered canopies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

1.7 PERMITS AND SUBMISSIONS

- A. The Contractor shall be responsible for all permits and notifications required by State and Local codes and regulations.
- B. Copies of all submissions and permits/registrations received shall be provided as part of the closeout documentation.

PART 2 - PRODUCTS

2.1 FUEL SYSTEM CANOPY

- A. Manufacturers:
1. VFS Canopy (attn Tim Teeter 315-867-9799 tteeter@vfscanopy.com)
 2. Austin Mohawk (315-793-3000 <https://www.austinmohawk.com/>)
 3. Approved Equal
- B. The Contractor shall design and provide a rigid metal fueling canopy and associated appurtenances in accordance with manufacturer's specifications and with the approved shop drawings. The Contractor is responsible for submitting three (3) sets of design drawings including footing design, signed and sealed by a State of Connecticut Licensed Professional Engineer, for approval within 21 days of the contract award. The canopy shall be designed and constructed in accordance with the State of Connecticut Building Code.
- C. All steel canopy materials, including beams, angles, plates, supports, and deck panels shall meet applicable American Society for Testing and Materials (ASTM) standards and CT Building Code.
- D. **The canopy colors, architecture and materials shall compliment the adjacent Town of Branford Fire Department Headquarters building located at 45 North Main Street, Branford, CT. Prior to bidding, procurement and construction, the contractor shall provide submittals for all materials and colors for Town approval. Refer to PART 4.0 – REFERENCE PHOTOS.**
- E. **The canopy shall be equipped with a hip style metal standing seam roof and fascia arrangement as depicted on the Project Drawings. Colors of the standing seam room to match the adjacent Town of Branford Fire Department Headquarters building. The vertical face of the canopy color and material shall compliment the standing seam roof and match the adjacent Town of Branford Fire Department Headquarters building. Exact colors to be determine through the submittal and approval process with the Town of Branford representatives. Refer to PART 4.0 – REFERENCE PHOTOS.**

- F. **NO GLOSSY OR REFLECTIVE FINISHES ARE ALLOWED.**
- G. Decking shall have a minimum 20 gage thickness. Galvanized steel with baked enamel finish, embossed white. Decking shall be provided below the canopy structure.
- Canopy shall have perimeter drains. Provide schedule 80 PVC drain piping and route down spouts to discharge to ground surface and orient away from fuel dispensers.
- H. The canopy shall be furnished with factory applied primer and paint. The contractor shall select canopy colors for the fascia and columns which compliment the adjacent building on site and present to owner for final review and approval.
- I. The canopy shall be supplied with overflow scuppers cut into the gutters, to allow for the release of overflow water from the gutters in the event that the drain becomes blocked. The size, quantity, and placement of the scuppers shall be determined by the canopy manufacturer and designer.
- J. Provide LED under canopy lighting fixtures in accordance with the construction drawings. All fixtures shall be UL listed and be supplied with an integral motion / occupancy sensor and daylight sensor that has a minimum of seven (7) low level settings and seven (7) high level settings. Canopy lights shall come with a remote control configurator tool ("Tool" for light level programming. The Contractor shall trin the owner the Light Configurator Tool and deliver all materials and the device to the Owner.
- K. All canopy lights shall be recessed in the the canopy deck and have a full cut off lens.
1. LSI Scottsdale Vertex or approved equal
- L. Provide enabling conduit and electrical lighting circuitry in accordance with the construction drawings.

PART 3 - EXECUTION

3.1 CANOPY INSTALLATION

- A. The Contractor shall pour all canopy footings in accordance with the contract documents, manufacturer's requirements, and the sealed design drawings. All footings shall be poured to the same top elevation.
- B. Concrete canopy footings shall be constructed in accordance with manufacturer requirements and the sealed structural plans.
1. Canopy footings shall be poured to a minimum depth below finished grade as required by local codes and ordinances.
- C. The design of the canopy footers shall be designed to avoid conflict with the traffic protection bollards and the underground dispenser containment sumps.
- D. The Contractor shall mastic coat all steel bolts in accordance with manufacturer recommendations.
- E. The Contractor shall paint steel canopy and canopy columns in the following manner:
1. Spot prime all scratched or damaged areas of factory installed primer and paint.
2. Touch-up all primed steel with two (2) coats of exterior enamel to match factory applied paint.
3. Do not prime or paint pre-finished fascia. Contractor shall supply fascia in color acceptable to the Owner.

FUEL FACILITY INSTALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS

4. Complete all painting touch ups prior to attaching signage or other appurtenances to the canopy. Do not paint around signs and appurtenances.
 5. Any unpainted areas of structural steel shall be primed and painted, including the ends of the canopy columns.
- F. The Contractor shall furnish and install canopy drain pipe including all drainage systems, in accordance with the construction drawings.
- G. Install under canopy lighting in accordance with the Connecticut Electric Code. Connect to lighting switch in building. Install electrical conduits in accordance with the electrical sections.

PART 4 - REFERENCE PHOTOS

4.1 PHOTOS

The Contractor and their canopy installers / suppliers are encouraged to visit the site to view the adjacent Town of Branford Fire Department Headquarters building located at 45 North Main Street, Branford, CT. The canopy colors, architecture and materials shall compliment the Town of Branford Fire Department Headquarters building.



END OF SECTION

FUEL FACILITY INSTALLATION
TOWN OF BRANFORD FIRE HEADQUARTERS