

# PROJECT MANUAL

BUREAU OF MOTOR VEHICLES  
**VEHICLE TESTING FACILITY**  
18-14 FISHFRY DR.  
ENIGHED CRUZ BAY QUARTER  
ST.JOHN, UNITED STATES VIRGIN ISLANDS



Nelson M. Petty Jr., P.E., Commissioner  
GOVERNMENT OF THE VIRGIN ISLANDS  
DEPARTMENT OF PUBLIC WORKS  
NO.8244 SUB BASE  
ST.THOMAS, UNITED STATES VIRGIN ISLANDS 00802-5805  
TELEPHONE: 340-776-4844

FOR

Barbara Jackson McIntosh, Director  
BUREAU OF MOTOR VEHICLES  
GOVERNMENT OF THE VIRGIN ISLANDS  
SUBBASE, ST. THOMAS  
UNITED STATES VIRGIN ISLANDS 00802

**DIVISION 0 – PROCUREMENT AND CONTRACTING REQUIREMENTS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **SECTION 0 – INDEX**

### **GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES VEHICLE TESTING FACILITY**

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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<b>DIVISION 0</b>	<b>INVITATION FOR BID REQUIREMENTS</b>
<u>SECTION NUMBER</u>	<u>TITLE</u>

SECTION 0	INDEX
SECTION 1	INVITATION FOR BIDS
SECTION 2	BID SHEET
SECTION 3	CONSTRUCTION CONTRACT

<b>DIVISION 1 -</b>	<b>GENERAL REQUIREMENTS</b>
<u>SECTION NUMBER</u>	<u>TITLE</u>

01000	SUMMARY
01039	COORDINATION MEETINGS
01045	CUTTING AND PATCHING
01095	REFERENCE STANDARDS AND DEFINITIONS
01200	PRICE AND PAYMENT PROCEDURES
01300	SUBMITTALS
01325	CONSTRUCTION PROGRESS SCHEDULE
01400	QUALITY CONTROL
01600	MATERIAL AND EQUIPMENT HANDLING
01620	TRANSPORTATION AND HANDLING
01630	STORAGE AND PROTECTION
01700	CONTRACT CLOSEOUT
01710	CLEANUP
01730	GUARANTEES AND WARRANTIES
01780	CLOSEOUT SUBMITTALS

<b>DIVISION 2 -</b>	<b>EXISTING CONDITIONS</b>
<u>SECTION NUMBER</u>	<u>TITLE</u>

02282	TERMITE CONTROL
024115	STRUCTURE DEMOLITION

<b>DIVISION 3 -</b>	<b>CONCRETE</b>
<u>SECTION NUMBER</u>	<u>TITLE</u>

03346	CAST IN PLACE CONCRETE
03410	PRECAST MANHOLE BASES, RISERS AND TOPS DESCRIPTION
03900	CONCRETE RESTORATION AND CLEANING

<b>DIVISION 4 -</b>	<b>MASONRY</b>
<u>SECTION NUMBER</u>	<u>TITLE</u>

040523	MASONRY ACCESSORIES
--------	---------------------

<b>DIVISION 5 -</b>	<b>METALS</b>
<u>SECTION NUMBER</u>	<u>TITLE</u>

05500	MISCELLANEOUS METAL WORK
05600	MANHOLE FRAMES AND COVERS

<b>DIVISION 6 -</b>	<b>WOODS AND PLASTICS</b>
<u>SECTION NUMBER</u>	<u>TITLE</u>

06100	ROUGH CARPENTRY
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## **SECTION 0 – INDEX**

### **GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES VEHICLE TESTING FACILITY**

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### **DIVISION 7 - THERMAL AND MOISTURE PROTECTION**

##### **SECTION NUMBER TITLE**

07130	SELF ADHESIVE WATERPROOFING MEMBRANE
07411	STANDING SEAM METAL ROOF PANELS
07620	FLASHING AND SHEET METAL
077123	ROOF GUTTERS AND DOWNSPOUTS
07900	JOINT SEALERS

#### **DIVISION 9- FINISHES**

##### **SECTION NUMBER TITLE**

09253	SALT RETAINING WATER REPELLENT RENOVATION STUCCO
09772	SILICATE COATINGS
09900	PAINTING

#### **DIVISION 10 - SPECIALTIES**

##### **SECTION NUMBER TITLE**

104416	FIRE EXTINGUISHERS
101416	CONVEX MIRROR

#### **DIVISION 26 - ELECTRICAL**

##### **SECTION NUMBER TITLE**

260500	BASIC ELECTRICAL MATERIALS AND METHODS
260510	COMMON WORK RESULTS FOR ELECTRICAL
260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526	GROUNDING AND BONDING FOR ELECTRICAL
260529	SYSTEMS HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533	RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
260543	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS
260548	VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS
260553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
260923	LIGHTING CONTROL DEVICES
262416	PANELBOARDS
262726	WIRING DEVICES
262813	FUSES
262816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
265150	INTERIOR LIGHTING

#### **DIVISION 32 - EXTERIOR IMPROVEMENTS**

##### **SECTION NUMBER TITLE**

323100	ORNAMENTAL SECURITY FENCING AND GATES
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#### **DIVISION 33 - UTILITIES**

##### **SECTION NUMBER TITLE**

332722	STORM DRAINAGE STRUCTURES
332724	STORM DRAINAGE PIPE

**October 30, 1974**

REVISED: 3-18-08

GOVERNMENT OF  
THE VIRGIN ISLANDS OF THE UNITED STATES  
DEPARTMENT OF PROPERTY AND PROCUREMENT

**INVITATION FOR BIDS**

Invitation No. \_\_\_\_\_ Date: \_\_\_\_\_

Pursuant to Laws of the Government of the Virgin Islands sealed bids in Quintuplicate (5) copies ((1) original and (4) copies) for the work described herein will be received on **Monday, September 23, 2019 at 10:00 a.m. at the Department of Property & Procurement** and publicly open thereafter.

**Description of Work and Project Number:** IFB0 BMV19 (C) GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES, VEHICLE TESTING FACILITY, 18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS.

**Pre-Bid Conference:** A Pre-Bid Conference will be held on **Tuesday, August 23, 2019 at 11:00** o'clock a.m., at the Department of Property and Procurement. **A site visit will be conducted following the meeting.**

**Cost Per Set: \$100.00 NON-REFUNDABLE**

**Liquidated Damages: \$100.00 / calendar day**

**Completion time of Work: 90 calendar days**

**Information regarding bidding documents:**

Bidding Documents include the Public Notice, this Invitation to Bid, Non- Collusion Affidavit, Instruction to Bidders, Contractor's Qualification Statement, the Contract, Performance, Bid and Payment Bonds, General Provisions, Special Provision, Supplemental Specifications, Plan and Specifications. All documents may be obtained from the Department of Property and Procurement.

Each bid must be accompanied by a Bid Guarantee as provided for in Form No. P&P-ITB-CC-16-73 (Instruction to Bidders) which is hereby made a part of this Invitation and by this reference incorporated herein as fully and effectively as if set forth in detail. Bid Guarantee for Preferred Bidders is specified in 31 V.I.C. 236a (Act No. 2995 approved April 16, 1971), if the Preferred Bidders Act applies. If the Preferred

Bidders Act does not apply, failure to provide a Five (5%) percent bond will render the bid unresponsive. It is the Bidder's responsibility to determine if the Act applies.

The Bid Guarantee for bidders not claiming or having the status of a preferred bidder will be Five (5%) per cent of the bid price. Bid Guarantee will be in the form of a Bond (Corporate or Individual Surety), Money Order, Certified Check or Irrevocable Letter of Credit.

No Bidder will be allowed to withdraw his bond within a period of thirty (30) calendar days following the date set for the opening thereof.

**Preferred Bidder:**

Any bidder claiming eligibility as a “preferred bidder” under the provision of the Preferred Bidders Act (31 VIC 236a – Act No. 2995, approved April 16, 1971) must request that his/her name be added to a preferred bidders’ list to be maintained by the Commissioner of Property and Procurement.

If a bidder has not previously filed a notarized Certificate with the Commissioner of Property and Procurement, copies thereof may be obtained from the Department of Property and Procurement, Division of Procurement, Building No. 1, Subbase, Third Floor, St. Thomas, Virgin Islands and/or from 3274 Estate Richmond, Christiansted, St. Croix, Virgin Islands.

Certificates must be fully completed, notarized and filed in the Division of Procurement before the day and hour set for bid opening.

**Contractor’s Qualification Statement**

Each bidder must submit with his bid an executed copy of a Contractor’s Qualification Statement which is hereby made a part of this Invitation for Bid and by this reference incorporated herein as fully and effectively as if set forth in detail.

**Business License**

Each bidder must submit with his bid a valid copy of a Virgin Islands Business License.

**BONDS:**

A Bid Bond, Performance Bond and Payment each are required as follows:

Bid Bond:	5% of the Contract
Performance Bond:	100% of the Contract
Payment Bond:	100% of the Contract

GOVERNMENT OF  
THE VIRGIN ISLANDS OF THE UNITED STATES  
Department of Property and Procurement  
Invitation For Bids  
(CONSTRUCTION)

Date: \_\_\_\_\_

IFB No: \_\_\_\_\_

To: The Commissioner  
Department of Property and Procurement  
Government of the Virgin Islands

**Section 1.** The undersigned, \_\_\_\_\_

\_\_\_\_\_ in compliance with your Invitation For Bids, above referenced, for the GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES, VEHICLE TESTING FACILITY, 18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST. JOHN, U.S. VIRGIN ISLANDS, hereby offers to perform the above construction work more particularly described in the Contract documents which accompanied the

Request For Bids- for the total sum of \$ \_\_\_\_\_

**Section 2.** The undersigned hereby certifies that he has examined or caused to be examined for and on his behalf the plans and specifications together with related documents and the site of the proposed work and being familiar with all of the conditions surrounding the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein of which the bid is a part.

**Section 3.** The undersigned agrees that upon written notice of the acceptance of this offer he will execute a formal contract within ten (10) calendar days and deliver to the Contracting Officer such bonds as are required.

**Section 4. (a)** The undersigned further agrees that if awarded a contract hereunder, he will within such time as determined by the Contracting Officer before or after the date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule showing the order in which he proposes to carry on the work; the date on which he will start the several salient features including procurement of materials and equipment and the contemplated dates for completing the same.

**(b)** The schedule shall be in the form of a Progress Chart of suitable scale to indicate appropriately the percentage of work schedule for completion at any time. The Contractor shall enter in the chart the actual progress at the end of each week or at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three (3) copies thereof.

(c) If, in the opinion of the Contracting Officer, the undersigned contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may, **inter alia**, require him to increase the number of shifts, and/or overtime operations or days of work to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained **all without additional cost to the Government.**

(d) Failure of the Contractor to comply with the requirements of the Contracting Officer under the provisions hereof shall be grounds for determination by the Contracting Officer that the Contractor is not prosecuting the work with such diligence as will ensure completion within the time specified. Upon such determination, the Contracting Officer may terminate the contractor's right to proceed with the work, or any separable part thereof, in accordance with the delays damages article of the contract.

**Section 5.** The bid security attached, in the sum of \$\_\_\_\_\_ shall become the property of the Government, as **liquidated damages**, in the event the contract is not executed or the bonds furnished within the time set forth.

Respectfully submitted:

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Official designation)

\_\_\_\_\_  
(Name of Firm)

Seal – if by Corporation



**ACCEPTANCE AND NOTIFICATION**  
**Government of the Virgin Islands**

The above offer is hereby accepted and Offeror is hereby so notified.

Dated: \_\_\_\_\_

\_\_\_\_\_  
Anthony D. Thomas  
Commissioner  
Department of Property and Procurement  
Contracting Officer, G.V.I.

## SECTION 2 – SCHEDULE OF PRICES

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

	DESCRIPTION	UNIT	QUANTITIY	UNIT PRICE	EXTENSION	TOTAL LABOR	TOTAL MATERIAL
	<b>DIVISION 1 – GENERAL REQUIREMENTS</b>						
1	01300 & 01780 Submittals	LS	1				
3	Portable Toilet	LS	1				
4	Erosion & Sedimentation Control	LS	1				
5	Permit Fees	LS	1				
6	Mobilization	LS	1				
	<b>DIVISION 2 – EXISTING CONDITIONS</b>						
7	022820-Termite Control	LS	1				
8	024115-Structure Demolition	SF	320				
	<b>DIVISION 3 – CONCRETE</b>						
9	03346 Reinforced Concrete Slab	CY	16				
10	03346 Concrete Columns	CY	3				
11	03346 Concrete Beams	CY	5				
	<b>DIVISION 4 - MASONRY</b>						
12	040523 8" CMU	SF	275				
	<b>DIVISION 5 – METALS</b>						
13	05500 6" Bollards	EA	4				
14	05600 Transit Frame Grate Light Duty R-4938	EA	1				
	<b>DIVISION 6 – WOODS AND PLASTICS</b>						
15	06100 Rough Carpentry	SF	260				
	<b>DIVISION 7 – THERMAL AND MOISTURE PROTECTION</b>						
16	07130 & 07411 & 07620 Roof	SF	260				
17	07620 & 077123 Gutter	LF	100				
18	07620 & 077123 Downspout	LF	80				
	<b>DIVISION 9 – FINISHES</b>						
19	092400 Portland Cement Plastering & Waterproofing	SF	1600				
20	09253 & 09772 Painting Interior Walls	SF	800				
21	09253 & 09772 Painting Exterior Walls	SF	800				

## SECTION 2 – SCHEDULE OF PRICES

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

	DESCRIPTION	UNIT	QUANTITIY	UNIT PRICE	EXTENSION	TOTAL LABOR	TOTAL MATERIAL
22	09900 Painting Interior Ceiling	SF	260				
	<b>DIVISION 10 - SPECIALTY ITEMS</b>						
23	104416 Fire Extinguisher Mounted Type	EA	1				
24	Table 36" x 48" Powder Coated Aluminum	EA	1				
25	108600 36" Convex Mirror	EA	1				
	<b>DIVISION 26 – ELECTRICAL</b>						
26	260519, 260529 & 260533 Low Voltage Wiring in conduit	LS	1				
27	260553, 262416, 262813 & 262816 Panel Box Service Connection	LS	1				
28	265151 Suspended LED Fixtures, 1S, 18	EA	2				
29	265151 Wall Sconce	EA	4				
30	260923 & 262126 Switches, Outlets, Data Etc. (Points)	PT	10				
	<b>DIVISION 32 – EXTERIOR IMPROVEMENTS</b>						
31	323100 16'x 7' Aluminum Bi-Swing Decorative Gate Installed	EA	1				
	<b>DIVISION 33 – UTILITIES</b>						
32	332722 & 03410 Storm Drainage Structure	EA	1				
33	332724 4" PVC Storm Sewer	LF	16				

**TOTAL BID**

\_\_\_\_\_

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### SECTION 3 – CONSTRUCTION CONTRACT

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### CONSTRUCTION CONTRACT

THIS AGREEMENT is made this \_\_\_\_ day of \_\_\_\_\_, 20\_\_, in the Territory of the Virgin Islands, by and between the Government of the Virgin Islands, Department of Property & Procurement (hereinafter referred to as “Government”) and **[Insert Contractor’s Name or Company Name]** (hereinafter referred to as “Contractor”).

#### WITNESSETH:

WHEREAS, the Government is in need of a contractor to furnish all labor, materials and equipment necessary for the **GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES, VEHICLE TESTING FACILITY, 18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**, in strict accordance with the plans and specifications (incorporated by reference and made a part of this contract), which duties and responsibilities are more particularly described in *Addendum I*, (Scope of Work), *Addendum II* (General Provisions and Warranties together with the additional General Provisions – Construction), *Addendum III* (Termination of Contracts), and *Addendum IV* (Compensation) attached hereto; and

WHEREAS, the Contractor represents that it is willing and capable of providing such services;

NOW THEREFORE, in consideration of the mutual covenants herein contained, and intending to be legally bound by this written instrument, the parties hereto do covenant and agree as follows:

C0 ( )  
IFB0 (C)

Contractor’s Initials\_\_\_\_\_

## SECTION 3 – CONSTRUCTION CONTRACT

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### 1. SERVICES

The Contractor will provide the services described more particularly in Addendum I (Scope of Work) incorporated herein by reference and made a part of this construction contract.

### 2. TERM

This Contract shall commence upon execution by the Governor and shall terminate within **One Hundred** (100 days) calendar days thereafter, or in accordance with an agreed upon extension pursuant to the General Provisions. Particular reference should be made to the Notice to Proceed.

### 3. COMPENSATION

The Government, in consideration of satisfactory performance of the services described in Addendum I, agrees to pay the Contractor the sum of **[insert contract price in words (contract price in numbers)]** in accordance with the provisions set forth in Addendum IV (Compensation), attached hereto is hereby incorporated by reference and made a part of this contract.

C0 ( )  
IFB0 (C)

Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### **4. LIQUIDATED DAMAGES**

It is hereby expressly agreed by the parties hereto that in the event the Contractor has not completed the scope of work under the term set forth in Paragraph 2 hereof, **One Hundred and 00/100 Dollars (\$100.00)** for each calendar day or portion thereof shall be due the Government. The liquidated damages shall first be deducted from any contract monies due, but not yet paid to the extent available.

#### **5. RECORDS**

The Contractor will present documented, precise records of time and/or money expended under this Contract.

#### **6. PROFESSIONAL STANDARDS**

The Contractor agrees to maintain the professional standards applicable to its profession and to Contractors doing business in the United States Virgin Islands.

#### **7. DOCUMENTS, PRINTOUTS, ETC.**

Certified copies of all documents, books, records, instructional materials, programs, printouts and memoranda of every description derived therefrom and pertaining to this Contract shall become the property of the Government and shall be turned over to it at the

C0 ( )  
IFB0 (C)

Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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termination of this Contract, or at the Government's request, during the life of the contract.

The above-described materials shall not be used by Contractor or by any other person or entity except upon the written permission of the Government.

#### **8. LIABILITY OF OTHERS**

Nothing in this Contract shall be construed to impose any liability upon Government to persons, firms, associations, or corporations engaged by Contractor as servants, agents, independent contractors, or in any other capacity whatsoever, or make the Government liable to any such persons, firms, associations or corporations for the acts, omissions, responsibilities, obligations and taxes of Contractor or whatsoever nature, including but not limited to unemployment insurance and social security taxes for Contractor, its servants, agents or independent contractors.

#### **9. ASSIGNMENT**

The Contractor shall not subcontract or assign any part of the services under this contract without the prior written approval of the Government.

#### **10. INDEMNIFICATION**

Contractor agrees to indemnify, defend, and hold harmless the Government from and against any and all loss, damage, liability, claims, demands, detriments, cost, charges and

C0 ( )  
IFB0 (C)

Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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expenses (including attorney's fees) and causes of action of whatsoever character which the Government may incur, sustain or be subjected to, arising out of or in any way connected to the services to be performed by Contractor under this Contract and arising from any cause, except the sole negligence of Government.

#### **11. INDEPENDENT CONTRACTOR**

The Contractor shall perform this Contract as an independent contractor and nothing herein contained shall be construed to be inconsistent with this relationship or status.

#### **12. GOVERNING LAW**

This Contract shall be governed by the laws of the United States Virgin Islands and jurisdiction and venue are exclusive in the United States Virgin Islands.

#### **13. WAIVERS AND AMENDMENTS**

No waiver, modification, or amendment of any term, condition or provision of this Contract shall be valid or of any force or effect unless made in writing, signed by the parties hereto or their duly authorized representatives, and specifying with particularity the nature and extent of such waiver, modification, or amendment. Any such waiver, modification, or amendment in any instances shall in no event be construed to be a general waiver, modification, or amendment of any of the terms, conditions, or provisions of this Contract,

C0 ( )  
IFB0 (C)

Contractor's Initials\_\_\_\_\_



### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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but the same shall be strictly limited and restricted to the extent and occasion specified in such signed writing or writings.

#### **14. ENTIRE AGREEMENT**

This agreement constitutes the entire agreement of the parties relating to the subject matter addressed in this agreement. This agreement supersedes all prior communications, contracts, or agreements between the parties with respect to the subject matter addressed in this Agreement, whether written or oral.

#### **15. RIGHT TO WITHHOLD**

If work under this Contract is not performed in accordance with the terms, hereof, Government will have the right to withhold out of any payment due to Contractor, such sums as the Government may deem ample to protect it against loss or to assure payment of claims arising therefrom, and, at its option, the Government may apply such sums in such manner as the Government may deem proper to secure itself or to satisfy such claims. The Government will immediately notify the Contractor in writing in the event that it elects to exercise its right to withhold.

C0 ( )  
IFB0 (C)

Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### **16. CONDITION PRECEDENT**

This Contract shall be subject to the availability and appropriation of funds and to the approval of the Governor.

#### **17. TERMINATION**

Either Party will have the right to terminate this contract with cause on ten (10) days written notice to the other party specifying the date of termination. The attached “Addendum III- Termination of Contracts for the Convenience of the Government” is hereby fully incorporated herein by reference and is made a part of this agreement.

#### **18. PARTIAL TERMINATION**

The performance of work under this contract may be terminated by the Government in part, whenever the Government shall deem such termination advisable. This partial termination shall be effected by delivering to the Contractor a Notice of Partial Termination specifying the extent to which the term and/or duties under this contract are terminated and the date upon which such termination becomes effective. The Contractor shall be entitled to receive payment for services provided to the date of termination, including payment for the period of the ten (10) days’ notice.

C0 ( )  
IFB0 (C)

Contractor’s Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### **19. NON-DISCRIMINATION**

No person shall be excluded from participating in, be denied the proceeds of, or be subject to discrimination in the performance of this Contract on account of race, creed, color, sex, religion, disability or national origin.

#### **20. CONFLICT OF INTEREST**

(a) Contractor covenants that it has no interest and will not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of services required to perform under this Contract.

(b) Contractor further covenants that it is:

(1) not a territorial officer or employee (i.e., the Governor, Lieutenant Governor, member of the Legislature or any other elected territorial official; or an officer or employee of the legislative, executive, or judicial branch of the Government or any agency, board, commission, or independent instrumentality of the Government, whether compensated on a salary, fee or contractual basis); or

(2) a territorial officer or employee and, as such, has:

(i) familiarized itself with the provisions of Title 3, Chapter 37, Virgin Islands Code, pertaining to conflicts of interest, including the penalties provisions set forth in section 1108 thereof;

C0 ( )  
IFB0 (C)

Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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(ii) not made, negotiated or influenced this contract, in its official capacity;

(iii) no financial interest in the contract as that term is defined in section 1101, (1) of said Code chapter.

#### **21. EFFECTIVE DATE**

The effective date of this Contract is upon the execution by the Governor.

#### **22. NOTICE**

Any notice required to be given by the terms of this Contract shall be deemed to have been given when the same is sent by certified mail, postage prepaid or personally delivered, addressed to the parties as follows:

#### **GOVERNMENT**

**Anthony D. Thomas**

Commissioner

Department of Property and Procurement

#3274 Estate Richmond

Christiansted, VI 00820-4241

#### **CONTRACTOR**

**Contractor's Name**

**Contractor's Title**

**Contractor's Name or Company Name**

**Contractor's P. O. Box**

**Contractor's City, State, Zip Code**

C0 ( )  
IFB0 (C)

Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### **23. LICENSURE**

The Contractor covenants that it has:

- a. obtained all of the applicable licenses or permits, temporary or otherwise, as required by Title 27 of the Virgin Islands Code; and
- b. familiarized itself with the applicable provisions of Title 27 of the Virgin Islands Code pertaining to professions and occupations.

#### **24. CONTRACTOR'S REPRESENTATIONS**

The Contractor agrees that he is fully informed regarding all the conditions affecting the work to be done and labor and materials to be furnished for the completion of the Contract, and that he has been engaged in and now does such work and represents that he is fully equipped, competent, and capable of performing the work and is ready and willing to perform such work.

The Contractor agrees further to begin work not later than the date indicated on the formal notice to proceed and complete the work within the number of days specified in the proposal or as extended in accordance with the General Provisions of the Contract.

The Work shall be done under the direct supervision of the Government, and in accordance with the laws of the Government and its Rules and Regulations thereunder issued and any and all applicable federal rules and regulations. The parties hereto agree that this

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IFB0 (C)

Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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contract shall, in all instances, be governed by the Laws of the Government of the Virgin Islands.

#### **25. WARRANTY OF NON-SOLICITATION**

The Contractor expressly warrants that he has employed no person to solicit or obtain this contract on his behalf, or to cause or procure the same to be obtained upon compensation in any way, contingent, in whole or in part, upon such procurement, and that he has not paid, or promised or agreed to pay to any person, in consideration of such procurement, or in compensation for services in connection therewith, any brokerage, commission, or percentage upon the amount receivable by him hereunder; and that he has not, in estimating the contract price demanded by him included any sum by reason of such brokerage, commission or percentage; and that all monies payable to him hereunder are free from obligation to any other person for services rendered, or supposed to have been rendered, in the procurement of this contract.

Breach of the warranty shall give the Government the right to terminate this Contract, or in its discretion, to deduct from the contract price or consideration the amount of such commission, percentage, brokerage or contingent fees.

C0 ( )  
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Contractor's Initials\_\_\_\_\_

### **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### **26. FALSE CLAIMS**

Contractor warrants that it shall not, with respect to this Contract, make or present any claim upon or against the Government of the Virgin Islands, or any officer, department, board, commission, or other agency thereof, knowing such claim to be false, fictitious or fraudulent. Contractor acknowledges that making such a false, fictitious, or fraudulent claim is an offense under Virgin Islands law.

#### **27. OTHER PROVISIONS**

Addendum II (General Provisions and Warranties) and Addendum III (Termination of Contracts) attached hereto are hereby incorporated by reference and made a part of this contract.

IN WITNESS WHEREOF, the parties have hereunto set their hands on the day and year first above written.

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Contractor's Initials\_\_\_\_\_

**SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**WITNESSES:**

**GOVERNMENT OF THE VIRGIN ISLANDS**

**Date:** \_\_\_\_\_

\_\_\_\_\_  
**Anthony D. Thomas**  
**Commissioner**

Department of Property and Procurement

**CONTRACTOR**

**Date:** \_\_\_\_\_

\_\_\_\_\_  
**Contractor's Name, Title**  
Contractor's Company Name

*(Corporate seal, if Contractor is a corporation)*

**APPROVED:**

\_\_\_\_\_  
**Albert Bryan**

**Date:** \_\_\_\_\_

**GOVERNOR OF THE VIRGIN ISLANDS**

**APPROVED AS TO LEGAL SUFFICIENCY**

**AT THE DEPARTMENT OF JUSTICE BY:** \_\_\_\_\_

**Date** \_\_\_\_\_

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Contractor's Initials \_\_\_\_\_



### SECTION 3 – CONSTRUCTION CONTRACT

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### CERTIFICATE OF APPROVAL

I hereby certify that this is a true and exact copy of Contract No. (**Insert Construction Contract Number**) entered into between the Department of Property and Procurement, on behalf of the **Lieutenant Governor's Office and Contractor's Name/Company Name**

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**Anthony D. Thomas., Commissioner**  
Department of Property and Procurement

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IFB0 (C)

Contractor's Initials\_\_\_\_\_

## **SECTION 3 – CONSTRUCTION CONTRACT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **Addendum I (include each addenda on a separate sheet of paper)**

*Scope of Work*

### **Addendum II**

*General Provisions and Warranties*

*Additional General Provisions - Construction*

### **Addendum III**

*Termination of Contracts*

### SECTION 3 – CONSTRUCTION CONTRACT

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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#### **Addendum IV**

##### *Compensation*

The Government, in consideration of the satisfactory performance of the services described in Addendum I (Scope of Work), agrees to make progress payments based on the Schedule of Values and invoices submitted by the Contractor **[Insert Contractor's Name or Company Name]** in accordance with Clause 7 (Payments to Contractor) of the General Provisions.

The parties agree that the sum to be paid under this contract is **[Insert Contract price in words] [(Insert Contract price in numbers)]**. The parties further agree that payments will be made in accordance with services rendered.

The final payment is subject to the inspection and acceptance of the project by the Government, the submission of all pertinent warranties, and the Release of Claims. Contractor shall submit a Waiver of Liens or Affidavits of subcontractors who have released the contractor of its obligations. Contractor shall also submit Consent of Surety before final payment and, upon the Government's request, any other documentation the Government deems necessary.

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Contractor's Initials\_\_\_\_\_

# **DIVISION 1 – GENERAL REQUIREMENTS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **SECTION 01000 - SUMMARY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I -GENERAL**

#### **1.1 PROJECT**

A. Project Name:

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES, VEHICLE TESTING FACILITY, 18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

B. Owner's Name:

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

C. Plan Designer's Name:

Department of Public Works

D. The complete Project consists of the replacement of the Vehicle Testing Facility on St. John. This work shall include: demolition and construction of walls, floors, ceilings, electrical system, painting, and miscellaneous items as shown in the construction drawings prepared by the Department of Public Works.

#### **1.2 SALVAGE BY OWNER BEFORE START OF WORK**

1. N/A

#### **1.3 SALVAGE BY CONTRACTOR**

A. Contractor shall remove and store the following, for later reinstallation by Contractor, prior to start of work:

2. N. A.

#### **1.4 WORK BY OTHERS**

A. N.A.

#### **1.5 OWNER FURNISHED PRODUCTS**

A. Products furnished by Owner include the following categories:

1. OFCI:

Owner furnished Contractor installed.

2. OFCR:

Owner furnished Contractor rough-in:

3. OFOI:

Owner furnished Owner Installed.

## **SECTION 01000 - SUMMARY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**B. Owner Responsibilities for products in the following category:**

OFCI

1. Arrange installation inspections required by regulatory agencies having jurisdiction.

**C. Contractor's Responsibilities (for all categories unless otherwise noted): OFCR;**

1. Coordinate installation of Owner furnished products with other portions of the Work.
2. Designate submittal and delivery date for each product affecting construction schedule.
3. Review submittals of Owner furnished products and verify rough-in requirements prior to installation for products in the following categories:

a. OFCI

b. OFCR

Notify Owner's Representative of discrepancies that would affect installation and rough-ins.

4. Promptly inspect products jointly with the Owner, record shortages, damaged or defective products listed in the following categories:

a. OFCI

5. Protect products from damage after installation.

a. The sink and the cabinetry in the Break Room are to remain.

6. Assemble, install connect, adjust, test and calibrate, and finish products listed in the following category:

a. OFCI.

7. Provide mechanical, plumbing and electrical connections to Contractor installed products including installation of service fixtures for products listed in the following categories:

a. OFCR

b. OFCI.

8. Afford Owner's forces a reasonable opportunity for delivery and storage of their products and the execution of their work. Where required, Construction Manager shall properly connect his work to that installed by the Owner's forces.

9. Repair or replace items damaged by Construction Manager.

10. Receive and unload products at the site for products listed in the following categories:

a. OFCI

b. OFCR.

## **SECTION 01000 - SUMMARY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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11. Handle products at the site, including uncrating and storage for products listed in the following categories:

a. OFCI

b. OFCR.

### **1.6 CONTRACTOR FURNISHED PRODUCTS**

A. Products furnished by Contractor consist of products listed in the following category:

12. CFCI.

B. Contractor's responsibilities:

1. As indicated in the Construction Documents.

### **1.7 OWNER OCCUPANCY**

A. Owner intends to occupy the Project by the date stated in the Agreement as the contract completion date.

B. Cooperate with Adjacent Property Owners to minimize conflict and to facilitate the adjacent Land Owner's operations with the least amount of inconvenience.

C. Contractor shall take precautions to avoid excessive noise or vibration that would disturb Adjacent Property owners' operations. When directed by Owner, Contractor shall perform certain operations at designated time of day or night in order to minimize disturbance to Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

### **1.8 CONTRACTOR USE OF SITE AND PREMISES**

A. Construction Operations are limited to areas permitted by Law, Ordinances, Permits and Contract Documents.

B. Arrange use of site and premises to allow:

2. Owner occupancy and operation.

3. Use of adjacent sites by the public.

C. Do not unreasonably encumber site or premises with materials or equipment.

D. Limit use of site and premises for Work and storage as follows:

1. Maintain Owner and public access to existing building, parking, drives and walks at all times.

2. Restrict work and storage to construction areas indicated on Drawings.

## **SECTION 01000 - SUMMARY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Existing parking areas may not be used for storage.
  4. Access site only as indicated on the Drawings.
  5. Restrict parking to areas designated by the Owner.
  6. Do not perform operations that would disrupt or delay Owner's daily operations.
  7. Restrict construction personnel from access to other areas of the site and existing building, except as required to perform new and alterations work.
- E. Assume full responsibility for protection and safekeeping of products stored on premises.
- F. Relocate stored products which interfere with operations of Owner.
- G. Do not load structure with weight that will endanger structure.
- H. Emergency Building/Site Exits during Construction:
1. Keep all existing site exits open during construction period.
  2. Provide barricade and signage in accordance with all requirements of the local building authorities during construction.
- I. Utility Outages and Shutdown:  
To be scheduled with the Owner's representative prior to implementing.

### **1.9 WORK SEQUENCE**

- A. Coordinate construction schedule and operations with Owner.

### **1.10 BID SCHEDULE**

- A. The Contract Scope is a Unit Price offer to include the entire Scope Of Work described in the Contract Documents. The Contractor shall complete the Bid Schedule included in the Contract Documents and submit it with their bid. The Bid Schedule is representative of a breakdown of major scope items. Items shown in the Contract Documents, but not specifically shown in the Bid Schedule are also included in the Contract Cost.

## **PART II -PRODUCTS- NOT USED**

## **PART III -EXECUTION- NOT USED**

**END OF SECTION**



# **SECTION 01039-COORDINATION AND MEETINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I - - GENERAL**

### **1.1 SECTION INCLUDES**

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meeting.
- F. Pre-installation meetings.
- G. Equipment electrical characteristics and components.
- H. Examination.
- I. Preparation.
- J. Cutting and Patching.
- K. Alteration project procedures.

### **1.2 RELATED SECTIONS (NOT USED)**

### **1.3 COORDINATION AND PROJECT CONDITIONS**

- A. Coordinate scheduling, submittals, and Work of the various sections of the Specifications to ensure an efficient and orderly sequence of construction elements.
- B. Verify all existing utility locations.

### **1.4 FIELD ENGINEERING**

- A. Contractor shall locate and protect all survey control and reference points, and shall accurately replace and have verified by the Engineer any such point, which is damaged or moved, at his own expense.
- B. Control datum for survey is as that shown on Drawings. The survey shall establish certain reference points and benchmarks in the immediate vicinity of the work areas. The Contractor shall lay out all additional lines and grades and otherwise do all layout and measurements necessary for the proper completion of the work.
- C. Verify setbacks and easements; confirm drawings dimensions and elevations.
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

## **SECTION 01039-COORDINATION AND MEETINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- E. The Contractor shall furnish assistance to the Engineer as requested to check the layout or otherwise control the work. Such assistance shall be understood to include the provision of suitable manpower to assist the Engineer in taping measurements, holding a survey rod for checking grades and the like.
- F. The Engineer reserves the right to inspect or check any of this work, and the Contractor shall not claim added compensation for any delay occasioned by required as a result of the Engineer's inspections.

### **1.5 PRECONSTRUCTION MEETING**

- A. Owner will schedule a meeting after Notice of Award.
- B. Attendance Required:  
Owner, Owner's Construction Representative, Designer, and Contractor.
- C. Agenda:
  - 1. Submission of list of testing agency and other parties providing services on the project.
  - 2. Procedures and processing of field decisions, submittals, and substitutions, applications for payments, pricing request, Change Orders, and Contract closeout procedures.
  - 3. Procedures for layout of the project, establishing controls, limits of right-of-way and easements.
  - 4. Scheduling.
- D. Contractor will record minutes and distribute copies to participants and those affected by decisions made.

### **1.6 SITE MOBILIZATION MEETING**

- A. Owner's Representative may schedule a meeting at the project site prior to construction start-up.
- B. Attendance Required:  
Owner's Representative/Engineer, Contractor's Superintendent, and major Subcontractors.
- C. Agenda:
  - 1. Use of the site by Owner and Contractor.
  - 2. Owner's requirements. Features to remain.
  - 3. Construction facilities provided by Contractor.
  - 4. Temporary utilities provided by Contractor.
  - 5. Security and housekeeping procedures.
  - 6. Schedules.

## **SECTION 01039-COORDINATION AND MEETINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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7. Application for payment procedures.
  8. Procedures for testing.
  9. Procedures for maintaining record documents.
- D. Contractor will record minutes and distribute copies to participants and those affected by decisions made.

### **1.7 PROGRESS MEETINGS**

- A. Schedule and administer meetings throughout the progress of the Work at weekly intervals or intervals agreed to by Owner's Representative and Contractor.
- B. Owner's Representative will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.
- C. Attendance Required:  
Job superintendent, major Subcontractors suppliers, and Owner's Representative as appropriate to agenda topics for each meeting.
- D. Agenda:
  1. Review minutes of previous meetings.
  2. Review of Work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems which impede planned progress.
  5. Review of submittals schedule and status of submittals.
  6. Review of off-site fabrication and delivery schedules.
  7. Maintenance of progress schedule.
  8. Corrective measures to regain projected schedule.
  9. Planned progress during succeeding work period.
  10. Coordination of projected progress.
  11. Maintenance of quality and work standards.
  12. Effect of proposed changes on progress schedule and coordination.
  13. Other business relating to Work.
- E. Owner's Representative will record minutes and distribute copies to participants and those affected by decisions made.

## **SECTION 01039-COORDINATION AND MEETINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART II -- PRODUCTS (NOT USED)**

**PART III -- EXECUTION (NOT USED)**

**END OF SECTION**

# **SECTION 01045-CUTTING AND PATCHING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I – GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division- 1 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. This Section specifies administrative and procedural requirements for cutting and patching.
- B. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
  - 1. Requirements of this Section apply to mechanical and electrical installations. Refer to Division- 23 and Division-26 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.
  - 2. Demolition of selected portions of the building for alterations is included in Section "Selective Demolition."

### **1.3 SUBMITTALS**

- A. Cutting and Patching Proposal:

Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:

  - 3. Describe the extent of cutting and patching required and how it is to be performed indicate why it cannot be avoided.
  - 4. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
  - 5. List products to be used and firms or entities that will perform Work.
  - 6. Indicate dates when cutting and patching is to be performed.
  - 7. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
  - 8. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.

## **SECTION 01045-CUTTING AND PATCHING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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9. Approval by the Owner/Owner's Representative to proceed with cutting and patching does not waive the Owner/Owner's Representative's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

### **1.4 QUALITY ASSURANCE**

#### **A. Requirements for Structural Work:**

Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

1. Obtain approval of the cutting and patching pricing proposal before cutting and patching the following structural elements:
  - a. Foundation construction
  - b. Bearing and retaining walls
  - c. Structural concrete
  - d. Structural steel
  - e. Lintels
  - f. Timber and primary wood framing
  - g. Miscellaneous structural metals
  - h. Exterior curtain wall construction

#### **B. Operational and Safety Limitations:**

Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

1. Obtain approval of the cutting and patching pricing proposal before cutting and patching the following operating elements or safety related systems:
  - a. Shoring, bracing, and sheeting.
  - b. Water, moisture, or vapor barriers.
  - c. Membranes and flashings.
  - d. Electrical wiring systems.

#### **C. Visual Requirements:**

## **SECTION 01045-CUTTING AND PATCHING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Owner's Representative's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. If possible retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:

- a. Processed concrete finishes
- b. Stonework and stone masonry
- c. Ornamental metal

## **PART II -- PRODUCTS**

### **2.1 MATERIALS**

- A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

## **PART III -- EXECUTION**

### **3.1 INSPECTION**

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
  - 1. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

### **3.2 PREPARATION**

- A. Temporary Support:
  - Provide temporary support of Work to be cut.
- B. Protection:
  - Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

## **SECTION 01045-CUTTING AND PATCHING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

### **3.3 PERFORMANCE**

#### **A. General:**

Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

- 2. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

#### **B. Cutting:**

Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.

- 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
- 3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
- 4. Comply with requirements of applicable Sections of Division- 2 where cutting and patching requires excavating and backfilling.
- 5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

#### **C. Patching:**

Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

- 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
- 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.



## **SECTION 01045-CUTTING AND PATCHING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **3.4 CLEANING**

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

**END OF SECTION**

**SECTION 01095 – REFERENCE STANDARDS AND DEFINITIONS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART I – GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division I Specification Sections, apply to this Section.

**1.2 DEFINITIONS**

- A. General:  
Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated:  
The term indicated refers to graphic representations, notes, or schedules on Drawings, or other Paragraphs of Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.
- C. Directed:  
Terms such as directed, requested, authorized, selected, approved, required and permitted mean directed by the Owner's Representative, requested by the Owner's Representative, and similar phrases.
- D. Approved:  
The term approved, when used in conjunction with the Owner's Representative's action on the Contractor's submittals, applications, and requests, is limited to the Owner's Representative's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulations:  
The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish:  
The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install:  
The term describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, and finishing, curing, protecting, cleaning, and similar operations.
- H. Provide:  
The term provide means to furnish and install, complete and ready for the intended use.
- I. Installer:

## **SECTION 01095 – REFERENCE STANDARDS AND DEFINITIONS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

**J. Trades:**

Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

**K. Project site:**

The space available to the Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

**L. Testing Agencies:**

A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, or to reports on and, if required, to interpret results of those inspections or tests.

**M. Owner's Representative:**

Agent authorized to act on behalf of the Owner.

### **1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION**

**A. Specification Format:**

These Specifications are organized into Divisions and Sections based on the Construction Specification Institute's 50 - Division Format and MASTER FORMAT numbering system.

**B. Specification Content:**

This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

**1. Abbreviated Language:**

Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicate.

## **SECTION 01095 – REFERENCE STANDARDS AND DEFINITIONS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subject language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by other means when so noted.

a. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.

### **1.4 INDUSTRY STANDARDS**

#### **A. Applicability of Standards:**

Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

#### **B. Publication Dates:**

Comply with the standards in effect as of the date of the Contract Documents.

#### **C. Conflicting Requirements:**

Where compliance with two or more standard is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Owner's Representative for a decision before proceeding.

#### **3. Minimum Quantity or Quality Levels:**

The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Owner's Representative for a decision before proceeding.

#### **D. Copies of Standards:**

Each entity engaged in construction on the project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

#### **E. Abbreviations and Names:**

Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the Text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

## **SECTION 01095 – REFERENCE STANDARDS AND DEFINITIONS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **1.5 SUBMITTALS**

#### **A. Permits, Licenses, and Certificates:**

For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

### **PART II -- PRODUCTS (NOT APPLICABLE)**

### **PART III -- EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

## **SECTION 01200 – PRICE AND PAYMENT PROCEDURES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I – GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Procedures for preparation and submittal of application for final payment.

#### **1.2 RELATED SECTIONS: N/A**

#### **1.3 SCHEDULE OF VALUES**

- A. Submit a printed schedule on AIA Form G703 -Application and Certificate for Payment Continuation Sheet.
- B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
- C. Format:  
Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization, bonds, and insurance, and site demobilization.
- D. Revise schedule to list approved Change Orders, with each Application for Payment.

#### **1.4 APPLICATIONS FOR PROGRESS PAYMENT**

- A. Payment Period:  
Submit at intervals stipulated in the Agreement.
- B. Present required information as typewritten/computer-generated form.
- C. Form:  
AIA G702 Application and Certificate for Payment and AIA G703 -Continuation Sheet including continuation sheets when required.
- D. D. For each item, provide a column for listing each of the following:
  - 1. Item Number
  - 2. Description of Work
  - 3. Scheduled Values
  - 4. Previous Applications
  - 5. Work in Place and Stored Materials under this Application

## **SECTION 01200 – PRICE AND PAYMENT PROCEDURES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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6. Total Completed and Stored to Date of Application
  7. Percentage of Completion
  8. Balance to Finish
  9. Retainage
- E. Execute certification by signature of authorized officer.
- F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
- G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original time of Work.
- H. Submit two copies of each Application for Payment.
- I. Include the following with the application:
1. Transmittal Letter as specified for Submittals in Section 01300.
  2. Construction progress schedule, revised and current as specified in Section 01300.
  3. Current construction photographs specified in Section 01300.
  4. Partial release of liens from major Subcontractors and Vendors.
  5. Affidavits attesting to off-site stored products.
- J. When Owner's Representative requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

### **1.5 MODIFICATION PROCEDURES**

- A. Owner's Representative will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.
- B. Construction Change Directive:  
Owner's Representative may issue a document, signed by Owner, instructing Construction Manager to proceed with a change in the Work, for subsequent inclusion in a Change Order.
6. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.
  7. Promptly execute the change in Work.

## **SECTION 01200 – PRICE AND PAYMENT PROCEDURES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **C. Pricing Request:**

Owner's Representative may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid.

Construction Manager shall prepare and submit a fixed price quotation within 15 days.

### **D. Computation of Change in Contract Amount:**

1. For change requested by Owner's Representative for work falling under a fixed price contract, the amount will be based on Construction Manager's price quotation.
2. For change requested by Construction Manager, the amount will be based on the Construction Manager's request for a Change Order as approved by Owner.
3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
4. For change ordered by Owner's Representative without a quotation from the Construction Manager, the amount will be determined by Owner's Representative based on the Construction Manager's substantiation of costs as specified for Time and Material Work.

### **E. Substantiation of Costs:**

Provide full information required for evaluation.

#### **1. Provide the following data:**

- a. Quantities of products, labor, and equipment
- b. Taxes, insurance, and bonds
- c. Overhead and profit
- d. Justification for any change in Contract Time
- e. Credit for deletions from Contract, similarly documented

#### **2. Support each claim for additional costs with additional information:**

- a. Origin and date of claim
- b. Dates and times work was performed, and by whom
- c. Time records and wage rates paid
- d. Invoices and receipts for products, equipment, and subcontracts, similarly documented

#### **3. For Time and Material Work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.**



## **SECTION 01200 – PRICE AND PAYMENT PROCEDURES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**F. Execution of Change Orders:**

Owner's Representatives will issue Change Orders for signatures of parties as provided in the Conditions of the Contract on AIA G701.

**G. After execution of Change Order, promptly revise Schedules of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.**

**H. Promptly revise Progress Schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.**

### **1.6 APPLICATION FOR FINAL PAYMENT**

**A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.**

**B. Application for Final Payment will not be considered until the following have been accomplished:**

4. All closeout procedures specified in Section 01700

### **PART II -- PRODUCTS- NOT USED**

### **PART III -- EXECUTION- NOT USED**

**END OF SECTION**

## **SECTION 01300 – SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I – GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Project coordination
- B. Preconstruction meeting
- C. Progress meetings
- D. Progress photographs

#### **1.2 RELATED SECTIONS**

- A. Section 01700-Execution Requirements:  
Additional coordination requirements.
- B. Section 01780-Closeout Submittals:  
Project record documents.

#### **1.3 PROJECT COORDINATION**

- A. Contractor:  
The Contractor shall be responsible for overall project coordination between subcontractors and trade contractors.
- B. Cooperate with the Contractor in allocation of mobilization areas of site; for field offices and storage, for personnel access, traffic, and parking facilities.
- C. During construction, coordinate use of site and facilities through the Contractor.
- D. Comply with Contractor procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts. Particular attention should be given to the Contractor's subcontractor safety policy.
- E. Comply with instructions of the Contractor for use of temporary utilities and construction facilities.
- F. Coordinate field engineering and layout work under instructions of the Contractor.
- G. The Contractor to make the following types of submittals to Owner's Representative:
  - 1. Requests for Interpretation
  - 2. Requests for Substitution
  - 3. Shop Drawings, Product Data, and Samples
  - 4. Test and Inspection Reports

## **SECTION 01300 – SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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5. Manufacturer's Instructions and Field Reports
6. Applications for Payment and Change Order requests
7. Progress Schedules
8. Coordination of Drawings
9. Closeout Submittals

## **PART II -- PRODUCTS (NOT USED)**

## **PART III - – EXECUTION**

### **3.1 PRECONSTRUCTION MEETING**

A. Contractor will schedule a meeting after Notice of Award and prior to mobilization.

B. Attendance Required:

1. Owner:  
Owner's Representative and invited Consultants
2. Contractor:  
Project Manager and Job Superintendent
3. Major Sub-contractors as requested by the Owner and Contractor.

C. Minimum Agenda:

1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Submission of progress schedule.
4. Procedures and processing of field decisions, submittals and substitutions, applications for payments, pricing requests, Change Orders, and Contract closeout procedures.
5. Use of premises by Owner and Contractor.
6. Construction facilities and controls provided by Owner.
7. Temporary utilities provided by Owner.
8. Survey and construction layout.
9. Security and housekeeping procedures.
10. Schedules.
11. Application for payment procedures.

## **SECTION 01300 – SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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12. Procedures for testing.
13. Procedures for maintaining record documents.
14. Scheduling.
15. Scheduling activities of Material Testing.

- D.** Contractor shall record minutes and distribute copies within five days after meeting to participants, with one copy to Owner's Representative, Owner, participants, and those affected by decisions made.

### **3.2 PROGRESS MEETINGS**

- A.** Contractor shall schedule and administer meetings throughout the progress of the Work at maximum bi-monthly intervals. A representative from each major trade contractor shall be required to attend these meetings, as requested by the Owner's Representative.
- B.** The Contractor shall make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

**C.** Attendance Required:

16. Contractor, Project Manager and Job Superintendent.
17. Owner's Representative.
18. Engineer/Architect.
19. Major Sub-contractors as appropriate to agenda topics for each meeting.

**D.** Minimum Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.

## **SECTION 01300 – SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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11. Other business relating to Work.

- E. Contractor shall record minutes and distribute copies within five days after meeting to participants, with one copy to Owner's Representative, Owner, participants, and those affected by decisions made.

### **3.3 PROGRESS PHOTOGRAPHS**

- A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Owner's Representative.

- B. Take photographs on date for each application for a payment and as follows:

1. Completed demolition and Site clearing.
2. Excavations.
3. Foundations.
4. Utility Installation – depth, alignment, stub-outs
5. Final completion.

- C. Views:

1. Provide non-aerial photographs from three cardinal views at each specified time, until Date of Substantial Completion.
2. Consult with Owner's Representative for instructions on views required.
3. Provide factual presentation.
4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

- D. Each Photo:

Full color, jpeg format

1. Provide 3 sets on separate USB sticks

Size:

5 MB file

2. Identify each photo on file name. Identify name of Project, contract number, phase, date and orientation of view.

- E. Deliver USB sticks with Application for Payment and transmittal letter specified in this Section.

**END OF SECTION**

**SECTION 01325 – CONSTRUCTION PROGRESS SCHEDULE**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART I - GENERAL**

**1.1 SECTION INCLUDES**

- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

**1.2 RELATED SECTIONS (NOT APPLICABLE)**

**1.3 SUBMITTALS**

- A. Within 10 days after date established in Notice To Proceed, submit preliminary schedule defining planned operations for the first 30 days of Work, with a general outline for remainder of Work, in Microsoft Project format on a USB stick.
- B. If preliminary schedule requires revision after review, submit by email in the Microsoft Project format a revised schedule within 10 days.
- C. Within 30 days after review of preliminary schedule, submit draft of proposed complete schedule by email in the Microsoft Project format for review.
- D. Within 10 days after joint review, submit complete schedule by email in the Microsoft Project format.
- E. Submit updated paper schedule with each Application for Payment.
- F. Submit the number of opaque reproductions that the Contractor requires, plus four copies which will be retained by the Owner's Representative.
- G. Submit under transmittal letter form specified in Section 01300.

**1.4 QUALITY ASSURANCE**

- A. Scheduler:  
Contractor's personnel specialist Consultant specializing in CPM scheduling with two years minimum experience in scheduling construction work of a complexities comparable to this Project, and having use of computer facilities capable of delivering by email a detailed graphic schedule in Microsoft Project format within 48 hours of request.

**1.5 SCHEDULE FORMAT**

- A. Listings:  
In chronological order according to the start date for each activity. Identify each activity with the applicable Specification Section number.
- B. Hard Copy Sheet Size:  
Multiples of 8-1/2 x 11 inches.

**SECTION 01325 – CONSTRUCTION PROGRESS SCHEDULE**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- C. Scale and Spacing:  
To allow for notations and revisions.

- D. Software Format:  
Microsoft Project

**PART II - PRODUCTS (NOT USED)**

**PART III - EXECUTION**

**3.1 PRELIMINARY SCHEDULE**

- A. Prepare preliminary schedule in the form of a horizontal bar chart.

**3.2 CONTENT**

- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by Specification Section number.
- C. Identify Work of separate stages and other logically grouped activities.
- D. Provide separate schedule of submittal dates for shop drawings, product data, and dates reviewed submittals will be required from the Owner's Representative. Indicate decision dates for selection of finishes.
- E. Provide legend for symbols and abbreviations used.

**3.3 BAR CHARTS**

- A. Include a separate bar for each major portion of Work or operation.

**3.4 REVIEW AND EVALUATION OF SCHEDULE**

- A. Participate in joint review and evaluation of schedule with Owner's Representative at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

**3.5 UPDATING SCHEDULE**

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Annotate diagrams to graphically depict current status of Work.
- D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

**SECTION 01325 – CONSTRUCTION PROGRESS SCHEDULE**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

E. Indicate changes required to maintain Date of Substantial Completion.

**3.6 DISTRIBUTION OF SCHEDULE**

- A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, Suppliers, Engineer/Architect, Owner's Representative, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

**END OF SECTION**



## **SECTION 01400 – QUALITY CONTROL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **PART I – GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Quality assurance- control of installation
- B. Tolerances
- C. References and standards
- D. Mock-up
- E. Inspecting and testing laboratory services
- F. Manufacturers' field services

#### **1.2 RELATED SECTIONS**

- A. Section 01000 General Specifications:  
Contractor's Shop and Working Drawings.

#### **1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Owner's Representative/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration physical distortion, or disfigurement.

#### **1.4 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances conflict with Contract Documents, request clarification from Owner's Representative/Engineer before proceeding.

## **SECTION 01400 – QUALITY CONTROL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- C. Adjust Products to appropriate dimensions; position before securing Products in place.

### **1.5 REFERENCES AND STANDARDS**

- A. For Products or workmanship specified by association, trade, or other consensus standards, complies with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C. Obtain copies of standards where required by product Specification Sections.
- D. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract, nor those of the Owner's Representative/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

### **1.6 MOCK UP (NOT USED)**

### **1.7 INSPECTION AND TESTING LABORATORY SERVICES**

- A. Owner may appoint, employ, and pay for specified services of an independent firm to perform construction testing services.
- B. The independent firm will perform testing and other services specified in individual sections and as required by the Owner.
- C. Testing reports will be submitted by the independent firm to the Owner indicating services and indicating compliance or non-compliance with the Contract Documents.
- D. Cooperate with independent firm; furnish safe access and assistance by incidental labor as requested.
  - 1. Notify Owner's Representative and/or independent firm 48 hours prior to expected time for operations requiring services. These operations include, but are not necessarily limited to:
    - a. Cast-in-place concrete placement.
    - b. Bituminous pavement construction.

### **1.8 INSPECTION SERVICES**

- A. Owner may appoint, employ, and pay for specified services of an independent firm to perform observation.
- B. The independent firm will perform observations and other services specified in individual Specification Sections and as required by the Owner.
- C. Reports will be submitted by the independent firm to the Owner, in duplicate, indicating observations and indicating compliance or non-compliance with Contract Documents.
- D. Cooperate with independent firm; furnish safe access and assistance by incidental labor as requested.

## **SECTION 01400 – QUALITY CONTROL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. Notify Owner's Representative and /or independent firm 48 hours prior to expected time for operations requiring services.

E. Observations do not relieve Contractor to perform Work to the contract requirements.

### **1.9 MANUFACTURERS' FIELD SERVICES**

- A. When specified in individual Specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Owner 30 days in advance of required observations. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

## **PART II -- PRODUCTS (NOT USED)**

## **PART III -- EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

### **3.2 PREPARATION**

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

**END OF SECTION**

## **PART I – GENERAL**

### **1.1 REQUIREMENTS INCLUDED**

- A. Products
- B. Transportation and Handling
- C. Storage and Protection
- D. Product Options
- E. Products List
- F. Substitutions

### **1.2 RELATED REQUIREMENTS**

- A. Section 01400- Quality Control:  
Submittal of manufacturer's data
- B. Section 01700- Contract Closeout:  
Operation and maintenance data

## **PART II -- PRODUCTS**

### **2.1 GENERAL**

- A. Products include the material, equipment, and systems used on this Project.
- B. Comply with the Specifications and referenced standards as minimum requirements.
- C. Components required to be supplied in quantity within a Specification Section shall be the same, and shall be interchangeable.

### **2.2 TRANSPORTATION AND HANDLING**

- A. Transport products by methods that will avoid product damage and deliver them in undamaged condition in the manufacturer's unopened containers or packaging.
- B. Provide equipment and personnel to handle unloading and storage of the products by methods to prevent soiling or damage.
- C. Promptly inspect the shipments to assure that the products comply with requirements, the quantities are correct, and the products are undamaged.

### **2.3 STORAGE AND PROTECTION**

- A. Store products in accordance with the manufacturer's instructions, with intact and legible seals and labels.

**SECTION 01600 – MATERIAL AND EQUIPMENT HANDLING**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover the products subject to deterioration with an impervious sheet covering; provide ventilation to avoid condensation.
- C. Store loose granular materials on solid surfaces in a well-drained area. Prevent mixing of the materials with foreign matter.
- D. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.

## **2.4 PRODUCT OPTIONS**

- A. Products specified by Reference Standards or by Description Only: Furnish any product meeting those standards.
- B. Products specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named.
- C. Products specified by Naming Several Manufacturers.
- D. Products of named manufacturers meeting Specifications: No options, no substitutions will be allowed.

## **2.5 PRODUCTS LIST**

- A. Within 15 days after the date of Owner-Contractor Agreement, submit a complete list of major proposed for use, with name of the manufacturer, trade name, and model number of each product.

## **2.6 SUBSTITUTIONS**

- A. Only within 15 days after date of the Agreement will the Owner's Representative/Engineer consider requests from the Contractor for substitutions. Subsequently, substitutions will be considered only when a product becomes unavailable due to no fault of the Contractor.
- B. Document each request with complete data substantiating the compliance of the proposed substitution with the Contractor Documents.
- C. The request constitutes a representation that the Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds, in all respects, the specified product.
  - 2. Will provide the same warranty for substitution as for the specified product.
  - 3. Will coordinate installation and make other changes which may be required for the Work to be complete in all respects.
  - 4. Waives claims for additional cost which may subsequently become apparent.

**SECTION 01600 – MATERIAL AND EQUIPMENT HANDLING**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- 5. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require substantial revision of the Contract Documents.
- D. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals without separate written request, or when acceptance will require substantial revision of the Contract Documents.
- E. The Owner's Representative/Engineer will determine acceptability of the proposed substitution, and will notify the Contractor of acceptance or rejection in writing within a reasonable time.
- F. Only one request for the substitution will be considered for each product. When substitution is not accepted, provide the specified product.

**2.7 SYSTEM DEMONSTRATION**

- A. Prior to the final inspection, demonstrate operation of the entire system to the Owner.

**PART III -- EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01620 – TRANSPORTATION AND HANDLING**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART I – GENERAL**

- A. The Contractor shall provide transportation of all equipment, materials and products furnished under these Contract Documents to the site of the Work. In addition, the Contractor shall provide preparation for shipment and storage, unloading, handling and re-handling, short-term storage, extended storage, storage facilities, maintenance and protection during storage, preparation for installation, and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the Work.

**PART II -- TRANSPORTATION**

- A. All equipment shall be suitably boxed, crafted, or otherwise protected during transportation.

**PART III -- HANDLING**

- A. All materials, and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation. All equipment, materials, and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Authority prior to being incorporated into the Work.
- B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Spreader bars or lifting beams shall be used when the distances between lifting points exceeds that permitted by standard industry practice. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.
- C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground. Tossing of pipes and pipe fittings and accessories is an unacceptable practice. Items tossed shall be inspected by the Owner's Representative/Engineer and/or Architect. If the Owner's Representative determines that the product has been comprised, Contractor shall replace product at no additional cost to Owner.
- D. Items such as non-metallic pipe, non-metallic conduit, flagpoles, and lighting poles shall be handled using non-metallic slings or straps. Under no circumstance shall chains or steel cables be used to transport or handle non-metallic products.

**END OF SECTION**

## **SECTION 01630 – STORAGE AND PROTECTION**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I – GENERAL**

- A. Equipment shall be received, inspected, unloaded, handled, stored, maintained, and protected by the Contractor in a suitable location on or off site, if necessary, until such time as installation is required.
- B. Storage and protection of Contractor-furnished equipment shall be strict conformance with the requirements of the Section entitled "General Equipment Stipulations" of these Specifications.

### **PART II -- STORAGE**

- A. The Contractor shall be responsible for providing satisfactory storage facilities that are acceptable to the Owner's Representative/Engineer. In the event that satisfactory facilities cannot be provided on site, satisfactory warehouse, acceptable to the Owner's Representative/Engineer, will be provided by the Contractor for such time until the materials and products can be accommodated at the site.
- B. Materials, and products that are stored in a satisfactory warehouse acceptable to the Owner's Representative/Engineer will be eligible for progress payments as though they had been delivered to the job site.
- C. The Contractor shall be responsible for the maintenance and protection of all equipment, materials, and products placed in storage and shall bear all costs of storage, preparation for transportation, transportation, re-handling, and preparation for installation.
- D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.
- E. Unless otherwise permitted in writing by the Owner's Representative/Engineer, building products such as rough lumber, plywood, concrete block, and structural tile may be stored outdoors under a properly secured waterproof covering.
- F. Tarpaulins and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarpaulins and covers shall be arranged to prevent ponding of water.
- G. PVC pipe, if stored outside, shall be suitably protected from sunlight (UV) by covering with a tarp or exterior paint. Such covering shall be completed and continual.

### **PART III -- EXTENDED STORAGE (NOT USED)**

**END OF SECTION**



## **PART I – GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division - 1 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
  - 1. Inspection procedures.
  - 2. Project record document submittal
  - 3. Operating and maintenance manual submittal.
  - 4. Submittal of warranties.
  - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16, including all Mechanical, Electrical and Plumbing Specifications.

### **1.3 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures:

Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
- 6. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
  - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
- 7. Advise Owner of pending insurance change-over requirements.
- 8. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- 9. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include permits and similar releases.
- 10. Deliver tools, extra stock, and similar items.

## **SECTION 01700 – CONTRACT CLOSEOUT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **B. Inspection Procedures:**

On receipt of a request for inspection, the Owner will either proceed with inspection or advise the Contractor of unfilled requirements. The Owner will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Owner will repeat inspection when requested and assured that the Work has been substantially completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

## **1.4 FINAL ACCEPTANCE**

### **A. Preliminary Procedures:**

Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

3. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
4. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
5. Submit a certified copy of the Owner's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Owner's Representative.
6. Submit consent of surety to final payment.
7. Submit a final liquidated damages settlement statement.
8. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

### **B. Re-inspection Procedure:**

The Owner will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Owner's Representative.

1. Upon completion of re-inspection, the Owner's Representative will prepare a certificate of final acceptance, or notify the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, re-inspection will be repeated.

## **1.5 RECORD DOCUMENT SUBMITTALS**

### **A. General:**

## **SECTION 01700 – CONTRACT CLOSEOUT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Owner's reference during normal working hours.

### **B. Record Drawings:**

Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

3. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
4. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
5. Note related Change Order numbers where applicable.
6. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

### **C. Record Specifications:**

Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.

1. Upon completion of the Work, submit record Specifications to the Owner's Representative for the Owner's records.

### **D. Record Product Data:**

Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the Work which cannot otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.

1. Upon completion of mark-up, submit complete set of record Product Data to the Owner's Representative for the Owner's records.

### **E. Record Sample Submitted:**

## **SECTION 01700 – CONTRACT CLOSEOUT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Immediately prior to the date or dates of Substantial Completion, the Contractor will meet at the site with the Owner's Representative and the Owner's personnel to determine which of the submitted Samples that have been maintained during progress of the Work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's Sample storage area.

**F. Miscellaneous Record Submittals:**

Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Owner's Representative for the Owner's records.

## **PART II -- PRODUCTS (NOT USED)**

## **PART III -- EXECUTION**

### **3.1 CLOSEOUT PROCEDURES**

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Record documents
2. Spare parts and materials
3. Tools
4. Cleaning
5. Warranties and bonds

### **3.2 FINAL CLEANING**

**A. General:**

General cleaning during construction is required by the General Conditions and included in Section "Temporary Facilities".

**B. Cleaning:**

Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

6. Complete the following cleaning operations before requesting inspection for Final Acceptance.
  - a. Remove labels that are not permanent labels.
  - b. Clean exposed exterior hard-surfaced finishes to a dust-free condition, free of stains, film and similar foreign substances.

## **SECTION 01700 – CONTRACT CLOSEOUT**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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c. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

**C. Removal of Protection:**

Remove temporary protection and facilities installed for protection of the Work during construction.

**D. Compliance:**

Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

**END OF SECTION**

## **SECTION 01710 – CLEANUP**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I –GENERAL**

- A. During its progress, the Work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.
- B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipe structures, as a result of Work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the Work, and the ditches, channels, drains, pipes, structures, and work, etc., shall upon completion of the Work, be left in a clean and neat condition.
- C. On or before the completion of the Work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organic matter in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- D. Upon completion of the Work, the Contractor shall remove from the sites of the subsurface explorations all of his plant, machinery, tools, equipment, temporary work, and surplus materials; shall, unless otherwise directed or permitted in writing, remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.
- E. The Contractor shall thoroughly clean all materials installed by him and his subcontractors, and on completion of the Work shall deliver it undamaged and in fresh and new-appearing condition.
- F. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his Work, equipment, or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end, the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.
- G. The Contractor shall submit a Waste Plan and secure a Waste permit from the VI Waste Management Authority

**END OF SECTION**

**SECTION 01730 – GUARANTEES AND WARRANTIES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART I – GENERAL**

- A. The Contractor shall warrant all materials, products, and workmanship provided by the Contractor under the Contract for a period of twelve (12) months after the date of final acceptance of the Work by the Owner.
- B. If, during the warranty period: (a) Any materials or products furnished and/or installed by the Contractor are found to be defective in service by reason on the Contractor's faulty process, structural and/or mechanical design or Specifications; or (b) Any materials, or products furnished by the Contractor shall, as soon as possible after receipt of such defective materials or products, or replace such defective materials or products.

**PART II -- START-UP OF OPERABLE COMPONENTS**

- A. Because of the need to maintain operation during construction, it will be necessary to accept operable components of the project at various times prior to the completion and final acceptance of the entire project.
- B. A component of the project, as used herein, shall include all associated structures, paving, piping, etc.
- C. When a component of the project has been completed, checked out, and made ready for operation, the Contractor shall notify the Owner's Representative/Engineer in writing that the component is substantially complete and request an inspection for substantial completion. The Owner will schedule the inspection within ten (10) days of the Contractor's request. If he concurs in the Contractor's statement, the Owner's Representative/Engineer will notify the Contractor in writing that the component is accepted as substantially complete. At the same time, the Owner's Representative/Engineer will submit to the Contractor a list of items that must be completed or corrected before final acceptance can be given.
- D. If a component of the project is needed in order to maintain operation during construction and if it has been accepted as substantially complete, the Contractor shall start up the component when directed by the Owner. Once the component has achieved stable and satisfactory operation (minimum 95 percent availability over a 7- day period), the Contractor shall request beneficial occupancy by the Owner. The Department, if they concur in the Contractor's statement, that stable and satisfactory operation has been achieved, will notify the Contractor in writing within ten (10) days that he is assuming beneficial occupancy of the component.
- E. On the date that the Department assumes beneficial occupancy, the following shall occur:
  - 1. The one-year warranties for the component specified in Part 1-A of this section will begin
  - 2. The Owner will assume responsibility for operating and maintaining the component

**END OF SECTION**

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I – GENERAL**

#### **1.1 RELATED DOCUMENTS:**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### **1.2 SECTION INCLUDES:**

- A. Project Record Document submittal.
- B. Operation and Maintenance manuals.
- C. Warranties, Bonds, Extra Stock, Permits, and Manuals.

#### **1.3 SUBMITTALS:**

- A. Project Record Documents:  
Submit documents to Owner. The following submittal procedure shall occur prior to Final Acceptance.

1. Submit original copy of as-built drawings (Drawings & Specifications) to Owner for review.
2. Compile and organize any drawings or schedules in the Project Manual onto sheets of the same size as the Contract Drawings and into electronic files to submit with other record documents.
3. Contractor will be notified within 15 work days if the submitted documents are acceptable.
4. Should the submittal be unacceptable for any reason, the Contractor shall make requested modifications and resubmit to the Owner. Continue to resubmit as necessary until the submittal is acceptable.
5. Upon acceptance of the submittal, Owners Engineer will, within 30 work days, incorporate the Contractor's as-built drawings into the Owner's Engineer's original Contract Documents.

- B. Warranties, Bonds, Extra Stock, and Permits:

1. Obtain and assemble executed certificates, warranties, bonds, receipts for extra stock, and permits signed by any authorities having jurisdiction. These may be tabbed in the front of the General Operation and Maintenance Manual provided they do not over-fill the binder.
2. Verify that documents are in proper form and contain full information.
3. Include originals of each in operation and maintenance manual, indexed separately on Table of Contents.



## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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4. Co-execute submittals when required.
5. Submittal of warranties, bonds, extra stock and permit manual to match submittal requirements.
6. Provide Table of Contents neatly typed, in complete and orderly sequence. Include complete information for each of the following:
  - a. Product or work item;
  - b. Firm, with name of principal, address, and telephone number;
  - c. Scope;
  - d. Date of beginning of warranty or service and maintenance contract;
  - e. Duration of warranty or service maintenance contract;
  - f. Proper procedure in case of failure;
  - g. Instances which might affect validity of warranty or bond; and
  - h. Contractor, name or responsible principal, address, and telephone number.
7. Make submittals within ten days after Date of Substantial Completion.
8. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

## **PART II -- PRODUCTS**

### **2.1 PROJECT RECORD DOCUMENTS:**

- A. Project Record Documents include the following:
  1. Marked-up copies of Contract Drawings.
  2. Marked-up copies of Project Manuals (Specifications and Detail Book, as applicable), all volumes.
  3. Addenda.
  4. Reviewed and marked-up copies of shop drawings and product data.
  5. Newly prepared drawings.
  6. Change Orders, RFIs and other modifications to the Contract issued in printed form during construction.

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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7. Owner's Representative's Clarifications and Pricing Request with all supporting documentation.
8. Field Authorizations.
9. Record Samples.
10. Field records for variable and concealed conditions.
11. Record information on Work that is recorded only schematically.
12. Manufacturer's instruction for assembly, installation, and adjusting.
13. Other miscellaneous record documents as listed below and applicable.
  - a. Field records on excavations and foundations.
  - b. Field records on underground construction and similar work.
  - c. Survey showing locations and elevations of underground lines.
  - d. Invert elevations of drainage piping.
  - e. Surveys establishing building lines and levels.
  - f. Authorized measurements utilizing unit prices or allowances.
  - g. Records of plant treatment.
  - h. Ambient and substrate condition tests.
  - i. Certifications received in lieu of labels on bulk products.
  - j. Batch mixing and bulk delivery records.
  - k. Testing and qualification of tradesmen.
  - l. Documented qualification of installation firms and/or personnel.
  - m. Load and performance testing.
  - n. Inspections and certifications by governing authorities.
  - o. Leakage and water-penetration tests.
  - p. Final inspection and correction procedures.

### **PART III - -EXECUTION**

#### **3.1 PROJECT RECORD DOCUMENTS:**

##### **A. Maintenance of Documents and Samples:**

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Store and maintain in field office apart from the Contract Documents used for construction, one complete set of record documents and samples which are used to record as-built conditions.
2. Do not use Project Record Documents for construction purposes; protect from deterioration and loss in a secure fire-resistant location. Maintain record documents in good order and in a clean, dry, legible condition.
3. Make record documents and samples available at all times for review by Owner's Representative and the Owner.
4. Record actual revisions to the Work concurrent with construction progress.
5. Ensure entries are complete and accurate, enabling future reference by Owner.
  - a. Following each month Progress Schedule Meeting, Contractor shall meet with all major subcontractors whose work is in progress at the site, including, but not limited to mechanical, plumbing, electrical, security, fire protection, civil, and as otherwise designated, to review all "as-built" revisions on the day-by-day working set of "Project Record Copy" and verify installed record information from the previous month is properly recorded on the day-by-day "Project Record Copy," with all revisions and pertinent information clearly indicated.

### **B. Record Drawings and Shop Drawings:**

A clean, undamaged set of Contract Drawings including coordination drawings and shop drawings shall be kept at the job site as "as-built" record documents. Record "as-built" drawings shall be comprised of all sheets contained in the Contract Drawings, as well as all special equipment or system drawings.

1. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawings that show conditions fully and accurately. Where shop drawings, RFIs or other communication record are used to identify a change, record a cross-reference at the corresponding location on the Contract.
2. Drawings:

Give particular attention to concealed elements that would be difficult to measure and record at a later date. Items required to be marked include, but are not limited to, the following:

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- a. Indicate field changes of dimension and detail.
  - b. RFIs.
  - c. Depths of foundations below the First Floor.
  - d. Horizontal and vertical measurements of underground services and utilities, referenced to the building or other permanent construction.
  - e. Note changes of directions and locations, by dimensions and Elevations, as utilities are actually installed.
  - f. Show measured locations of construction-concealed internal utilities and appurtenances referenced to visible and accessible features of the structure.
  - g. Record accurate locations of piping, valves, and the like.
  - h. Revisions to electrical circuitry.
  - i. Indicate details not on original Contract Drawings.
  - j. "X-out" conditions not constructed and appropriately annotate "note constructed" to convey the actual "as-constructed" condition.
3. Mark record sets in a clear, legible manner, using red ink (no pencils); use other colors to distinguish between variations in separate categories of the work. Use 'whiteout' to erase errors.
  4. Mark new information that is important to the Owner, but which was not shown on the Contract Documents or Shop Drawings.
  5. Show Addenda items, Change Orders, RFI, or other means of communication used in the construction process.
  6. Show and date revisions to drawings with a "cloud" drawn around the revision.
  7. Organize record drawing sheets in manageable sets, bind with durable paper cover sheets, and print suitable titles, dates, and other identification on the cover of each set. Where shop drawings, RFIs, or other communication record is used as a reference, include a copy of it as part of the Record Drawings.
  8. Shop Drawings:
    - a. Maintain as record documents; legibly annotate to record changes made after review.
    - b. Include subcontractor reproducible shop drawings including as a minimum where applicable to the project, and others as deemed appropriate. Record Drawing shop drawings shall be easily reproducible; as appropriate and approved by the Owner.

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **C. Project Manual(s):**

During the construction period, maintain one complete copy of the Project Manual(s), including Specifications, Detail Book(s), addenda, and one copy of other written Construction Documents, such as Change Orders, and RFIs issued in printed form during construction.

1. Legibly mark these documents in red ink to show substantial variations in actual work performed in comparison with the text of the Specification and modifications. Give particular attention to substations, selection of options, and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related Record Drawing information and product data. Record at each product section description of actual products installed, including the following:
  - a. Product substitutions or alternates utilized.
  - b. Changes made by Addenda and modifications.
2. Mark Detail Book schedules, details, etc., to indicate the actual installation where the installation varies from the indicated in the Detail Book and modification issued. Complete information in accordance with paragraph for all detail drawings.
3. Each prime contractor (Subcontractor) is responsible for marking up Sections that contain its own Work.
4. General Contractor shall be responsible for collecting marked-up Sections that contain its own work.
5. General Contractor shall be responsible for submitting the complete set of record Specifications as specified.

### **D. Record Product Data:**

1. Maintain one copy of each data Submittal, and mark-up variations in actual work in comparison with submitted information. Include both variations in product as delivered to the site, and variations from manufacturer's instruction and recommendations for installation.
2. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observation. Note related Change Orders and mark- up of Record Drawings and Project Manuals.
3. Note related Change Orders and mark-up of record Drawings, where applicable.
4. Upon completion of mark-up, submit complete set to Owner's Representative for Owner's records.
5. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as record Product Data.

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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6. Each prime contractor (Subcontractor) shall be responsible for marking up and submitting record Product Data for its own Work.

7. Insofar as possible, insert record product data in individual sub-sections of O&M Manuals. Refer to 3.05 below.

**E. Record Sample Submittal:**

Immediately prior to date(s) of substantial completion, Owner's Engineer will meet with Contractor at site, and will determine which (if any) of submitted samples maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes. Comply with *NE's* instructions for packaging, identification marking, and delivery to Owner's sample storage place.

**F. Miscellaneous Record Submittals:**

Refer to paragraph above for listing of miscellaneous record documents and to other Sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to date of Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Owner for their records.

### **3.2 OPERATION AND MAINTENANCE DATA- GENERAL:**

**A. For Each Product:**

List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies.

**B. Product Data:**

Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

**C. Drawings:**

Supplement product data to illustrate relations of component parts of systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

**D. Typed Text:**

As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### **3.3 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS: (NOT USED)**

### **3.4 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES: (NOT USED)**

### **3.5 OPERATION AND MAINTENANCE MANUALS: (NOT USED)**

### **3.6 WARRANTIES, BONDS, AND PERMIT MANUAL:**

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **A. Project Warranty-General:**

1. If, within one (1) year after the Date of Substantial Completion of the Work, or designated portion thereof, or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor, and where applicable, his subcontractor that portion of the work, shall correct it promptly after receipt of a written notice from the Owner or Owner's Representative to do so. This obligation shall survive Termination of the Contract. The Owner will give such notice promptly after discovery of the condition.
2. Refer to Section 01 78 36 for administrative and procedural requirements for tracking project warranty issues subsequent to date of Substantial Completion.

### **B. Categories of Specific Warranties:**

1. Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories related to individual units of work specified in the technical sections of these specifications.
  - a. Special Project Warranty (Guarantee):
    - i. A warranty specifically written and signed by Contractor for a defined portion of the work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by Contractor.
  - b. Specified Product Warranty:
    - i. A warranty which is required by contract documents, to be provided for a manufactured product incorporated into the work; regardless of whether manufacturer has published warranty without regard for specific incorporation of product into the work, or has written and executed warranty as a direct result of contract document requirements.
  - c. Coincidental Product Warranty:
    - i. A warranty which is not specifically required by contract documents (other than as specified in this section); but which is available on a product incorporated into the work, by virtue of the fact that manufacturer of product has published warranty in connection with purchases and uses of product without regard for specific applications except as otherwise limited by terms of warrantee.
2. Refer to individual sections for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).

### **C. Disclaimer and Limitations:**

## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

**D. General Limitations:**

It is recognized the specific warranties are intended primarily to protect the Owner against failure of the work to perform as required, and against deficient, defective, and faulty materials and workmanship, regardless of sources.

**E. Related Damages and Losses:**

**1. General:**

In connection with Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.

**2. Consequential Damages:**

Except as otherwise indicated or required by governing regulations, Special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract), which occurs as a result of failure of warranted work.

**F. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.**

**G. Reinstatement of Warranty Period:**

Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for the time period starting on the date of acceptance of replaced or restored work and ending upon date original warranty would have expired if there had been no failure, with an equitable adjustment for depreciation.

**H. Replacement Cost, Obligations:**

Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. Contractor shall be responsible for the cost of replacing or restoring defective Work regardless of whether the Owner has benefited from use of the Work through a portion of anticipated useful service life.

**I. Owner's Recourse:**

Expressed warranties made to the Owner are in condition addition to implied warranties and shall not limit the duties, obligations, right, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.



## **SECTION 01780 – CLOSE OUT SUBMITTALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**J. Rejection of Warranties:**

Owner reserves the right, at time of final acceptance or thereafter, to reject coincidental product warranties submitted by the Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of Contract Documents.

**K. Contractor's Procurement Obligations:**

Do not purchase, subcontract for, or allow others to purchase or sub-contract for materials or units of work for project where a special project warranty, specified product warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.

**L. Co-execute warranties when required. Provide originals of each for inclusion in each operation and maintenance manual.**

**M. Retain warranties and bonds until time specified for submittal.**

**END OF SECTION**

**DIVISION 2-EXISTING CONDITIONS**

**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**

**VEHICLE TESTING FACILITY**

**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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## **SECTION 02282 – TERMITE CONTROL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I -GENERAL**

#### **1.1 SUMMARY**

- A. Provide boric acid based wood applied treatment for primary termite control, as herein specified.
- B. Limits of termite treatment are as follows:
  - 1. Boric acid product application will be provided to wood structural components in contact with foundations and application to bath traps, plumbing penetration and certain foundation areas.

#### **1.2 REFERENCES**

- A. General:
  - 1. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. American Wood-Preservers' Association (AWPA); AWPA Standard M4-01: Standard for the Care of Preservative-Treated Wood Products; 2001.
  - 1. Requires that a preservative be applied to any end cut to protect exposed wood not protected by pressure treatment (as in sill plates) to meet international building code requirements.
- C. International Residential Code (IRC) sections that mandate AWPA's *Standard M4* for end cut treatment:
  - 1. Section R319: Protection Against Decay
  - 2. Section R319.1.1 Field Treatment [of End Cuts]
  - 3. Section R320: Protection Against Subterranean Termites
  - 4. Section R320.1.2 Field Treatment [of End Cuts]; 2006.
- D. U.S. Green Building Council:
  - 1. LEED® for Homes Rating System, SS 5: Nontoxic Pest Control; 2008
    - a. Green building program assigns a maximum of two program points for the use of nontoxic pest control methods, including a barrier treatment of all cellulosic building material with a borate product.

#### **1.3 SYSTEM DESCRIPTION**

## **SECTION 02282 – TERMITE CONTROL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **A. Performance Requirements:**

1. Provides structural termite protection when applied according to the applicable sections of the U.S. Environmental Protection Agency registered label.

### **1.4 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

### **1.5 SUBMITTALS**

#### **A. Product Data:**

1. Submit applicable manufacturer's technical data and application.

### **1.6 QUALITY ASSURANCE**

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of structure and application.
- B. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities and trained in the application of boric acid wood applied termiticide treatment solution.

### **1.7 JOB CONDITIONS**

#### **A. Restrictions:**

1. Treatment will be performed when access to all structural wood members and foundations is available. This is normally at the "dried-in" stage of construction when all structural wood and sheathing is in place and prior to installation of drywall, insulation, mechanical systems and electrical wiring. Comply with handling and application instructions of the product.

### **1.8 SPECIFIC PRODUCT WARRANTY**

- A. **Furnish written warranty certifying that the applied boric acid based treatment will prevent infestation of subterranean termites and, that if subterranean termite activity is discovered during warranty period, Contractor will re-treat structure and repair or replace damage caused by termite infestation.**

## **PART II - PRODUCTS**

### **2.1 BORIC ACID TERMITICIDE, INSECTICIDE & FUNGICIDE**

#### **A. Termiticide requirements:**

## **SECTION 02282 – TERMITE CONTROL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

1. Boric acid based primary termiticide treatment that complies with requirements of authorities having jurisdiction over such an application.
2. Boric acid based treatment shall be provided in a concentrated formulation that dilutes with water or foaming agent.
3. Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use according to the registered label.

### **PART III - EXECUTION**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

##### **A. Compliance:**

1. Comply with product data, including product literature, technical bulletins and U.S. EPA registered label.

#### **3.2 APPLICATION**

##### **A. Site Preparation:**

1. Remove foreign matter that could decrease thoroughness of treatment, such as sawdust, away from treatment surfaces. Move building materials that block or prevent product application to required treatment areas.

##### **B. Application Rates:**

1. Apply treatment by label directions to include:

- C. The treatment of all structural wood and sill plates within 24 inches of contact with the foundation. Apply a second application to wood within treated area when only one or two surfaces are exposed.
- D. The treatment of all cellulosic sheathing within 24 inches of the foundation.
- E. The treatment of the concrete slab a minimum of 2 inches out from the wooden sill plate.
- F. The treatment of open bath traps at 8-16 ounces of treatment solution per square foot of bath trap with the additional treatment of a 12 inch wide band of treatment solution on the slab area surrounding the bath trap.
- G. The treatment of all pipe and plumbing penetrations with the treatment solution to a height of two feet and extending at least 6 inches out horizontally from the penetration onto slab surface.
- H. The treatment of the inside surface of crawlspace concrete or concrete block walls extending vertically up two feet from the soil.

## **SECTION 02282 – TERMITE CONTROL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- I. The treatment of the inside surface of basement concrete or concrete block walls extending vertically up two feet from the slab.
- J. Treat abutting slab areas and expansion joints to cover at least six inches of slab surface out from each side of joint or abutting slab connection.
- K. The treatment of termite trails and nests on interior walls.

**END OF SECTION**

## **SECTION 024115 – STRUCTURE DEMOLITION**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I - GENERAL**

#### **1.1 SECTION INCLUDES**

##### **A. Structure Demolition:**

1. Demolition of designated building structures.
2. Demolition of designated site improvements including paving, curbing, site walls, and utility structures.
3. Demolition of below-grade foundations and site improvements to depth to avoid conflict with new construction or site work.
4. Removal of hollow items or items which could collapse.
5. Protection of site work and adjacent structures.
6. Disconnection, capping, and removal of utilities.
7. Pollution control during building demolition, including noise control.
8. Removal and legal disposal of materials.
9. Protection of designated site improvements and adjacent construction,
10. Interruption, capping or removal of utilities as applicable.

##### **B. Hazardous Materials:**

1. Not present.

#### **1.2 SUBMITTALS**

- A. Submit under provisions of Section 013000 - Administrative Requirements.
- B. Schedule: Submit for approval demolition schedule, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service.

#### **1.3 QUALITY ASSURANCE**

- A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers.

#### **1.4 PRE-INSTALLATION MEETINGS**

- A. Convene minimum two weeks prior to starting work of this section.

#### **1.5 SEQUENCING**

## **SECTION 024115 – STRUCTURE DEMOLITION**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Immediate areas of work will not be occupied during demolition. The public, including children, may occupy adjacent areas.
- B. No responsibility for buildings and structures to be demolished will be assumed by the Owner.
- C. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

### **PART II -PRODUCTS - NOT APPLICABLE TO THIS SECTION**

### **PART III -EXECUTION**

#### **3.1 STRUCTURE DEMOLITION**

- A. Demolition Operations: Items of salvage value, not included on schedule of salvage items to be returned to Owner, shall be removed from structure. Storage or sale of items at project site is prohibited.
- B. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.
- C. Occupied Spaces: Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.
- D. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.
- E. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.

#### **3.2 SCHEDULE**

- A. Items for Protection During Demolition: (The following are samples only)
  - 1. Designated site improvements, trees, and plantings.
  - 2. Adjacent construction.
- B. Items to be Salvaged for Reinstallation:
  - 1. N/A
- C. Items to be Salvaged for Delivery to Owner:
  - 1. N/A
- D. Utilities Requiring Interruption, Capping, or Removal:
  - 1. Electric.
  - 2. Water.



## **SECTION 024115 – STRUCTURE DEMOLITION**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Sewerage.

4. Cable television.

**END OF SECTION**

**DIVISION 3-CONCRETE**

**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**

**VEHICLE TESTING FACILITY**

**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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## **PART I -GENERAL**

### **1.1 DESCRIPTION**

#### **A. Work Included in This Section:**

1. Provide all labor, materials, equipment, and services, etc., required to furnish and install all cast-in-place plain and reinforced concrete work, as indicated on the Drawings, Specified herein, or otherwise required for a complete and proper job.

#### **B. The Work shall include, but shall not necessarily be limited to:**

1. Forms, shoring, reinforcing, reinforcing accessories, and form removal.
2. The furnishing, placing, finishing, curing, and protection of all above and below grade, plain and reinforced, architectural and non-architectural concrete including but not necessarily limited to:
  - a. Foundations and footings.
  - b. Walls, pilasters, beams, lintels, columns, pits and piers.
  - c. Slabs-on-grade
  - d. Ramps.
  - e. Cast-in-place stairs.
  - f. Encasements, miscellaneous fills and enclosures.
  - g. Equipment bases and housekeeping pads (as required for all trades).
  - h. Site work concrete: walks, ramps, stairs, islands, curbs, walls, wall caps, headwalls, pads, bases, platforms, cradles, encasements, thrust blocks, etc.
3. Vapor retarders under interior slabs-on-grade.
4. Installation of embedded items (pipe sleeves, duct sleeves, keys, chases, boxes, bolts, anchors, reglets, inserts, expansion joint covers, etc.) furnished by other trades.
5. Cutting and patching existing concrete.
6. Joint filler and sealant in and around concrete slabs.
7. Sealing of concrete slabs to remain exposed.

C. Related Work Specified Elsewhere:

1. N/A

## 1.2 SUBMITTALS

A. Product Data:

Submit manufacturers' technical data, application, and installation instructions for each type of manufactured materials and product indicated.

1. Mix Designs: Submit concrete mix designs with two (2) cylinder test results by a qualified independent testing laboratory for each type of concrete to be used, not less than ten (10) days prior to placement. NOTE: If concrete is to be pumped, separate mix design(s) shall be required. If admixtures are to be included in the mix, provide mix design with test results. Indicate quantities of mix water for addition at project site.

B. Shop Drawings:

1. Submit reinforcing steel shop drawings detailing, bending, and placing of reinforcements, and bar lists in accordance with ACI 315 "Manual of Standard Practice for Detailing Concrete Structures".
2. Submit for information only, formwork shop drawings prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Submit formwork, joint, and tie layout shop drawings for all architectural concrete. The Project Manager will review these drawings for aesthetic considerations only. All form design and engineering shall remain the exclusive responsibility of the Contractor.
3. Submit proposed schedule and sequence of stripping form work, shoring removal, and installing and removing re-shoring.

C. Certificates:

Submit certificates for welding procedures and personnel. Submit material certificates signed by the manufacture certifying materials comply with the project requirements for the following:

1. Cementitious materials and aggregates.
2. Form materials and form release agents.
3. Steel reinforcement and reinforcement accessories.
4. Fiber reinforcement.
5. Admixtures.
6. Curing materials.
7. Floor and slab treatments.

8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Epoxy joint filler.
12. Joint filler strips.
13. Repair materials.

### **1.3 TESTING AND INSPECTIONS**

- A. Testing and inspection shall be performed as required by the building code, the Contract Documents, or as otherwise directed by the Project Manager. The Contractor shall employ a testing laboratory for the purpose of testing concrete, inspecting reinforcements and submitting reports. The cost of testing and inspections shall be paid for by the Contractor.
- B. The Contractor shall arrange and coordinate all testing and inspections and shall give the Owner's Representative and Project Manager a minimum of forty-eight (48) hours notice before each concrete pour.
- C. Sampling and testing for quality control during concrete placement may include the following, as directed by the Project Manager:
  1. Slump: ASTM C-143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  2. Air Content: ASTM C-173; volumetric method for light-weight or normal-weight concrete; ASTM C-231, pressure method for normal-weight concrete; one for each day's pour of each type of concrete mix.
  3. Concrete Temperature: ASTM C-1064; one test hourly when air temperature is 80 degrees F and above, and one test for each set of compressive strength specimens.
  4. Compression Test Specimen: ASTM C-31; one set of four standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field cured test specimens are required.
  5. Compressive Strength Tests: ASTM C-39; one set for each day's pour exceeding 5 cu.yd. plus additional sets for each 50 cu.yd. more than the first 25 cu.yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
    - i. Should tests yield compressive strengths equal to or exceeding 28-day minimum requirements, discontinue testing of remaining cylinders for that sample lot.
    - ii. Specimens in reserve are to be disposed of upon completion of the Project.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST. JOHN, U.S. VIRGIN ISLANDS

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6. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
- D. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.
- E. When total quantity of a given class of concrete is less than 50 cu. yd. the Project Manager may waive strength testing if adequate evidence of satisfactory strength is provided.
- F. When strength of field cured cylinders are less than 85 percent of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in place concrete.
- G. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- H. Test results will be reported in writing to the Owner's Representative, Project Manager, Structural Engineer, Contractor, concrete manufacturer, and Building Inspector within 2 working days. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions, and materials, compressive breaking strength, and type of break for both 7 day and 28 day tests.
- I. Contractor shall pay for testing conducted and any other additional testing as may be required when unacceptable concrete is verified.
- J. The Contractor shall remove and replace, or strengthen, as determined by the Project Manager, all concrete work for which test results fall below the specified requirements.
- K. Early (4-day) concrete cylinder breaks to facilitate the Contractor's schedule and operations shall be paid for by the Contractor.

### 1.4 PRECAUTIONS

- A. No aluminum of any kind (conduit, wire, reglet, inserts, etc.) shall be placed in concrete work, except where contact surfaces are coated with an epoxy paint, approved by the Project Manager.
- B. Use no form release agents containing materials that may affect a satisfactory finish and/or adhesion of materials to be applied to concrete by other sections.
- C. Slab curing agents other than water may be used, with prior written approval.
- D. No conduits, pipes, ducts, or other non-structural components of any kind shall be placed in concrete slabs, without the Project Manager's prior written authorization.

## **1.5 QUALITY ASSURANCE**

### **A. Codes and Standards:**

All concrete shall be placed, cured, and tested in accordance with all applicable sections of the American Concrete Institute (ACI) specifications, latest edition, including but not limited to the following, except where more stringent requirements are shown or specified:

1. ACI 117- "Specification for Tolerances for Concrete Construction and Materials".
2. ACI 211.1- "Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete".
3. ACI 301- "Structural Concrete for Buildings".
4. ACI 302.1- "Guide for Concrete Floor and Slab Construction".
5. ACI 304- "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
6. ACI 305R- "Hot Weather Concreting".
7. ACI 308- "Standard Practices for Curing Concrete".
8. ACI 311- "Recommended Practice for Concrete Inspection".
9. ACI 315- "Standard Practice for Detailing Reinforced Concrete Structures".
10. ACI 318- "Building Code Requirements for Reinforced Concrete".
11. ACI 347- "Recommended Practice for Concrete Formwork".
12. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".

### **B. Installer Qualifications:**

Shall be an experienced installer who has completed concrete work similar in materials, design, and extent to that required for this project, with a record of successful completions.

### **C. Professional Engineer Qualifications for services related to formwork, shoring and re-shoring installation:**

Shall be a professional engineer, licensed in the United States Virgin Islands, experienced in providing engineering services of this type.

### **D. Ready-mix Plant Qualifications:**

Shall be a firm experienced in the manufacture of ready mixed concrete products complying with ASTM C94 requirements for production facilities and equipment. Manufacturer shall be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

- E. Obtain each type of class of cementitious materials of the same brand from the same manufacturer's plant, each aggregate from one source and each admixture from the same manufacturer.
- F. Qualify procedures and personnel according to AWS D1.4 Structural Welding Code- Reinforcing Steel".
- G. Pre-installation Meeting:  
A pre-installation meeting to review cast-in-place concrete project requirements shall be attended by the Contractor, General Superintendent, Concrete Sub-contractor, ready-mix producer, testing and inspection agency, Owner's Representative and Project Manager.

### 1.6 PRODUCT HANDLING

- A. Protection:  
Protect materials during transit, on-site storage, and handling to prevent deterioration and damage. Reinforcing steel shall be stored off the ground in an orderly manner to facilitate access and usage in designated locations. Repair epoxy coating on steel reinforcement according to ASTM D3963 and ASTM D3963M.

## PART II - PRODUCTS

### 2.1 FORM MATERIALS

- A. Forms for Exposed Concrete:  
Shall be exterior grade plywood, equal to American Plywood Association B-B Plyform, in excellent condition, free of dents, scratches or surface deposits. Forms for architectural concrete shall be HDO (High Density Overlaid) Plyform, in "like-new" condition. Use appropriate thickness of Class I, II or Structural I Plyform as recommended by APA for specific installations.
- B. Forms for Concealed Concrete:  
May be Plyform, matched dressed lumber or steel.
- C. Forms for Cylindrical Columns, Pedestals, and Supports:  
Shall be metal, glass fiber reinforced plastic, paper or fiber tubes that shall provide surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Pan-Type Forms:  
Glass fiber reinforced plastic or formed steel stiffened to resist plastic concrete loads without detrimental deformation.



## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

**E. Void Forms:**

Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

**F. Chamfer Strips:**

Shall be wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.

**G. Form Ties and Spreaders:**

Shall be factory fabricated, adjustable length, removable or snap-off metal or glass fiber reinforced plastic form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than one (1) inch to the plane of the exposed concrete surface. Do not use wire ties and wood spreaders. Where concrete is to remain exposed to view or painted, ties shall have removable tapered plastic cones of no greater than one (1") inch outside diameter. Ties for walls below grade and wall indicated to receive damp proofing or waterproofing shall incorporate water seal washers.

**H. Form Release Agent:**

Shall be a commercial formulation with a maximum of 350 mg/1 volatile organic compounds that will not bond with, stain or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

**I. Keyed Slab-On-Grade Form:**

Shall be 24-ga. Hot dipped galvanized steel with interlocking support stakes, and dowel bar knock-outs, "Model Pro-Key" as manufactured by BoMetals, Inc., or approved equal. Provide appropriate form depth for slab depth as indicated on the Drawings.

## 2.2 REINFORCING MATERIALS

**A. Reinforcing Bars:**

Shall be deformed bars complying with ASTM A-615 A and M, Grade 60. Low alloy deformed steel reinforcing bars shall conform to STM A706 A and M. Fabricated deformed epoxy coated reinforcing shall comply with ASTM A934 A and M. Steel bar mats shall conform to ASTM A184 A and M, and shall be assembled with clips.

**B. Welded Wire Fabric:**

Deformed steel wire shall conform to ASTM A496, and sheets shall conform to ASTM A497, provide in flat sheets. Epoxy coated wire shall conform to ASTM A884 A and M, Class A, plain or deformed as indicated on the Drawings and fabric shall conform to ASTM A884 A and M, Class A.

**C. Supports for Reinforcement:**

Shall include, but are not limited to: spacers, chairs, ties, bolsters, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric. Supports shall conform to CRSI "Manual of Standard Practice".

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic protected or CRSI Class 2 stainless steel bar supports.

SECTION 03346-CAST IN PLACE CONCRETE  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

2. For epoxy coated reinforcement, use epoxy coated or other dielectric polymer coated wire bar supports.

D. Joint Dowel Bars:

Shall be plain steel bars conforming to ASTM A615 A and M, Grade 60, or epoxy coated bars conforming to ASTM A775A and M Grade 60, as indicated on the Drawings. Cut bars true to length with ends square and free of burrs.

E. Repair Materials:

For epoxy, shall be liquid epoxy repair coating compatible with epoxy coating complying with ASTM A775 A and M.

## 2.3 CONCRETE MATERIALS

A. Portland Cement:

Shall comply with ASTM C-150, Type II. Only one brand of cement shall be used throughout the project.

B. Concrete Aggregates shall conform to the following requirements:

1. Fine Aggregate:

Shall comply with ASTM C-33 and consist of clean, hard, tough and preferably siliceous material (sand), free from mineral or other coatings, soft particles, clay, loam, or other deleterious matter. Materials for exposed concrete shall come from a single source.

2. Coarse Aggregate (normal weight):

Shall comply with ASTM C-33 and consist of crushed stone or gravel having clean, hard, durable, uncoated particles, free from deleterious matter. Materials for exposed concrete shall come from a single source.

3. Coarse Aggregate (light weight):

Shall comply with ASTM C-33 and consist of cellular materials of mineral origin, such as shale, clay, slate, fly ash, or slag, either naturally occurring or produced by sintering, expansion, palletizing, or rotary kiln processes. Material shall have a dry loose weight of 55 lbs. per cu. ft. and graded from 3/4" to No. 4.

C. Mixing Water shall be potable.

D. Admixtures:

Shall be used in complete accordance with the manufacturer's directions. All admixtures shall be by the same manufacturer, who shall provide at no added cost to the Owner, the services of its representative at the job to ensure proper use of each particular admixture. No admixtures containing calcium chloride (chloride ions) shall be placed in concrete work. Admixtures shall be certified by the manufacturer to contain no more than 0.1 percent water soluble chloride ions by mass of cementitious materials, to be compatible with other admixtures and cementitious materials and to comply with the following:

1. Air-entraining: ASTM C-260.

2. Water-reducing: ASTM C-494, Type A
3. High-range, Water-reducing: ASTM C494, Type F.
4. Water-reducing and accelerating: ASTM C494, Type E.
5. Water-reducing and retarding: ASTM C494, Type D.
6. Corrosion-inhibiting:  
Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor, capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

## 2.4 RELATED MATERIALS

A. Curing Membrane shall be one of the following:

1. White polyethylene sheeting 4 mils thick, ASTM C171; or
2. Waterproof paper, Sisalkraft Type, ASTM C171-69 as manufactured by Fortifiber Corp., Ludlow Papers, Glas-Kraft; or
3. Jute or kenaf, approximately 9 oz. per sq. yd., complying with AASHTO M-182, Class 2.
4. Liquid membrane curing compound of resin or latex base conforming to ASTM C309 Type I, Class A. Confirm compatibility with subsequent surface treatments, sealers, surfacing materials adhesives, etc. prior to use. Product shall be "Kur-N-Seal" or "Kur-N-Seal NB" by Sonneborn, "Safe Cure & Seal" by Dayton Superior Corp., "Spray-Cure & Seal 25" by Conspec Manufacturing, or approved equal.

B. Interior Concrete Sealer:

Exposed interior concrete slabs, shall have two (2) applications of sealer in accordance with manufacturer's directions. Interior cistern surfaces receiving a waterproof epoxy need not be treated with sealers. Office area slabs to receive finish flooring or garage floors to receive 2 coats of epoxy painting shall not be treated with sealers or hardeners.

C. Exterior Concrete Sealer (Sidewalks, plazas, pads):

Shall be "Silocks Plus-WB" as manufactured by Silpro, "Sheild MX" by Conproco, or approved equal.

D. Joint Sealant for joints in slabs and walks:

Shall be self-leveling, multi-component polyurethane. Use primer as recommended by the manufacturer. Sealant shall be "THC-900" or "THC-901" (low sag as required by job conditions) as manufactured by Tremco, or approved equal such as SikaFlex. Color shall be as selected by the Project Manager.

E. Premolded Joint Filler Strips:

Shall be 1/2" thick, unless otherwise noted, premolded, resilient, compressible, re- expanding, non-extruding bituminous and fiber material, made with cane fibers, uniformly saturated with not less than 35% and not more than 50% by weight of asphalt, conforming to ASTM D1751.

SECTION 03346-CAST IN PLACE CONCRETE  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

F. Chemical Bonding Agent:

Shall be film-forming, freeze-thaw resistant compound suitable for brush or spray application, "Daraweld-C" by W.R. Grace Company, "Euroweld" by Euclid Chemical Company, or approved equal.

G. Slab Vapor Retarder:

1. Shall be 10 mils thick un-reinforced polyethylene, conforming to ASTM D4397.

H. Plastic Control Joints:

Shall be "Zip Cap" type as manufactured by W.R. Meadows., Sika Corp., or approved equal. Depth shall be as required to penetrate 1/4" thickness of slab.

I. Repair Underlayment:

Shall be cement based, polymer modified, minimum 4,100 psi strength, self-leveling product, for edge feathering to adjacent floor surfaces. Provide a surface primer as recommended by manufacturer.

J. Repair Topping:

Shall be traffic bearing, cement based, polymer modified, minimum 5,700 psi strength, self-leveling product, application thickness from 1/4 inch. Provide a surface primer as recommended by manufacturer.

K. Other Materials:

All other materials not specifically described herein, but required for a complete and proper installation, shall be as selected by the Contractor and approved by the Project Manager.

## **PART III - EXECUTION**

### **3.1 PROPORTIONS**

- A. All concrete shall be ready-mixed controlled concrete and proportioned according to ACI 211 and ACI 301 for normal-weight concrete and light-weight concrete.
- B. The nominal maximum size of the aggregate shall not be larger than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear distance between reinforcing bars or between bars and forms, whichever is least. In general, 3/4" size will satisfy these requirements. Aggregate of 1-1/2" size shall be used for slabs on grade, which are 5" or more in thickness.
- C. Concrete for every part of the Work shall be a homogeneous structure which, when cured, will have at least the strength required by design. The limiting values of concrete shown in Table A and the requirements hereinafter specified must be met.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST. JOHN, U.S. VIRGIN ISLANDS

- D. Proportions of concrete ingredients shall be determined in advance of concreting operations by the testing laboratory, and shall be such as to produce a concrete fulfilling every requirement of the Contract Documents. Advance specimen shall be tested as to compliance with this requirement by standard laboratory tests of concrete made with representative samples of the cement and aggregates, which the Contractor proposes to use for each specific portion of the Work. It shall be the Contractor's responsibility to provide the concrete strengths required and to pay the cost for a laboratory to make necessary trial mixes.
- E. The design strength of the concrete in this structure is based upon ultimate strength requirements of ACI 318. The minimum strength requirement stated is the strength of the concrete at 28 days when samples are cured and tested in accordance with the recommended standards of ACI 318.
- F. By the water-cement ratio is meant the total quantity of water entering the mixture, including the surface water carried by the aggregates, expressed in terms of the quantity of cement.
- G. All concrete exposed to the exterior shall be air-entrained concrete, typically 6% +/- 1% by volume for 3/4" aggregate and 8% +/- 1% for 3/8" aggregate. Maximum air-entrainment for exterior slabs shall be 3%. Interior floor slabs shall not be air entrained.
- H. The water-cement ratio shall be expressed in U.S. gallons per sack (94 lb net) of cement.

TABLE A

Minimum Allowable Compressive Strength @ 28 Days PSI	Maximum Allowable Net Water Content Gals/Sack*	Cement Sacks Per CU. YD. Minimum Permissible **	Total Water Maximum
3500	3.5	6.0	21.0 gal/CY
4000	4.0	6.5	26.0 gal/CY

\* Maximum: Decrease if possible. This represents the total water in the mix at the time of mixing, and includes free water on aggregates. Reduce net allowable water content by one gallon for air-entrained concrete.

\*\* Minimum: Increase as necessary to meet other requirements.

- I. The method of measuring water and aggregates shall be such as to secure specified proportion in each batch, and in a manner that proportion of water to cement can be closely controlled and easily checked at any time.
- J. The proportions of aggregates to cement for concrete for any of this work shall be such as to produce concrete that will work readily into corners and angles of the forms and around the reinforcement without excessive puddling or spading and without permitting the materials to segregate or free water to collect on the surface.
- K. Light-weight concrete mix shall be proportioned as herein specified, and shall produce strength and modulus of elasticity as noted on the Drawings, or Specified herein, with a split-cylinder strength factor (Fsp) of not less than 5.5 and a dry weight of not less than 95 lbs. or more than 100 lbs. after 28 days. Shrinkage shall be limited to 0.03% at 28 days.

SECTION 03346-CAST IN PLACE CONCRETE  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST. JOHN, U.S. VIRGIN ISLANDS

---

- L. No change in source of materials or mix shall be made without the Project Manager's authorization. Concrete mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Such adjustments shall be at no additional cost to Owner and as accepted by Project Manager. Laboratory test data for revised mix design and strength results shall be submitted to and accepted by Project Manager before using in the Work.
- M. Design mix reports shall include the following information:
  - 1. Identification of aggregate source of supply.
  - 2. Tests of aggregate for compliance with specified requirements.
  - 3. Scale weight of each aggregate.
  - 4. Absorbed water in each aggregate.
  - 5. Brand, type and composition of cement.
  - 6. Brand, type and amount of each admixture.
  - 7. Amounts of water used in trial mixes.
  - 8. Proportions of each material per cu. yd.
  - 9. Gross weight and yield per cubic yard of trial mixtures.
  - 10. Measured slump.
  - 11. Compressive strength results of 2 representative samples at 7 and 28 days for each type of concrete to be used.

### **3.2 STRENGTH COMPLIANCE**

- A. The following more clearly defines performance:
  - 1. To meet the requirements of this Specification and those of ACI 318, the average of any three consecutive strength tests of laboratory-cured specimens representing each class of concrete shall be equal to or greater than the specified strength ( $f_c$ ), and not more than one out of ten strength tests shall have a value of less than the specified minimum strength. In addition to the above requirement, the allowed 10% of tests below the minimum required strength shall be equal to or greater than 90% of the minimum specified strength ( $f_c$ ).
  - 2. Should the strengths shown by the test specimens fall below the specified design strengths, the Project Manager shall have the right to require additional curing on those portions of the structure represented by those test specimens.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

3. When the tests on control specimens of concrete fall below the required strength, the Project Manager will permit, at the Contractor's expense, check tests for strengths to be made by means of Windsor Probes or typical cores drilled from the structure in accordance with ASTM C-42 and C-39. In cases of failure of the latter, the Project Manager, in addition to other resources, may require, at the Contractor's expense, load tests on any members in which such concrete was used. Load tests need not be made until concrete has aged 60 days.

### 3.3 DESIGN OF FORMWORK

- A. The design, engineering, and safety of formwork, as well as its construction shall be the exclusive responsibility of the Contractor.
- B. Exercise care in order to ensure that all formwork is properly designed, engineered and erected, and capable of safely supporting all loads and pressures. Forms shall be held to the dimensions indicated on the Drawings, with the tolerances established by ACI 117 concrete surface irregularities shall be limited as designated by ACI 347R.
- C. Temporary openings shall be provided at the base of forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is deposited.
- D. Forms shall be sufficiently tight to prevent leakage of grout or cement paste.
- E. Properly set and secure all embedded items to be furnished by other trades.
- F. Properly set and secure all form applications for chamfers, reglets, rustication joints, etc., as indicated on the Drawings. Chamfer exterior corners and edges of permanently exposed concrete.

### 3.4 PREPARATION OF FORM SURFACES AND EMBEDDING ITEMS

- A. Plywood and other wood surfaces not subject to shrinkage shall be sealed against absorption of moisture from the concrete by either: (1) a field applied approved form oil or sealer; or, (2) a factory applied non-absorbent liner. All shall be subject to review for finish appearance.
- B. When forms are coated to prevent bond with concrete, it shall be done prior to placing of reinforcing steel. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.
- C. Where architectural (as-cast) finishes are required, only non-staining materials shall be used at form surfaces. Where the finished surface is required to be painted or treated, the material applied to the form surface shall be compatible with the type of paint to be used.
- D. All forms shall be thoroughly cleaned before reuse.
- E. All necessary chamfer strips and related architectural detail strips shall be provided for as indicated on the Drawings.
- F. The Contractor shall thoroughly review all Drawings for special formwork required at openings such as windows, louvers, doors, etc.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

- G. Set and build into form work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Set anchor rods by template to ensure proper positioning. Do not cut, core, or sleeve through footings or embed mechanical and electrical utilities in or through footings without consulting with the Project Manager, before any such cutting, coring, sleeving, or embedding is begun.
- H. Do not place (embed) mechanical or electrical conduit, ducting, etc., in supported (suspended) concrete slabs.
- I. At slabs, set edge forms, bulkheads, and intermediate screed strips to achieve required elevations, and contours in finished surfaces for slabs. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

### 3.5 CONCRETE REINFORCEMENT

- A. Reinforcing bars to be embedded in concrete shall be free of oil, dirt, loose mill scale, and loose rust. Reinforcing bars with rust, mill scale, or a combination of both will be acceptable as being satisfactory with cleaning or brushing, provided that upon wire brushing, the dimensions including height of deformations and weights of a cleaned sample shall not be less than the applicable ASTM specification requirements.
- B. The placement of bars shall conform to CRSI Manual of Standard Practice, Placing Reinforcing Bars. Maintain adequate space for proper concrete cover.
- C. Place no concrete before installation of the reinforcement has been reviewed by the independent inspection agency.
- D. In event of displacement of any reinforcement, same shall be corrected and retied as necessary and in a satisfactory manner.
- E. All splicing of bars, concrete cover, and bar spacing shall conform to "Building Code Requirements for Reinforced Concrete" (ACI 318) as published by the American Concrete Institute, and to recommended practices in "Splicing Reinforcing Bars" by the Concrete Reinforcing Steel Institute, or as hereinafter specified.
  - 1. When necessary to splice reinforcement, bars shall be lapped at least 40 bar diameters, unless noted otherwise, placed in contact and wired. Laps shall be avoided at points of maximum stress. All rods shall be securely wired together at all intersections. No permanent device for fastening reinforcement shall be left in contact with the face of forms at exposed surfaces.
- F. The welding of reinforcing bars shall be performed in accordance with "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections for Reinforced Concrete Construction" (AWS D12.1), as by the American Welding Society. Welders shall be qualified by tests as prescribed in the "Standard Qualification Procedures" (AWS B3.0), as published by the American Welding Society.
- G. Tack welding of reinforcing steel shall not be permitted.
- H. Heat bending of reinforcing steel shall not be permitted.



SECTION 03346-CAST IN PLACE CONCRETE  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

- I. All splicing of wire fabric shall be made with fabric lapped at least 2 meshes wide and tied at 3'-0" O.C.
- J. Repair all holes in vapor retarders prior to concrete placement.

### 3.6 MIXING

- A. Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set for it in ASTM C94 and ACI 614.
- B. Transit-mixed concrete shall be delivered in high-lift trucks to enable it to be easily deposited in the forms.
- C. The mixing shall be continuous after the water has been added to the mix in the drum, but no concrete shall be placed in the forms more than 90 minutes after the water has been added.

### 3.7 CONSISTENCY

- A. The consistency of the concrete is mainly dependent upon the thoroughness of the mixing and the quantity of water contained in the mix. In general, the maximum slump and minimum strengths shall be as follows:

Type of Construction	Compressive Strength Required in PSI	Maximum Slump (inches)
All Exterior Concrete	4000 (air entrained)	4
Beams and Columns	4000	4
Footings	3500	4
Foundation Walls	3500	4
Slabs	4000	4
Miscellaneous Concrete	3500	4

### 3.8 CONCRETE PLACEMENT

- A. Inspection:  
Prior to placing concrete, all formwork, reinforcements and embedded items shall be complete and inspected by the inspection agency. All embedded items shall be checked for proper location, type, and quantity.
- B. Prior to placing concrete:  
Clean all equipment used for mixing and transporting the concrete. Remove all debris from the place to be occupied by the concrete, and check forms for dimensions, position, and adequacy.
- C. Standing Water:  
Water shall be removed from excavations before any concrete is deposited. Any flow of water into an excavation shall be diverted through proper side drains to a sump, or shall be removed by other approved methods that will avoid washing the freshly deposited concrete. No pumping shall be done while the concrete is being placed.
- D. Conveyors and Pumps:

**SECTION 03346-CAST IN PLACE CONCRETE**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

Convey concrete from the mixer to the place of final deposit by rapid methods that will prevent the separation or loss of the materials. Equipment for placing concrete shall be of such size and design as to ensure delivery without segregation of the materials. All shall be in accordance with ACI 614.

**E. Concrete Placement:**

1. Concrete shall not be placed by means of open chutes, the combined length of which exceeds 30', and shall not be allowed to drop freely through distances exceeding 6' or through loosely spaced reinforcing bars, conduits, etc., which will tend to segregate materials.
2. Place concrete as nearly as practicable in its final position to avoid segregation due to handling or flowing. No concrete that has partially hardened or been contaminated by foreign material shall be deposited on the Work.
3. Once concrete placement is started, it shall be carried on as a continuous operation until the placing of the panel, section, or individual foundation is completed, so as not to cause formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints as specified and as detailed on the Drawings shall be provided. The top surface shall be generally level. When construction joints are necessary, they shall be made in as specified herein.
4. Place concrete in layers not over 12" deep, and thoroughly compact by means of vibrators, hand tamping and spading. During the operation of placing, thoroughly work the concrete around reinforcement, embedded fixtures, pipes, and conduits, and into the corners of the forms so as to prevent interior voids, honeycomb, and the patching of concrete surfaces after forms are removed. Internal vibrators should be used to aid in the compaction of the concrete. Extreme care shall be used on thin sections and exposed concrete.

**3.9 WEATHER PROTECTION**

- A.** Unless adequate protection is provided and/or approval is obtained, concrete shall not be placed during rain. Rainwater shall not be allowed to increase the mixing water or to damage the surface finish.

**B. Hot Weather Concrete Placement:**

1. Hot weather concrete placement shall be done in accordance with the recommendations of ACI 305R.
2. Concrete deposited in hot weather shall have a material temperature that will not cause difficulty from loss of slump, flash set, or cold joints (less than 90 degrees F).
3. In hot weather, be adequately prepared to protect the concrete from the adverse influence of heat before the placement of any concrete. Take precautions to avoid cracking of the concrete from rapid drying during placement of concrete, particularly when the work is exposed to direct sunlight.
  - a. Cool forms by fogging with water spray or by protecting them from the direct rays of the sun.

SECTION 03346-CAST IN PLACE CONCRETE  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- b. If requested by the Contractor, deemed advisable by the Testing Engineer, and approved by the Project Manager, a retardant may be used to delay the initial set of the mix.

### 3.10 CONCRETE JOINTS

- A. Construction joints shall be located so as to least impair the strength and water tightness of the structure. All construction joint locations shall be subject to the notification of and acceptance by the Project Manager, prior to placement.
- B. All construction placement joints shall be keyed.
- C. Reinforcement shall be continuous through construction joints and additional reinforcing placed as required. Except where otherwise specified, the surfaces of construction joints shall be prepared in a manner that will ensure bonding with concrete or grout placed on them. Wherever practical, construction joint surfaces shall be kept continuously moist until new concrete or grout is placed.
- D. Use bonding agent on existing concrete surfaces to be joined with new concrete. Use a epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- E. Place control joints perpendicular to main reinforcement. Continue reinforcement across control joints except as indicated otherwise.
- F. Locate joints for beams, slabs, joists and girders in the middle third of spans. Offset joints in girder a minimum distance of twice the beam width from a beam-girder intersection. Locate horizontal joints in walls and columns at underside of floors, slabs, beams and girders and at the top of footings or floor slabs. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

### 3.11 JOINTS IN SLABS

- A. Control (contraction and isolation) joints in slabs-on-grade shall be provided wherever new concrete abuts foundation walls, exterior slabs and to form slab panels as indicated on the Drawings, as otherwise noted, specified or detailed. All joints shall be straight and square to facilitate alignment of finish flooring movement joints where applicable. Where possible, control joints shall be located under a non-bearing partitions. All joints shall be keyed.
- B. The area contained between joints shall not exceed 480 square feet. The maximum distance between joints in any direction shall not exceed 24 feet.
- C. Construct isolation joints in slabs-on-grade at points of contact between slabs and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations as indicated. Extend joint filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated. Terminate full width joint filler strips not less than ½ inch or more than 1 inch below finished concrete surface where joint sealants are indicated. Install joint filler strips in lengths as long as practicable.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

- D. Joints shall be grooved after initial floating to a radius of 1/8 inch or joints may be sawed as soon as the surface is firm enough so that it will not be torn or damaged by the blade, usually within 4 to 12 hours after the concrete hardens, 1/8 inch wide and 1/4 of slab depth, unless otherwise indicated.
- E. All exposed sawed joints shall be filled with control joint filler. Surfaces to receive finish flooring shall utilize control joint filler acceptable to the flooring manufacturer.
- F. At the Contractor's option, concrete slabs to be covered by other finish flooring materials may utilize plastic control joints.
- G. Expansion joints in slabs shall be constructed with expansion joint covers at locations indicated on the Drawings. Installation shall be as recommended by the manufacturer. Coordinate with the Work of SECTION 05500: MISCELLANEOUS METAL WORK.
- H. Install dowel sleeves and dowels or dowel bar and support assemblies at joints where indicated. Use dowel sleeves with lubrication one half of dowel length to prevent concrete bonding to one side of joint.

### 3.12 REMOVAL OF FORMS

- A. Formwork not supporting the weight of concrete, such as sides of beams, walls, and similar parts of the work, may be removed 48 hours after placing the concrete, provided the concrete is sufficiently hard to not be damaged by the form removal operations, and provided that curing and protection operations are maintained.
- B. Removal of forms shall be in a manner to ensure safety of structure and prevent damage to concrete surfaces. Particular care shall be taken in the removal of forms for concrete surfaces to remain exposed.
- C. Whenever the formwork is removed during the curing period, the exposed concrete shall be cured by one of the methods specified.
- D. Formwork for beams, joist, slabs and other structural elements that support weight of concrete in place shall be left in place until the concrete has achieved at least 70 percent of its 28 day design compressive strength, as determined by testing specimens in accordance with ACI 301. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

### 3.13 PLACING SLABS

- A. Slabs-on-grade shall be thicknesses indicated on the Drawings, placed on compacted fill as specified. Concrete shall be full thickness of slab and troweled out as specified herein. Carefully review the Drawings in order to coordinate and provide all slab recesses, depressions, and pitches required for equipment or finishes to be furnished and installed by other trades, or for proper drainage. Install pre-molded joint filler strips at slab perimeters as indicated on the Drawings.
- B. Thicken and reinforce slabs-on-grade under non-bearing masonry partitions.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

- C. Provide a continuous slab vapor retarder under all slabs-on-grade unless specifically noted otherwise. Place, protect and repair vapor retarder sheets according to ASTM E1643 and manufacture's written instructions. Lap seams a minimum of twelve (12") inches and tape. Cover vapor retarder with granular material, moisten and compact. See SECTION 02300: EARTHWORK. Minimize traffic over uncovered vapor retarders to limit damage. Any damage to vapor retarders shall be repaired prior to fill placement above vapor retarders or concrete placement. Where slab vapor retarder is not required at slabs-on-grade, gravel or crushed stone shall be wetted just prior to concrete placement.
- D. Concrete slabs shall have wood or metal screeds spaced not over 10' o.c. and set at the elevations shown on the Drawings. NOTE: Contractor may, at his option, use wet screeds provided that wet pads are established at not more than 10' o.c. both ways, with elevations established by use of laser equipment.
- E. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section. Concrete shall be thoroughly worked around reinforcements and other embedded items and into corners.
- F. Bring slab surfaces to correct level with a straight edge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. This shall be completed before free moisture rises to the surface so as to avoid bleeding. Do not disturb slab surfaces prior to beginning finishing operations.
- G. Adjust concrete volume for L/360 dead load ponding at suspended slabs.
- H. Maintain reinforcing in proper position on chairs during concrete placements.

### 3.14 FINISHING FORMED NON-ARCHITECTURAL CONCRETE SURFACES

- A. Rough-Formed Finish:  
For concealed non-architectural finish on formed concrete with texture imparted by form material, repair tie holes and defective areas and chip off fins and projections exceeding 1/4 inch in height.
- B. Smooth-Formed Finish:  
For exposed non-architectural finish on select formed concrete and for concrete surfaces to receive a direct coating material such as waterproofing, damp proofing, veneer plaster, painting, etc. Immediately upon removal of forms, point all form tie holes and other defects flush with surface and remove all fins and projections exceeding 1/8" for a smooth surface, or as otherwise directed by the Project Manager.
- C. Smooth-Rubbed Finish:  
For exposed foundation surfaces and other smooth-formed surfaces as indicated on the Drawings, provide a smooth-rubbed finish not later than 1 day after form removal. Moisten concrete surfaces and rub with carborundum brick or other abrasive until producing a uniform color and texture. Remove all fins, burrs, joint marks, and other projections. Do not apply cement grout other than that created by the rubbing process.
- D. Grout-Cleaned Finish:

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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For smooth-formed surfaces as indicated on the Drawings, wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by light water spray for at least 36 hours.

### 3.15 CONCRETE SLAB FINISHES

#### A. Scratch Finish:

1. Apply scratch finish to slab surfaces to receive concrete floor topping, mortar setting beds for tile, other bonded cementitious finish flooring materials and where indicated.
2. After placing slabs, plane surface to a levelness/flatness tolerance not exceeding  $\frac{1}{2}$  inch in 10 feet when tested with a 10 ft. straight edge. Slope surfaces uniformly to drains where required or as indicated. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.

#### B. Float Finish:

1. Apply float finish to slab surfaces to receive trowel finish, other finishes as specified, and slab surfaces to be covered with membrane or elastic waterproofing, membrane, or elastic roofing and where indicated.
2. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or flat shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a levelness/flatness tolerance not exceeding  $\frac{1}{4}$  inch in 10 ft. when tested with a 10' straight edge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, re-float surface to a uniform, smooth, granular texture.

#### C. Trowel Finish:

1. Apply trowel finish to slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, thin-set ceramic or quarry tile, paint, or other thin-film finish coating system.
2. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance. Level surface plane to a tolerance not exceeding  $\frac{1}{4}$  inch in 10 feet when tested with a 10' straight edge. Grind smooth any surface defects that would telegraph through applied floor covering system.

#### D. Slip-Resistant Broom Finish:

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Apply a non-slip broom finish to exterior concrete platforms, sidewalks, pads, steps, ramps, and elsewhere as indicated on the Drawings.
2. Immediately after float finishing, slightly roughen concrete surface by brooming with a fiber-bristle broom perpendicular to main traffic route. Review final finish with Project Manager prior to application.
3. All joints and edges shall be tooled.
4. All surfaces shall be properly damp cured.
5. Slab sealer shall be applied to all exposed exterior concrete slab surfaces.
6. Surfaces shall receive sealer applied at rates and by the methods recommended by the manufacturer.

### 3.16 MISCELLANEOUS CONCRETE ITEMS

#### A. Filling In:

Fill in holes and openings left in concrete for passage of work by other trades, unless shown or directed, after work of other trades is in place. Mix, place and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete the Work.

#### B. Equipment Bases and Foundations:

Provide machine and equipment bases and foundations as shown on the Drawings. Set anchor bolts for machines and equipment to templates at correct elevations, complying with information provided by the equipment manufacturer.

#### C. Interior Curbs:

Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

#### D. Joint Sealing:

Seal joint as late in the course of the work as possible to allow shrinkage to occur. Clean joints and apply elastomeric sealant in accordance with manufacturer's instructions.

### 3.17 CURING AND PROTECTION

- A. Protect newly placed concrete against low and high temperature effects and against rapid loss of moisture. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with evaporation-control materials. Apply according to manufacturer's instructions, after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods. Moist curing shall include keeping concrete surfaces continuously wet by covering with water; using a continuous water-fog spray; or covering the concrete surface with continuously wetted burlap.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Curing Slabs, Toppings and Other Flat Surfaces: Within twenty-four (24) hours after final troweling, slab finish surfaces shall be covered to moist cure for at least seven days with burlap or curing paper. Curing paper shall be lapped 4" at edges and sealed with tape at least 3" inches wide. Paper shall be weighted to prevent displacement, and holes or tears shall be immediately repaired.
  2. Curing Formed Surfaces: Moist cure with forms in place for the full seven day curing period. If the forms are removed prior to seven days, apply curing compound and cure in accordance with manufacturer's written instructions. Intermittent wetting and drying does not provide acceptable curing. Keep steel forms heated by the sun, and all wood forms in contact with the concrete, wet during the curing period.
- C. Form Removal Not Supporting Weight of Concrete (footings, walls): May be removed after curing for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provide curing and protection operations are maintained.
- D. Form Removal Supporting Weight of Concrete: (beams, suspended slabs, lintels and other structural elements) May not be removed in less than 14 days or until concrete has attained at least 75% of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- E. Where shored, form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.
- F. Protection From Mechanical Injury: During the curing period, protect concrete from damaging mechanical disturbance, particularly load stresses and excessive vibration. Protect all finished concrete surfaces from damage caused by construction equipment, materials, or methods and running water. Do not overload self-supporting concrete structures. Foundation walls shall not be backfilled or driven over by vehicles during the curing period.
- G. Concrete floor sealer shall be applied to all exposed interior concrete slab floors, unless otherwise scheduled. Floors shall be clean and free of marks and stains. Floors shall receive sealer applied at rates and by the methods recommended by the manufacturer.
- H. Exterior concrete slab surfaces shall be sealed at rates and by the methods recommended by the manufacturer. Protect fresh concrete from pedestrian and vehicular traffic for at least seven (7) days after placement.
- I. Seal all concrete wall-slab perimeters and all penetrations with joint sealant as specified.

### 3.18 CONCRETE SURFACE REPAIRS

- A. Repairing Formed Surfaces:



## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Repair of formed architectural concrete surfaces is not allowed. Only repairing of formed non-architectural concrete surfaces is allowed. Remove and replace concrete that cannot be repaired and patched to Project Manager's approval. Repair and patch defective areas with cement mortar immediately after removing forms. Mix dry-pack mortar, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
2. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
3. For surfaces exposed to view, blend white Portland cement and standard Portland cement so that when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
4. Remove and replace concrete having defective surface if defects cannot be repaired to the satisfaction of the Project Manager. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, other surface projections, stain, and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or pre-cast cement cone plugs secured in place with bonding agent.
5. Repair concealed formed surfaces containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

### B. Repairing Slab Surfaces:

1. Test slab surfaces for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test surface slopes to drain for trueness of slope and smoothness by using a template having the required slope.
2. Repair finished surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcing or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycombs, rock pockets, and other objectionable conditions. Correct high areas in surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary cementitious underlayment compound may be used when acceptable to the Project Manager.

## SECTION 03346-CAST IN PLACE CONCRETE

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same material to provide the same type or class as original concrete. Place compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- C. At concealed, non-architectural concrete, repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and remove dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- D. Perform structural repairs with prior approval of Project Manager for method and procedure, using specified epoxy adhesive and mortar. Repair methods not specified above may be used, subject to acceptance by Project Manager.

**END OF SECTION**

## **PART I -GENERAL**

### **1.1 REQUIREMENTS INCLUDED**

- A. Base:  
Precast Concrete.  
Tops accurately shaped by ring forms to suit riser sections.
- B. Walls (Risers and Cones):  
Precast Concrete.
- C. Top of Cone:  
Reinforced concrete grading rings for adjusting frame to match finished surface (not to exceed 11 inch).
- D. Inverts:  
Form invert channels of concrete. Conform to adjoining pipe size. Curve side inverts and layout main inverts (where direction changes) in smooth curves of longest possible radius tangent to adjoining pipeline centerline.
- E. Frames and Covers:  
Cast iron.
- F. Water Infiltration Prevention:  
Manhole Encapsulation System such as Wrapid Seal, as manufactured by Canusa, or equivalent for sanitary sewer manholes, water manholes and electrical handholes

### **1.2 RELATED REQUIREMENTS**

- A. Section 02200: Earthwork
- B. Section 03300: Precast Concrete
- C. Section 05546: Manhole Frames and Covers

### **1.3 REFERENCES**

- A. ASTM:
  - 1. A48-76, Specification for Gray Iron Casting.
  - 2. C150-81, Specification for Portland cement.
  - 3. C478-82, Specification for Pre-Cast Reinforced Concrete Manhole Sections.
  - 4. C923-79, Specification for Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes.
  - 5. ASTM D 570 - Water Absorption of Plastics.

**SECTION 03410-PRECAST MANHOLE BASES, RISERS AND TOPS DESCRIPTION**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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6. ASTM D 638 - Tensile Properties of Plastics.

7. ASTM D 1002 - Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-To-Metal)

**B. AASHTO:**

1. M198-75, Joints for circular concrete sewer and culvert pipe using flexible watertight gasket.

**1.4 SUBMITTALS**

**A. Shop Drawings:**

Submit in accordance with requirements of GENERAL SPECIFICATIONS.

**B.** Manufacturer's written instructions for installing resilient connectors.

**PART II - PRODUCTS**

**2.1 PRODUCT TYPES**

**A. Portland Cement:**

ASTM C I 50-81, Type II

**B. Hydrated Lime:**

ASTM C207-79, TypeS

**C. Sand:**

Fine Aggregate for mortar, Section 03400, but passing the No.8 sieve.

**D. Frames and Covers:**

Cast iron as indicated, at least Class 25 conforming to ASTM A48-76, and as specified.

**E. Aluminum Steps Similar to:**

1. Stock No. I2653B made by Aluminum Company of America, Pittsburgh, Pennsylvania.

2. Stock No. F-I4-2-B made by New Jersey Aluminum Company, New Brunswick, New Jersey.

3. Stock numbers are for embedded steps, for steps to be attached after casting, shape of exposed parts to be like stock numbers, but other ends to be shaped to suit inserts.

**F. Plastic Coated Steel Steps Equal to:**

PS2-PF-SL Manhole Steps made by M.A. Industries, Inc., Peachtree City, Georgia.

**G. All steps capable of resisting following loads without loosening or damaging:**

1. Minimum horizontal pull out load 400 pounds.

2. Minimum vertical load 800 pounds.

**2.2 PRECAST CONCRETE SECTIONS ASTM C478-82 WITH THE FOLLOWING MODIFICATIONS:**

- A. Wall thickness as indicated on Plans.
- B. Cement:  
ASTM CI50-81, Type II, otherwise as directed by Engineer.
- C. Joints between Sections:
  - 1. Butyl rubber-based sealants.
  - 2. For Sanitary Sewers, Water Vaults or Electrical Manholes use Wrapid Seal.
- D. Steps set accurately as indicated and specified.
- E. Cones and Conical Transitions similar in design and construction to riser sections and as indicated. Flat slab tops as indicated.
- F. Cure by subjecting to saturated steam at temperature between 100 and 130 degrees F. for 12 hours or more.
- G. Cast or drill only two (2) lift holes in each section.
- H. Mark clearly date of manufacture and name or trademark CF manufacturer on insides of walls, on all sections.
- I. Acceptance on basis of material tests and product inspection.

**2.3 JOINTS**

- A. Between precast sections:
  - 1. Butyl rubber-based sealants per Type B, AASHTO M 198-75, but no bitumen content.
  - 2. For Sanitary Sewers, Water Vaults or Electrical Manholes use Wrapid Seal.
- B. Rubber ring water stops for use in pipe-to-manhole joints where indicated. Rings of resilient material that will fit snugly over pipes, held firmly against pipe surface by means of a mechanical take-up device which when tightened will compress resilient material or by a stretch fit. Water stop designed and installed so that leakage between pipe and manhole is minimized. Materials and manufacturer of water stops conform to applicable provisions of the ASTM Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes, Designation C923-79.
- C. Non-shrink mortar for pipe connections to existing manholes similar to:
  - 1. Masterflow 713 Grout made by Master Builders, Cleveland, Ohio.
  - 2. Five Star Grout made by U.S. Grout Corporation, Old Greenwich, Connecticut.

**SECTION 03410-PRECAST MANHOLE BASES, RISERS AND TOPS DESCRIPTION**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Upcon made by Upco Company, Cleveland, Ohio.

## **2.4 MIXES**

- A. Concrete:  
In conformance with Section 03400, Precast Concrete.
- B. Mortar:
  1. For Brickwork:  
Mix Portland cement, hydrated lime and sand in proportion by volume of 1:1/2:4-1/2.  
Use sufficient water to form workable mixture to make mortar damp, just short of "balling".
  2. For plugging lift holes:  
Mix Portland Cement and sand in proportion by volume of 1:1-1/2, with sufficient water.

## **PART III - EXECUTION**

### **3.1 SETTING PRECAST SECTIONS**

- A. Set vertical with sections and steps in alignment. Set bases true to line and elevation.
- B. Install Butyl rubber-based sealants in joints between sections conforming to manufacturer's standard.
- C. Plug holes for handling with mortar. Hammer mortar into hole until dense and excess of paste appears, then smooth flush with adjoining surface.

### **3.2 JOINTING AND CONNECTIONS**

- A. Joints between precast sections, and between pipes and precast sections shall conform to related standards and manufacturer's instruction.
- B. Rubber ring water stops for pipe-to-manhole: Hold firmly against pipe surface by mechanical take-up device to compress resilient material when tightened. Install to minimize leakage.
- C. Apply non-shrink mortar according to manufacturer's instruction.
- D. Stub out and plug openings for future connections as indicated on the Plans.

### **3.3 SETTING FRAMES AND COVERS**

- A. Set frames with top conforming to finished ground or pavement surface as indicated and directed.
- B. Set circular frames concentric with top of cement.

**SECTION 03410-PRECAST MANHOLE BASES, RISERS AND TOPS DESCRIPTION**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- C. Set frames in full bed of mortar to fill and make watertight the space between concrete top and bottom flange of frame.
- D. Place thick ring of mortar extending to outer edge of concrete, around bottom flange. Finish mortar smoothly and give a slight slope to shed water away from frame.
- E. Place concrete collar around frame when placing permanent pavement as indicated.
- F. Place covers in frames on completion of work.

### **3.4 INSTALLING STEPS**

- A. Embed or attach steps in wall during or after casting as specified.
  - 1. Embedded Steps:  
Use cleaning agents to remove dirt, oil, and grease. Rinse, dry and coat with heavy-bodied bituminous material, parts to be embedded. Dry and secure in forms for embedment during casting.
- B. Attached Steps:  
Drive into plastic inserts. Embed inserts during casting or drive inserts into holes formed during casting.
  - 1. Attach plastic coated steel steps after casting: Drive into holes formed during casting, or into embedded plastic inserts. May be embedded during casting.

**END OF SECTION**

# **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I - GENERAL**

### **1.1 SUMMARY**

#### **A. Section Includes:**

1. Graffiti removal from concrete surfaces.
2. Cleaning of existing horizontal and vertical concrete surfaces.
3. Epoxy repair of cracks in existing horizontal and vertical concrete surfaces.

#### **B. Related Sections:**

1. Section 09960 – High Performance Coatings Anti-graffiti coating applied to surfaces after cleaning and patching.

### **1.2 REFERENCES**

#### **A. American Association of State Highway and Transportation Officials (AASHTO) M-235 – Epoxy Resin Adhesives.**

#### **B. American Concrete Institute (ACI) 302.1 – Guide for Concrete Floor and Slab Construction.**

#### **C. American Society for Testing and Materials (ASTM):**

1. C 78 – Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
2. C 109 – Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens).
3. C 266 – Test Method for Time of Setting of Hydraulic Cement Paste by Gillmore Needles.
4. C 348 – Test Method for Flexural Strength of Hydraulic Cement Mortars.
5. C 881 – Specification for Epoxy-Resin Base Bonding Systems for Concrete.
6. C 882 – Test Method for Bond-Strength of Epoxy-Resin Systems Used with Concrete.
7. C 883 – Test Method for Effective Shrinkage of Epoxy-Resin Systems Used with Concrete.
8. C 928 – Specifications for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs.
9. C 944 – Standard Test Method for Abrasion Resistance of Concrete or Mortar Surfaces by the Rotary-Cutter Method.
10. C 1202 – Test Method for Electrical indication of Concrete's Ability to Resist Chloride Ion Penetration.



## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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11. C 1042 – Test Method for Comparing Concrete on the Basis of Bond Developed with Reinforcing Steel.
12. C 1059 – Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
13. D 570 – Test Method for Water Absorption of Plastics.
14. D 638 – Test Method for Tensile Properties of Plastics.
15. D 695 – Test Method for Compressive Properties of Rigid Plastics.
16. D 790 – Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

### **1.3 SUBMITTALS**

A. Submit under provisions of Section 01330:

1. Product Data: Include manufacturer's specifications, surface preparation and application instructions, and protection of adjacent surfaces.
2. Test Data: Confirm compliance with specified requirements.

### **1.4 QUALITY ASSURANCE**

A. Mockup

1. Clean and repair existing concrete surfaces under provisions of Section 01430.

### **1.5 DELIVERY, STORAGE AND HANDLING**

A. Deliver, store, and handle products under provisions of Section 01600.

B. Store materials in a dry area within temperature range recommended by manufacturer.

### **1.6 PROJECT CONDITIONS**

A. Apply materials within temperature range recommended by manufacturer.

B. Ensure adequate ventilation in application areas.

## **PART II -PRODUCTS**

### **2.1 MANUFACTURERS**

A. A. Manufacturer: Dayton Superior Corporation, 402 South First Street, Oregon, IL 61061, (800)

745-3707. (DSC)

B. Euclid Chemical Co.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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C. W.R. Grace Chemical Co.

D. Substitutions: As approved under provisions of Section 01630

### **2.2 MATERIALS – CLEANERS**

A. Concrete and Ceramic Tile Floor Cleaner, Degreaser, and Stripper:

1. Product: Concrete Floor Cleaner and Degreaser (DSC J-47).
2. Description: Water soluble cleaning and degreasing solution.

B. Wood or Vinyl Floor Cleaner, Degreaser, and Stripper:

1. Product: Citrus Peel (DSC J-48).
2. Description: Water soluble, biodegradable, cleaning, degreasing, and stripping solution.
3. VOC compliant.

### **2.3 MATERIALS – GRAFFITI CLEANERS**

A. Light Duty Graffiti Cleaner:

1. Product: Graffiti Klean (DSC J-45).
2. Description: Biodegradable, non-toxic graffiti cleaner.
3. VOC compliant.

B. Heavy Duty Graffiti Cleaner:

1. Product: Superior Graffiti Remover (DSC J-46) Gel.
2. Description: Heavy duty graffiti cleaner.
3. VOC compliant.

### **2.4 MATERIALS – CEMENTITIOUS PATCHING COMPOUNDS**

A. Non-Sag Patching Compound for Formed Vertical and Overhead Surfaces:

1. Products:
  - a. DSC HD-50.
  - b. “Verticoat Supreme” by The Euclid Chemical Company (or equal) one component, mircosilica and latex modified, non-sag repair mortar. Bonding strength of concrete to concrete after 28 days not less than 2,100 psi (ASTM C-882) and compressive strength of not less than 6,200 psi after 28 days (ASTM C109).

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

c. Approved Equal

2. Description: Fast setting, cement based, fiber reinforced, latex modified, heavy duty concrete patch for horizontal surfaces and vertical and overhead form-and-pour" applications.
3. Pourable and pumpable.
4. Meet ASTM C 928.
5. Compressive strength: Tested per ASTM C 109 with following results: Test Age Compressive Strength – psi (MPa) At 75 degrees F (24 degrees C)
  - a. 1 hour 2500 (17.2)–
  - b. 3 hours 3500 (24.1)
  - c. 1 day 6145 (42.4)
  - d. 7 days 7370 (50.8)
  - e. 28 days 7990 (55.1)
6. Bond strength: Tested per ASTM C 882 with following results: Test Age Bond Strength – psi (MPa)
  - a. 1 day 1950 (13.4)
  - b. 7 days 2550 (17.6)
7. Length change: Tested per ASTM C 928 with following results: Test Age Water Storage Air Storage Differential
  - a. 28 days Plus 0.03 percent Minus 0.09 percent 0.12 percent
8. Chloride ion permeability: Tested per ASTM C 1202.
  - a. Elapsed time: 360 minutes.
  - b. Total charge passed through specimen: 646 coulombs. c. Chloride permeability rating: Very low.

### **B. Fiber Reinforced Patching Compound for Floor Surfaces:**

1. Product: Day-Chem Perma Patch.
2. Description: Fast setting, cement based, fiber reinforced, silica fume, heavy duty concrete patch for horizontal surfaces.
3. Meet ASTM C 928.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

4. Compressive strength: Tested per ASTM C 109 with following results: Test Age Compressive Strength – psi (MPa)
  - a. 1 hour 2500 (17.2)
  - b. 3 hours 4000 (27.6)
  - c. 1 day 5200 (35.8)
  - d. 7 days 9000 (62.0)
  - e. 28 days 10,800 (74.5)
5. Length change: Tested per ASTM C 928 with following results: Test Age Water Storage Air Storage Differential 28 days Plus 0.03 percent Minus 0.07 percent 0.10 percent

### **C. Patching Compound for Thin Resurfacing of Floors:**

1. Product: DSC Thin Resurfacer.
2. Description: Cement based, polymer modified concrete patching and resurfacing compound for horizontal applications from 1/8 to 1/2 inch (3 to 13 mm).
3. Compressive strength: Tested per ASTM C 109 with following results: Test Age Compressive Strength – psi (MPa)
  - a. 1 day 1600 (11.0)
  - b. 3 days 3200 (22.0)
  - c. 7 days 5700 (39.3)
  - d. 28 days 6700 (46.2)
4. Bond strength: Tested per ASTM C 1042 with following results: Test Age Bond Strength – psi (MPa)
  - a. 7 days 2700 (18.6)
  - b. 28 days 3500 (24.1)
5. Flexural strength: 1100 psi (7.6 MPa), tested per ASTM C 78 at 28 days.

### **D. Polymer Modified Patching Compound for Floors:**

1. Product: DSC Polyfast.
2. Description: Cement based, polymer modified, shrinkage compensating concrete patching compound for vertical and overhead applications.
3. Meet ASTM C 928.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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4. Compressive strength: Tested per ASTM C 109 with following results: Test Age Compressive Strength – psi (MPa)
  - a. 1 day 4100 (22.2)
  - b. 3 days 6500 (44.8)
  - c. 7 days 8100 (55.8)
  - d. 28 days 9000 (62.0)
5. Bond strength: 5100 psi (35.1 MPa), tested per ASTM C 1042 at 7 days.
6. Flexural strength: 2000 psi (13.8 MPa), tested per ASTM C 348 at 28 days.
7. Chloride ion permeability: Tested per ASTM C 1202.
  - a. Elapsed time: 360 minutes.
  - b. Total charge passed through specimen: 8 coulombs.
  - c. Chloride permeability rating: Negligible.
8. Length change: Tested per ASTM C 928 with following results: Test Age Water Cure Air Cure 28 days Minus 0.027 percent Minus 0.03 percent

### **E. Fast Set Concrete Patching Compound:**

1. Product: Re-Crete 20 Minute Set with Ad Bond (DSC J-40).
2. Description: Cement based patching compound with accelerators.
3. Compressive strength: Tested per ASTM C 109 with following results: Test Age Compressive Strength – psi (MPa)
  - a. 1 day 2250 (15.5)
  - b. 3 days 5100 (35.2)
  - c. 28 days 8000 (55.1)

### **F. Water Stop Patching Compound:**

1. Product: Water Stop.
2. Description: Noncorrosive, non-rusting, hydraulic cement.
3. Compressive strength: Tested per ASTM C 109 with following results: Test Age Compressive Strength – psi (MPa)
  - a. 1 hour 975 (6.7)

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- b. 24 hours 1870 (12.9)
  - c. 3 days 2950 (20.3)
  - d. 7 days 3650 (25.1)
  - e. 28 days 5910 (40.7)
4. Setting time: 2–1/2 minutes initial, 3–1/2 minutes final; tested per ASTM C 266. Include one of the following epoxy adhesives for patching, resurfacing, and anchoring.

### **2.5 MATERIALS – EPOXY ADHESIVES**

#### **A. Epoxy Adhesive for Bonding Fresh to Existing Concrete and Anti-Corrosion for Steel:**

1. Products:
  - a. Sure Level Epoxy (DSC J–57).
  - b. “Duralprep AC” by The Euclid Chemical Company ([http://euclidchemical.com/product\\_catalog.asp?top=288](http://euclidchemical.com/product_catalog.asp?top=288)) or equal 3-part solvent free pre-proportioned, water based, epoxy-modified, cement bonding agent and anti-corrosion coating for steel reinforcement; used as a bonding agent for placing fresh concrete to existing concrete and for repair and restoration of concrete surfaces.
  - c. Approved Equal.
2. Description: Two component, pre-proportioned, 100 percent solids, low modulus, high strength, low viscosity epoxy.
3. VOC compliant.
4. Tested to ASTM C 881, Type 3, Grade 1, Classes B and C.
5. Compressive strength: 7500 psi (51.7 MPa) in 24 hours, tested per ASTM D 579.
6. Bond strength: 1600 psi (11.0 MPa) at 14 days, tested per ASTM C 882.
7. Tensile strength: 2500 psi (17.2 MPa), tested per ASTM D 638.

#### **B. Epoxy Adhesive for Anchors:**

1. Product: Sure–Anchor I (DSC J–51).
2. Description: Two–component, pre–proportioned, 100 percent solids, fast setting, moisture insensitive epoxy adhesive.
3. Tested to ASTM C 881, Types 1, 2, 4, and 5, Grade 3, Classes B and C.
4. VOC compliant.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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5. Compressive strength: 10,600 psi (73.0 MPa), tested per ASTM D 695 at 7 days.
6. Modulus of elasticity (compressive): 500,000 psi (3447 MPa), tested per ASTM D 695.
7. Water absorption: 0.9 percent, tested per ASTM D 570.
8. Concrete pullout resistance: Rod Diameter – Inches (mm) Hole Diameter – Inches (mm) Hole Depth – Inches (mm) Ultimate Pullout Strength based on Concrete Compressive Strength – pounds (kg)
  - a. 3500 (24) 4000 (27) 4500 (31)
  - b. 3/8 (10) 7/16 (11) 4 (102) 7100 (3216) 7150 (3238) 7190 (3257)
  - c. 3/8 (10) 7/16 (11) 5.5 (140) 8500 (3850) 8600 (3896) 8690 (3936)
  - d. 1/2 (13) 9/16 (14) 5 (127) 14,200 (6432) 14,400 (6523) 14,600 (6613)
  - e. 1/2 (13) 9/16 (14) 6.5 (165) 17,600 (7972) 17,800 (8063) 18,000 (8154)
  - f. 5/8 (16) 3/4 (19) 6 (152) 21,500 (9739) 21,700 (9830) 21,900 (9920)
  - g. 5/8 (16) 3/4 (19) 7.75 (197) 25,400 (11,506) 25,800 (11,687) 26,200 (11,868)
  - h. 3/4 (19) 7/8 (22) 7 (178) 28,600 (12,955) 28,800 (13,046) 29,200 (13,227)
  - i. 3/4 (19) 7/8 (22) 9.5 (240) 34,600 (15,673) 34,800 (15,764) 35,200 (15,945)

### **2.6 MATERIALS – EPOXY CRACK REPAIR**

#### **A. Epoxy Adhesive:**

1. Product: Sure-Inject (DSC J-56).
2. Description: Two component, pre-proportioned, 100 percent solids, low viscosity epoxy adhesive.
3. VOC compliant.
4. Tested to ASTM C 881, Types 1, 2, 4, and 5, Grade 1, Classes B and C.
5. Compressive strength: Minimum 13,000 psi (89.6 MPa), tested per ASTM D 695.
6. Concrete bond strength: 2000 psi (13.8 MPa) at 14 days, tested per ASTM C 882.
7. Tensile strength: 7400 psi (51 MPa) at 7 days, tested per ASTM D 638.
8. Water absorption: 0.23 percent, tested per ASTM D 570.
9. Shrinkage: Tested per ASTM C 883.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **2.7 MATERIALS – EPOXY REINFORCING STEEL SPRAY**

#### **A. Epoxy Reinforcing Spray:**

1. Product: Rebar Epoxy Spray (DSC J-62).
2. Description: Epoxy coating in self-contained spray applicator.
3. Color: Green.

### **2.8 MATERIALS – BONDING AGENTS**

#### **A. Epoxy Adhesive Bonding Agent Concrete to Concrete:**

1. Product: Resi-Bond (DSC J-58).
2. Description: Two component, pre-proportioned, 100 percent solids, high modulus, medium viscosity epoxy adhesive.
3. VOC compliant.
4. Tested to ASTM C 881, Types 1, 2, 4, and 5, Grade 2, Classes B and C and AASHTO M-235, Class III – Standard Version.
5. Compressive strength: Minimum 10,400 psi (71.7 MPa) in 7 days, tested per ASTM D 695.
6. Concrete bond strength: 2550 psi (17.6 MPa) at 2 days and 3150 psi (21.7 MPa) at 14 days, tested per ASTM C 882.
7. Tensile strength: 7580 psi (52.3 MPa) at 7 days, tested per ASTM D 638.
8. Water absorption: 0.13 percent, tested per ASTM D 570.
9. Modulus of elasticity: 275,000 psi (1896 MPa), tested per ASTM D 695.

#### **B. Latex Adhesive Bonding Agent Concrete to Concrete:**

1. Product: Day-Chem Ad Bond (DSC J-40).
2. Description: Non-reemulsifiable, acrylic latex emulsion bonding agent.
3. Tested to ASTM C 1059, Type II.
4. Bond strength: Tested per ASTM C 1042, Type II with following results: Test Age Compressive Strength – psi (MPa)
  - a. 14 days 1865 (12.9)
  - b. 28 days 2436 (16.8)

#### **C. Interior Bonding Agent:**



## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Product: Superior Concrete Bonder (DSC J-41). Do not use this product in exterior applications.
2. Description: Re-emulsifiable/re-wettable, polyvinyl acetate emulsion bonding agent.

### **2.9 SEALANTS**

- A. High-performance, low-modulus 1-part polyurethane, non-sag elastomeric sealant. ASTM C-920, Type S, Grade NS, Class 25 non-sag. Sikaflex – 15LM as manufactured by Sika Restoration Systems or approved equal.

### **2.10 MOISTURE RETAINING COVER**

- A. ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Euclid Chemicals high solids water based curing compound.
- C. W.R. Grace “Cure and Seal”

### **2.11 ACCESSORIES**

- A. Sand: Clean, well graded silica sand.
- B. Aggregate: 3/8 inch (10 mm) clean, washed pea gravel.

### **2.12 MIXING**

- A. Mix materials in accordance with manufacturer's instructions. Include the following for epoxy patching compounds.
- B. Epoxy Patching Compound: Add sand to mixed epoxy adhesive in accordance with manufacturer's instructions.
- C. Cementitious Patching Compound: Mix aggregate with patching compound at rate not to exceed manufacturer's recommended ratio.
- D. Do not over-water or retemper mixes.

## **PART III - EXECUTION**

### **3.1 GRAFFITI REMOVAL**

- A. Follow manufacturer's instructions for application and coverage.
- B. Apply cleaner in a flood coat by low pressure spray, roller, brush, or sponge.
- C. Allow cleaner to remain on surface for 5 to 10 minutes, then rinse completely with clean water.
- D. If graffiti remains on surface, reapply cleaner to affected areas and scrub with stiff bristle brush. Rinse completely with clean water.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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E. After surface has dried completely, apply anti-graffiti coating.

### **3.2 PREPARATION**

A. Clean surfaces to be patched or bonded:

1. Remove loose and foreign matter by sandblasting, chipping, wire brushing, or grinding.
2. Remove deteriorated and loose concrete to expose firm substrate.
3. Clean holes with bristle brush.
4. Remove remaining water and dust with clean, compressed air.
5. All oils, greases, dirt, old coatings or chemical contaminants must be removed. All steel surfaces should be blasted to a "Near White" metal finish using clean dry blasting media.

B. Protect adjacent and underlying surfaces.

### **3.3 APPLICATION – EPOXY REINFORCING SPRAY**

A. Follow manufacturer's instructions.

B. Apply to exposed reinforcing steel in several light, even coats.

### **3.4 APPLICATION – BONDING AGENTS**

A. Follow manufacturer's instructions.

B. Apply by brush, broom, or roller.

C. Place patching compounds within time period recommended by manufacturer, or recoat.

### **3.5 APPLICATION – INTERIOR EPOXY MORTAR FOR PATCHING OR OVERLAY**

A. Follow manufacturer's instructions.

B. Prime prepared substrate with mixed neat epoxy adhesive.

C. Apply epoxy mortar before primer becomes tack free.

D. Place in maximum 1 inch (25 mm) lifts. Allow each lift to cure before placing next lift.

E. Minimum thickness: 1/4 inch (6 mm).

F. Levels of Repair:

1. Level 1 repair consists of minor surface concrete crack and loose material removal and patch

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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repair.

2. Level 2 repair consists of medium depth concrete repair, removal of loose and damaged materials but no exposed rebar materials.
3. Level 3 repair consists of severe concrete repair. Missing and damaged concrete surfaces may require rebuilding. Exposed rebar is common.

### **3.6 APPLICATION – EXTERIOR EPOXY MORTAR PATCHING OR OVERLAY**

- A. Follow manufacturer's instructions.
- B. Prime prepared substrate with mixed neat epoxy adhesive.
- C. Apply epoxy mortar before primer becomes tack free.
- D. Thickness: 1/4 inch (6 mm) minimum to 1/2 inch (13 mm) maximum. Do not use the following for exterior slabs-on-grade.
- E. Levels of Repair:
  1. Level 1 repair consists of minor surface concrete crack and loose material removal and patch repair.
  2. Level 2 repair consists of medium depth concrete repair, removal of loose and damaged materials but no exposed rebar materials.
  3. Level 3 repair consists of severe concrete repair. Missing and damaged concrete surfaces may require rebuilding. Exposed rebar is common.

### **3.7 APPLICATION – EPOXY BROADCAST OVERLAY**

- A. Follow manufacturer's instructions.
- B. Prime prepared substrate with mixed neat epoxy adhesive.
- C. Apply mixed epoxy before primer becomes tack free, using notched squeegee.
- D. After material levels, broadcast sand slowly over surface at rate of 2 pounds per square foot (10 kg/sq m); allow to settle into epoxy binder. Remove excess sand after epoxy sets.
- E. After first coat has dried, apply second coat of epoxy and sand.

### **3.8 APPLICATION – EPOXY CRACK REPAIR**

- A. Follow manufacturer's instructions.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- B. Replace loose, missing or torn joint sealant with specified sealant. Prime and install the sealant in accordance with sealant manufacturer's instructions. For all concrete cracks greater than 1/16" in width; V-groove out the joint to a minimum 1/4" width and install a urethane sealant.
- C. Space injection holes at 8 to 36 inch (200 to 900 mm) intervals depending on crack width and thickness of member.
- D. Set injection ports in epoxy adhesive and allow to cure.
- E. Seal cracks with epoxy adhesive to prevent loss of injected epoxy.
- F. Inject epoxy to refusal.
- G. After curing, remove injection ports and grind surfaces smooth.

### **3.9 PATCHING HORIZONTAL SURFACES – CEMENTITIOUS COMPOUNDS**

- A. Follow manufacturer's instructions.
- B. Saw cut perimeter of area to be repaired.
- C. Wet surfaces or apply bonding agent.
- D. Thoroughly work repair material into substrate.
- E. Float or trowel smooth and flush with adjacent surfaces.
- F. Finish to match texture of surrounding concrete.
- G. Cure surfaces immediately after finishing to prevent moisture loss; apply curing compound or use wet burlap. Protect concrete from excessive hot temperatures. Comply with recommendations in ACI 305R for hot-weather protection during curing.
  - 1. If curing compound is used, cure with Euclid Chemicals high solids, water based curing compound or equal. Under hot, dry, direct sunlight or windy conditions apply a second coat of curing compound after the first has dried.
  - 2. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

### **3.10 PATCHING VERTICAL AND OVERHEAD SURFACES – CEMENTITIOUS COMPOUNDS**

- A. Follow manufacturer's instructions.
- B. Wet surfaces or apply bonding agent.
- C. Thoroughly work material into substrate without voids.

## **SECTION 03900 – CONCRETE RESTORATION AND CLEANING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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D. Float or trowel smooth and flush with adjacent surfaces.

E. Finish to match texture of surrounding concrete.

F. Cure surfaces immediately after finishing to prevent moisture loss; apply curing compound. Protect concrete from excessive hot temperatures. Comply with recommendations in ACI 305R for hot-weather protection during curing.

1. Curing compound is required. Cure with Euclid Chemicals high solids, water based curing compound or equal. Under hot, dry, direct sunlight or windy conditions apply a second coat of curing compound after the first has dried.
2. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

### **3.11 DEFECTIVE CONCRETE:**

A. Repair and patch defective areas when approved by Owner's Representative. Remove and replace patch to Owner's Representative's approval.

**END OF SECTION**

**DIVISION 4- MASONRY**

**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**

**VEHICLE TESTING FACILITY**

**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I -GENERAL**

#### **1.1 SECTION INCLUDES**

**A. Single-Wythe (CMU or Jumbo Brick) Wall Drainage Plane:**

**1. Interior Above Grade (CMU or Jumbo Brick) Wall:**

- a. Perforated Control Cavity. (PCC 4816)
- b. Perforated Control Cavity. (PCC 4832)
- c. 10MM Perforated Control Cavity. (PCC 2416)
- d. 10MM Perforated Control Cavity. (PCC 2432)

**2. Interior Below Grade Drainage Plane:**

- a. Control Cavity. (CC 4800)
- b. 10MM Control Cavity. (CC 4810)

**3. Interior Below Grade (Basement) Floor Retrofit Cap Slab Slip Sheet/Drainage Plane:**

- a. Control Cavity. (CC 4800)
- b. 10MM Control Cavity. (CC 4810)

**B. Exterior Horizontal Low Slope Drainage Plane and Slip Sheet:**

- 1. Sure Cavity. (SC 5016 & SC 5032)

**C. Window Rough Opening Sill Drainage Plane:**

- 1. Window Drainage Plane. (WDP 5000)

**D. Weep Systems:**

**1. Hollow Core Masonry Units (CMU - Jumbo Brick) as Single Wythe Walls:**

- a. Cavity Weep. (CV 5010)

**2. Hollow Core Masonry Units (CMU - Jumbo Brick) as Veneers:**

- a. Core Cavity Weep. (CCV 5020)

**3. Hollow Core Masonry Units (CMU - Jumbo Brick) as Below Grade Foundation Walls:**

- a. Vent Mat. (VM 9025)

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### 4. Steel Lintel:

- a. Head Joint Weeps. (HJW 3845)

### 5. Concealed Steel Lintel:

- a. Concealed Steel Lintel/Shelf Angle Weep System. (CLW 9040)

### 6. Shelf Angle:

- a. Head Joint Weeps. (HJW 3845)
- b. Vent Strip. (VS 3845)

### 7. Concealed Shelf Angle:

- a. Concealed Steel Lintel/Shelf Angle Weep System. (CLW 9040)
- b. Vent Strip. (VS 3845)

## **E. Masonry Accessories:**

- 1. L & R Weep Screed. (LR 3501)
- 2. Weep Screed Deflector. (WSD 1309)
- 3. Edge Metal. (MEM 3168)
- 4. Vented Edge Metal. (VMEM 3168)
- 5. Moisture Diverter. (DS 2858)
- 6. Mortar Belt. (MB 3550)
- 7. Trash Mortar Diverter. (TMD 9548)
- 8. Floor Edging. (FE 8555)
- 9. H Cove. (HC 3504)
- 10. Sump Basket. (SF30PR)

## **1.2 RELATED SECTIONS**

- A.** Section 03 30 00 - Cast-in-Place Concrete.
- B.** Section 04 70 00 - Manufactured Masonry.
- C.** Section 06 10 00 - Rough Carpentry.
- D.** Section 07 27 00 - Air Barriers.



## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **1.3 REFERENCES**

**A. ASTM International (ASTM):**

1. ASTM C 1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.
2. ASTM SEQ CHAPTER 1E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
3. ASTM E 2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2003.
4. ASTM G 154 - Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials; 2000a (2006).

### **1.4 SUBMITTALS**

**A. Submit under provisions of Section 01 30 00 - Administrative Requirements.**

**B. Product Data: Manufacturer's data sheets on each product to be used, including:**

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

**C. Shop Drawings: Provide drawings of special joint conditions.**

**D. Sustainable Design Submittals:**

1. Submit invoices and documentation from manufacturer of the amounts of pre-consumer and post-consumer recycled content for products specified.
2. Submit invoices and documentation showing manufacturing locations and origins of materials for products manufactured and sourced within 500 miles of project location.

**E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square representing actual product, color, and patterns.**

### **1.5 QUALITY ASSURANCE**

**A. Manufacturer Qualifications: Minimum 5 year experience manufacturing similar products.**

**B. Installer Qualifications: Minimum 2 year experience installing similar products.**

### **1.6 PRE-INSTALLATION MEETINGS**

**A. Convene minimum two weeks prior to starting work of this section.**

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements: Store materials in clean, dry, inside area in accordance with manufacturer's instructions. Protect materials from damage during handling and installation.

### **1.8 PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

### **1.9 SEQUENCING**

- A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

### **1.10 WARRANTY**

- A. Manufacturer Warranty: Submit manufacturer's standard 20 year limited warranty.

## **PART II -PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: Masonry Technology, Inc, which is located at: 24235 Electric St. P. O. Box 214; Cresco, IA 52136; Toll Free Tel: 800-879-3348; Tel: 563-547-1122; Fax: 563-547-1133; Email:[request info \(info@mtidry.com\)](mailto:info@mtidry.com); Web:[www.mtidry.com](http://www.mtidry.com)
- B. Requests for substitutions will be considered.

### **2.2 SINGLE-WYTHE MOISTURE CONTROL - PERFORATED CONTROL CAVITY (PCC 4816 & PCC 4832)**

- A. Description: Maintains separation between interior surface of single-wythe concrete masonry unit (CMU) substrate and moisture sensitive interior finished walls creating drainage system that allows moisture to drain down and out of walls.
- B. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations and a cross-woven polyolefin fabric, green color, attached on one side with a 4 inches (102 mm) overlapping skirt on one edge.
  - 1. Roll Length: 50 feet (15.24 m).
  - 2. Roll Width: 15.75 inches (324 mm) (PCC4816).

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

3. Roll Width: 31.5 inches (800 mm) (PCC4832).

4. Squared - Channel Depth: 3/16 inch (4.76 mm).

### **C. Performance Criteria:**

1. Fungi Resistance: No Growth; ASTM C 1338.

2. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

3. Load: 583 lbf at 10 percent strain; ASTM D 1621.

a. Compressive Strength: 36.1 psi at 10 percent strain; ASTM D 1621.

b. Compressive Modulus: 362 psi; ASTM D 1621.

## **2.3 SINGLE-WYTHE MOISTURE CONTROL - 10MM PERFORATED CONTROL CAVITY (PCC 2416 & PCC 2432)**

A. Description: Maintains separation between interior surface of single-wythe concrete masonry unit (CMU) substrate and moisture sensitive interior finished walls creating drainage system that allows moisture to drain down and out of walls.

B. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations and a cross-woven polyolefin fabric, green color, attached on one side with a 4 inches (102 mm) overlapping skirt on one edge.

1. Roll Length: 25 feet (7.62 m).

2. Roll Width: 15.75 inches (324 mm) (PCC2416).

3. Roll Width: 31.5 inches (800 mm) (PCC2432).

4. Angled - Channel Depth: 7/16 inch (11 mm).

### **C. Performance Criteria:**

1. Fungi Resistance: No Growth; ASTM C 1338.

2. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

3. Compressive Strength: At 10 percent strain; ASTM D 1621.

a. 4.9 psi (PCC 2432).

b. 5.6 psi (PCC 2416).

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **2.4 CAVITY DRAINAGE PLANES - CONTROL CAVITY (CC 4800)**

- A. Description: Provides separation between wood framing, insulation and gypsum board from concrete or masonry wall substrates and providing ventilation of these cavities.
- B. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations.
  - 1. Roll Length: 50 feet (15.24 m).
  - 2. Roll Width: 31.5 inches (800 mm).
  - 3. Squared - Channel Depth: 3/16 inch (4.76 mm).

### **2.5 PERFORMANCE CRITERIA:**

- 1. Fungi Resistance: No Growth; ASTM C 1338.
- 2. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.
- 3. Load: 583 lbf at 10 percent strain; ASTM D 1621.
  - a. Compressive Strength: 36.1 psi at 10 percent strain; ASTM D 1621.
  - b. Compressive Modulus: 362 psi; ASTM D 1621.

### **2.6 WINDOW SUB-SILL DRAINAGE PLANES WINDOW DRAINAGE PLANE (WDP 5000)**

- A. Description: Creates a horizontal and vertical void that separates the bottom side of the window frame from the top (slope to drain) sill pan flashing and the back side of the veneer from the face of the sill pan flashing.
- B. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations and bent into L-Shape, 5 inches (127 mm) wide by 9 inches (229 mm) high, to fit on top of sub-sill area of window rough opening prior to window installation.
  - 1. Length: 4 feet (1.2 m).
  - 2. Curved - Channel Depth: 1/8 inch (3.25mm).
  - 3. Window Drainage Plane - WDP 5000
- C. Performance Criteria:
  - 1. Fungi Resistance: No Growth; ASTM C 1338.
  - 2. Ultra-Violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **2.7 WEEP SYSTEMS FOR HOLLOW CORE MASONRY UNITS (CMU - JUMBO BRICK) AS SINGLE WYTHE WALLS**

#### **A. Cavity Weep (CV 5010):**

1. Description: Forms the bottom side of the bed joint of mortar on the exterior face shell to create tunnels/ channels that reach from the outside surface of the exterior face shell into the open core of a single wythe (CMU or jumbo brick) wall.
2. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations.
  - a. Weep Legs: 2-1/4 inch (57 mm) wide at 9-1/2 inches (242 mm) on center.
  - b. Continuous Belt Width: 1 inch (25 mm).
  - c. Overall Width: 6 inches (152 mm).
  - d. Length: 25 feet (7.6 m).
  - e. Squared - Channel Depth: 3/16 inch (4.76 mm).
  - f. Color: Translucent.
3. Performance Criteria:
  - a. Fungi Resistance: No Growth; ASTM C 1338.
  - b. Ultra-violet (UV) Exposure: No Cracking, checking, crazing, erosion or other characteristics that might affect performance; ASTM G 154.

### **2.8 WEEP SYSTEMS FOR HOLLOW CORE MASONRY UNITS (CMU - JUMBO BRICK) AS BELOW GRADE FOUNDATION WALLS**

#### **A. Vent Mat (VM 9025):**

1. Description: Forms the bottom side of the bed joint of mortar on the interior face shell to create tunnels/ channels that connect the core to the interior surface of the foundation wall and interior edge of the footing.
2. Material: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations.
  - a. Weep Legs: 2-1/4 inches (57 mm) wide at 4-1/2 inches (114.3 mm) on center.
  - b. Continuous Belt Width: 2-1/2 inches (63.5 mm).
  - c. Overall Width: 11-1/2 inches (292 mm).
  - d. Length: 25 feet (7.6 m).

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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e. Squared - Channel Depth: 3/16 inch (4.76 mm).

f. Color: Black.

### **3. Performance Criteria:**

a. Fungi Resistance: No Growth; ASTM C 1338.

b. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

## **2.9 WEEP SYSTEM FOR STEEL LINTEL**

### **A. Head Joint Weeps (HJW 3845):**

1. Description: Is a 3/8 inch x 3/8 inch spacer that is installed in each head joint of brick course laid dry on a flashing system that covers a steel lintel. It maintains a 3/8 inch high void in the bottom of the head joint of mortar from the exterior surface of the full brick veneer back into the vertical void created by the rainscreen drainage plane Sure Cavity (SC 5016/SC 5032), 10MM Sure Cavity (SCMM 2516/SCMM 2532) or Gravity Cavity (GC 1832).

2. Materials: Acetac, 0.24 inch (0.6 mm) thick.

a. Width: 3/8 inch (9.5 mm).

b. Height: 3/8 inch (9.5 mm).

c. Length: 4 1/2 inches (114mm) to 9 inches (228 mm).

d. Color: Light gray.

## **2.10 WEEP SYSTEM FOR CONCEALED STEEL LINTEL**

### **A. Concealed Steel Lintel/Shelf Angle Weep System (CLW 9040):**

1. Description: Forms the bottom side of the bed joint of mortar and the front nose of the bed joint of mortar to create tunnels/channels from behind the lip of a lip brick at the front of the steel lintel into the vertical void created by rainscreen drainage plane Sure Cavity (SC 5016/SC 5032) or 10MM Sure Cavity (SCMM 2516/SCMM 2532) or Gravity Cavity (GC 1832).

2. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations and bent into L-Shape, 5 inches (127 mm) or less on one leg by 9 inches (229 mm) or less on other leg.

a. Length: 4 feet (1.2 m).

b. Curved - Channel Depth: 1/8 inch (3.25 mm).

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **3. Performance Criteria:**

- a. Fungi Resistance: No Growth; ASTM C 1338.
- b. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

## **2.11 WEEP SYSTEM FOR SHELF ANGLE**

### **A. Head Joint Weeps (HJW 3845):**

1. Description: Is a 3/8 inch x 3/8 inch spacer that is installed in each head joint of brick course laid dry on a flashing system that covers a shelf angle. It maintains a 3/8 inch high void in the bottom of the head joint of mortar from the exterior surface of the full brick veneer back into the vertical void created by the rainscreen drainage plane, Sure Cavity (SC 5016/SC 5032) or 10MM Sure Cavity (SCMM 2516/SCMM 2532) or Gravity Cavity (GC 1832).
2. Materials: Acetac, 0.24 inch (0.6mm) thick.
  - a. Width: 3/8 inch (9.5 mm).
  - b. Height: 3/8 inch (9.5 mm).
  - c. Length: 4-1/2 inches (114 mm) to 9 inches (228 mm)
  - d. Color: Light gray.

### **B. Vent Strip (VS 3845):**

1. Description: Forms a flexible joint and maintains ventilation opening at top of masonry veneer or underside of the expansion pad mounted on the underside of the shelf angle from outside surface of the brick veneer into the cavity of the full brick veneer or into the vertical drainage plane created by the rainscreen drainage plane Sure Cavity (SC 5016/SC 5032) or 10MM Sure Cavity (SCMM 2516/SCMM 2532) or Gravity Cavity (GC 1832).
2. Materials: High impact polystyrene sheets, 0.024 inch (0.61mm) thick, formed with corrugations.
  - a. Width: 4-5/8 inch (117 mm).
  - b. Length: 50 feet (15.2 m)
  - c. Curved - Channel Depth: 1/8 inch (3.25 mm).

### **3. Performance Criteria:**

- a. Fungi Resistance: No Growth; ASTM C 1338.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- b. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

### **2.12 WEEP SYSTEM FOR CONCEALED SHELF**

#### **A. Concealed Steel Lintel/Shelf Angle Weep System (CLW 9040):**

1. Description: Forms the bottom side of the bed joint of mortar and the front nose of the bed joint of mortar to create tunnel / channels from behind the lip of a lip brick at front of the steel lintel into the vertical void created by rainscreen drainage plane Sure Cavity (SC 5016/SC 5032) or 10MM Sure Cavity (SCMM 2516 /SCMM 2532) or Gravity Cavity (GC 1832).
2. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations and bent into L-Shape, 5 inches (127 mm) or less on one leg by 9 inches (229 mm) or less on other leg.
  - a. Length: 4 feet (1.2 m).
  - b. Curved - Channel Depth: 1/8 inch (3.25 mm).
3. Performance Criteria:
  - a. Fungi Resistance: No Growth; ASTM C 1338.
  - b. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

#### **B. Vent Strip (VS 3845):**

1. Description: Forms flexible joint and maintains ventilation opening at top of masonry veneer or underside of the expansion pad mounted on the underside of the shelf angle from outside surface of the full brick veneer into the cavity of the full brick veneer or into the vertical drainage plane created by the rainscreen drainage plane, Sure Cavity (SC 501 /SC 5032) or 10MM Sure Cavity (SCMM 2516/SCMM 2532) or Gravity Cavity (GC 1832).
2. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations.
  - a. Width: 4-5/8 inch (117 mm).
  - b. Length: 50 feet (15.2 m)
  - c. Curved - Channel Depth: 1/8 inch (3.25 mm).
3. Performance Criteria:



## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- a. Fungi Resistance: No Growth; ASTM C 1338.
- b. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

### **2.13 MASONRY ACCESSORIES**

#### **A. L & R Weep Screed (LR 3501):**

- 1. Description: A sheet metal device that creates a bottom of thin veneer wall termination detail that encapsulates and weeps the bottom edge of the WRB, the bottom edge of the rainscreen drainage plane Sure Cavity (SC 5016 / SC 5032) or Gravity Cavity (GC 1832). The bottom edge of the self-furring expanded metal lath and scratch coat, a metal detail that bridges the construction joint created by the bottom of the wall sheathing and the top outside edge of the foundation wall.
- 2. Material: 26 gauge galvanized steel, bent into "V" shaped channel, with a long vertical leg and a short leg at 70 degree angle out from other leg and slots punched into bottom edge.
  - a. Length of Long Vertical Leg: 3-1/2 inches (38 mm).
  - b. Anchor Holes in Vertical Leg: 3/16 inch (4.76 mm) diameter.
    - i. Vertical Spacing: 1-5/16 inches (33.3 mm) apart.
    - ii. Horizontal Spacing: 2-3/4 inches (69.8 mm) apart.
  - e. Length of Short Leg: 1-1/32 inch (26.19 mm).
  - f. Length of Slots: 1 inch (25.4 mm).
  - g. Space between Slots: 1-3/4 inches (44 mm).
  - h. Length: 8 feet (2.4 m).

#### **B. Weep Screed Deflector (WSD 1309):**

- 1. Description: Formed metal termination material that provides mechanical termite barrier, used with weep screed to deflect drainage water away from foundation wall.
- 2. Material: 26 gauge galvanized steel, bent into "L" shaped channel, with long vertical leg and short leg at 120 degree angle out from other leg.
  - a. Length of Long Vertical Leg: 3 1/2 inches (88.9 mm).
  - b. Anchor Holes in Vertical Leg: 3/16 inch (4.76 mm) diameter.
    - i. Vertical Spacing: 1-5/16 inches (33.3mm) apart.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

ii. Horizontal Spacing: 2-3/4 inches (69.8mm) apart.

c. Length of Short Leg: 51/64 inch (20.24 mm)

d. Length: 8 feet (2.4m).

### **C. MTI Edge Metal (MEM 3168):**

1. Description: Formed metal termination to accommodate rainscreen drainage plane material.

2. Material: 26 gauge galvanized steel, bent into "J" shaped channel, with long vertical leg and short leg at 5 degree angle out from other leg.

a. Length of Long Vertical Leg: 3-21/32 inches (92.9 mm).

b. Anchor Holes in Vertical Leg: 3/16 inch (4.76 mm) diameter

i. Vertical Spacing: 1-5/16 inches (33.3 mm) apart.

ii. Horizontal Spacing: 2-3/4 inches (69.8 mm) apart.

c. Length of Short Leg: 3/8 inch (9.5mm)

d. Width at Bottom: 11/32 inch (8.6mm).

e. Length: 8 feet (2.4m).

### **D. Vented MTI Edge Metal (VMEM 3168):**

1. Description: Formed metal termination to accommodate rainscreen drainage plane material and weep.

2. Material: 26 gauge galvanized steel, bent into "J" shaped channel, with long vertical leg and short leg at 5 degree angle out from other leg and slots punched into bottom edge.

a. Length of Long Vertical Leg: 3-21/32 inches (92.9 mm).

b. Anchor Holes in Vertical Leg: 3/16 inch (4.76 mm) diameter

i. Vertical Spacing: 1-5/16 inches (33.3mm) apart.

ii. Horizontal Spacing: 2-3/4 inches (69.8 mm) apart.

c. Length of Short Leg: 3/8 inch (9.5 mm)

d. Width at Bottom: 11/32 inch (8.6 mm).

e. Length of Slots: 1 inch (25.4 mm)

f. Space Between Slots: 1.75 inches (44.45 mm).

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

g. Length: 8 feet (2.4 m).

### **E. Moisture Diverter (DS 2858):**

1. Description: Forms a diversion for moisture above wall openings such as windows and doors, directing the moisture to one side of opening and away from these moisture sensitive wall details.
2. Materials: 26 gauge galvanized steel, bent into "L" shaped channel, with long vertical leg and short leg at 65 degree angle out from other leg.
  - a. Length of Long Vertical Leg: 1-7/8 inches (47.6 mm).
  - b. Length of Short Leg: 5/8 inch (15.9 mm)
  - c. Length: 4 feet (1.2 m).

### **F. Mortar Belt (MB 3550):**

1. Description: Forms a barrier within cores of CMU to suspend and trap mortar occurring within cells.
2. Materials: High impact polystyrene sheets, 0.024 inch (0.61mm) thick, formed with corrugations.
  - a. Width: 3-1/2 inch (89 mm).
  - b. Length: 50 feet (15.2 m).
  - c. Squared - Channel Depth: 3/16 inch (4.76 mm).
  - d. Color: Black.
3. Performance Criteria:
  - a. Fungi Resistance: No Growth; ASTM C 1338.
  - b. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

### **G. Trash Mortar Diverter (TMD 9548):**

1. Description: Formed in a "V" Shape to hold and encapsulate trash mortar and prevent mortar bridging within 1-1/2 inch (38.1 mm) to 3 inches (76.2 mm) wide cavity air space.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

2. Materials: High impact polystyrene sheets, 0.024 inch (0.61 mm) thick, formed with corrugations and bent into V-Shape, with 8-1/2 inches (216 mm) back leg and 5-1/2 inch (140 mm) front leg. Contains weep holes at 2-1/2 inches (63.5 mm) on center in bottom of "V" and at 1 inch (25.4 mm) on center up each leg.

- a. Length: 4 feet (1.2 m).

- b. Squared - Channel Depth: 3/16 inch (4.76 mm).

- c. Color: Black.

3. Performance Criteria:

- a. Fungi Resistance: No Growth; ASTM C 1338.

- b. Ultra-violet (UV) Exposure: No Peeling, chipping, cracking, flaking, pitting, crazing, erosion or other deleterious effects were observed under a 5X magnification; ASTM G 154.

## **PART III -EXECUTION**

### **3.1 EXAMINATION**

- A. Do not begin installation until substrates have been properly prepared.

- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.2 PREPARATION**

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **3.3 VERIFICATION OF CONDITIONS**

- A. Verify that field conditions are acceptable and are ready to receive this work.

- B. Verify that related items provided under other sections are properly sized and located.

### **3.4 DRAINAGE PLANE INSTALLATION**

- A. Install systems in accordance with manufacturer's instructions and as follows.

1. Rainscreen Drainage Planes for Full Brick Veneers:

- a. Install first course of rainscreen drainage plane with fabric side facing to weather with 4 inches (102 mm) fabric skirt overlapping continuous belt of Cavity Weep (CV 5010).

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- b. Install successive courses so 4 inches (102 mm) long fabric skirt overlaps top edge of lower course of rainscreen drainage plane -- Sure Cavity (SC 5016 or SC 5032), 10MM Sure Cavity (SCMM 2516 or SCMM 2532), or Gravity Cavity (GC 1816 or GC 1832).
  - c. As an Contractor Option to Cavity Weep (CV 5010) at the bottom of wall and as a weep system to accommodate the top of wall openings details, install Wall Opening Weeps (WOW 9095), 10-1/2 inches (267 mm) on center with appropriate leg 5 inches or 9 inches (127 mm or 229 mm) extending up the backup wall behind Sure Cavity (SC 5016 or SC 5032), 10MM Sure Cavity (SCMM 2516 or SCMM 2532), or Gravity Cavity (GC 1816 or GC 1832) and horizontal leg 5 inches or 9 inches (127 mm or 229 mm) extending out from face of brick veneer a minimum of 1 inch or 1-1/2 inches (25 mm or 38 mm).
  - d. Tool joints and lightly score weep legs at face of brick veneer and crack off by pushing downward while mortar is still plastic.
  - e. Finish tool joints and brush brick wall.
  - f. Install the required accessories to accommodate wall opening and top of wall detail etc.
2. Drainage Plane for the Interior Surface of an Above Grade Single-Wythe (CMU or Jumbo Brick) Wall:
- a. Install Perforated Control Cavity (PCC 4816 and PCC 4832) or 10MM Perforated Control Cavity (PCC 2416 - PCC 2432) with the fabric facing to the interior of the living area.
  - b. Install Perforated Control Cavity with the 4 inches (102 mm) fabric skirt tucked behind the top edge of the fabric of the course below it.
  - c. Fasten Perforated Control Cavity 1 foot (305 mm) on center.
  - d. Install first course of Perforated Control Cavity with the 4 inches (102 mm) fabric skirt back wrapped.
  - e. Install of Perforated Control Cavity with the bottom edge approximately 4 inches to 6 inches (102 mm to 152 mm) below bottom elevation or concrete floor.
  - f. Install the first course of Perforated Control Cavity with the bottom edge into the drain field of the perimeter sub slab drain field drain tile system.
  - g. All wall openings shall be furred out to meet approximate interior finish plane.
  - h. Install Perforated Control Cavity with the edges abutting furred outsides and bottoms of all openings.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- i. Install Moisture Diverter (DS 2858) with a 1/4 inch (6.24 mm) slope to drain per foot to the interior surface of single wythe wall, approximately 4 inches to 6 inches (102 mm to 152 mm) above furred out wall openings, with the ends of the moisture diverter extending 4 inches to 6 inches (102 mm to 152 mm) passed the outside edge of wall opening side furring.
    - j. Install approximately 4 inches to 6 inches (102 mm to 152 mm) wide flashing tape over top edge of the Moisture Diverter (DS 2858).
    - k. Install corrugated plastic bottom edge of Perforated Control Cavity into Moisture Diverter (DS 2858) with 4 inches (102 mm) fabric skirt overlapping Moisture Diverter.
  3. Window Sub-Sill Drainage Plane (Rainscreen Drainage Plane for Window Rough Opening Sill. View examples at <http://www.mtidry.com/hyperspecs/> and Wall Openings.
    - a. Install Window Drainage Plane (WDP 5000) on the horizontal and vertical surfaces of the waterproofing system (sill pan) at bottom of window rough opening.
    - b. Minimize fastening vertical leg only.
    - c. Fabricate horizontal leg of window drainage plane to fit dimensions of horizontal plane of rough opening.
    - d. Install window.
- B. Interface with Other Work: Provide proper installation of other materials and work as required for a complete and properly functioning system.
- C. Install systems in accordance with manufacturer's instructions and as follows:
  1. Weep Systems for Hollow Core Masonry Units (CMU - Jumbo Brick) as a Single Wythe Wall:
    - a. Cavity Weep (CV 5010) installed in conjunction with a through wall Z flashing system. Installed on the first course above a bond beam.
      - i. Install Cavity Weep (CV 5010) on the lower horizontal surface of the Z flashing.
      - ii. Position Cavity Weep (CV 5010) with the back of the 1 inch (25 mm) continuous belt 1/2 inch (12 mm) from the vertical surface of the Z flashing and the 6 inches (152 mm) legs extending out from the exterior face of the wall.
      - iii. Cut down to the appropriate height Sure Cavity (SC 5016) or 10MM Sure Cavity (SCMM 2516) and install to the vertical surface of Z flashing trim 4 inches (102 mm) fabric skirt to overlay Cavity Weeps 1 inch (25 mm) continuous belt.
      - iv. Install mortar bed joint atop weep system and lay CMU.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

- v. Tool joints and lightly score weep legs along face of CMU wall and crack off by pushing downward while mortar is still plastic.
    - vi. Finish-tool joints and brush wall
    - vii. Install required accessories to accommodate wall opening and top of wall details.
  - b. Cavity Weep (CV 5010) install on the top of a CMU bond beam with the top surface of the grouted bond beam struck off with a 1/4 inch (6 mm) slope to drain to the exterior of the wall.
    - i. Install Cavity Weep (CV 5010) on the top surface of the sloped to drain water proofed bond beam.
    - ii. Center 1 inch (25 mm) continuous belt of Cavity Weep on CMU wall with 6 inches (152 mm) legs extended out past the exterior surface of the wall.
    - iii. Install mortar bed joint atop weep system and lay CMU.
    - iv. Tool joint and lightly score weep leg along face of CMU wall and crack off by pushing downward while mortar is still plastic.
    - v. Finish-tool joints and brush wall.
    - vi. Install required accessories to accommodate wall opening and top of wall details.
- 2. Weep Systems for Hollow Core Masonry Units (CMU - Jumbo Brick) as a Below-Grade Foundation Wall:
  - a. Vent Mat (VM 9025):
    - i. Install Vent Mat (VM 9025) on footing with the 1-1/2 inches (38 mm) continuous belt centered on wall with the weep legs extending past the interior face of the CMU wall and over the interior edge of the footing.
    - ii. Install mortar bed joint atop weep system and lay CMU.
    - iii. Finish-tool joints and clean excess mortar off footing.
    - iv. Install required accessories to accommodate wall opening and top of wall details.
- 3. Weep System for Steel Lintels (When masonry units are laid dry/no bed joint of mortar on flashing):
  - a. Rainscreen Drainage Plane: Sure Cavity (SC 5016 or SC 5032), 10MM Sure Cavity (SCMM 2516 or SCMM 2532) or Gravity Cavity (GC 1832).
    - i. Install Sure Cavity or Gravity Cavity on vertical surface of flashing, WRB and vertical leg of steel lintel with 4 inches (102 mm) fabric skirt overlapping the back ends of the Head Joint Weeps (HJW 3845).

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- ii. Trim 4 inches (102 mm) fabric skirt to appropriate length.
- b. Head Joint Weeps (HJW 3845):
  - i. Install Head Joint Weeps as spacers at each head joint, beginning with the first head joint on steel lintel.
  - ii. Position Head Joint Weeps with the front end flush with the exterior face of full brick veneer and the back end extending into cavity or vertical void created by Sure Cavity or Gravity Cavity.
  - iii. Strengthen up first course of masonry units.
  - iv. Spread bed joint of mortar on top of first course of masonry units.
  - v. Tuckpoint bed joint of mortar into head joints.
  - vi. Tool finish mortar joints.
  - vii. Install required accessories to accommodate wall opening and top of wall details.
- 4. Weep System for Concealed Steel Lintels:
  - a. Rainscreen Drainage Plane: Sure Cavity (SC 5016/SC 5032), 10MM Sure Cavity (SCMM 2516/ SCMM 2532) or Gravity Cavity (GC 1832).
    - i. Install Sure Cavity or Gravity Cavity on vertical surface of flashing, WRB, and vertical leg of steel lintel with 4 inches (102 mm) fabric skirt overlapping the back edge of Concealed Steel Lintel / Shelf Angle Weep (CLW 9040).
    - ii. Trim 4 inches (102 mm) fabric skirt to appropriate length.
  - b. Concealed Steel Lintel/Shelf Angle Weep (CLW 9040):
    - i. Install Concealed Steel Lintel/Shelf Angle Weeps on horizontal leg of steel lintel over drip plate and flashing system.
    - ii. Cut (CLW 9040) to required size.
    - iii. Position (CLW 9040) with the front nose edge over the front edge of the lintel flashing and the back edge into the vertical void created by the Sure Cavity (SC 5016/SC 5032), 10MM Sure Cavity (SCMM 2516/SCMM 2532), or Gravity Cavity (GC 1832).
    - iv. Spread bed joint of mortar and lay masonry unit (lip brick).
    - v. Finish tool joint
    - vi. Clean out and finish-tool mortar joint up under lip of lip brick.
    - vii. Install required accessories to accommodate wall opening and top of wall details.



## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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5. Weep System for Shelf Angle (when masonry units are laid dry/no bed joint of mortar on flashing):
  - a. Rainscreen Drainage Plane: Sure Cavity (SC 5016/SC 5032), 10MM Sure Cavity (SCMM 2516/ SCMM 2532) or Gravity Cavity (GC 1832).
    - i. Install Sure Cavity or Gravity Cavity on vertical surface of flashing, WRB and vertical leg of shelf angle with 4 inch fabric skirt overlapping the back ends of the Head Joint Weeps (HJW 3845).
    - ii. Trim 4 inches (102 mm) fabric skirt to appropriate length.
  - b. Head Joint Weeps (HJW 3845):
    - i. Install Head Joint Weeps as spacers at each head joint, beginning with the first head joint on shelf angle.
    - ii. Position Head Joint Weeps with the front end flush with the exterior face of full brick veneer and the back end extending into cavity or vertical void created by Sure Cavity or Gravity Cavity.
    - iii. Strengthen up first course of masonry units.
    - iv. Spread bed joint of mortar on top of first course of masonry units.
    - v. Tuckpoint bed joint of mortar into head joints.
    - vi. Tool finish mortar joints.
    - vii. Install required accessories to accommodate wall opening and top of wall details.
  - c. Vent Strip (VS 3845):
    - i. Fasten Vent Strip (VS 3845) to bottom of expansion pad that is adhered to bottom side of shelf angle.
    - ii. Position Vent Strip with front edge extending past front edge of expansion pad and back edge extended into vertical void created by Sure Cavity (SC 5016 or SC 5032), 10MM Sure Cavity (SCMM 2516 or SCMM 2532), or Gravity Cavity (GC 1832)
    - iii. Lay up top course of brick and tuckpoint mortar on top joint.
    - iv. Finish tool joint
    - v. Cut off excess vent strip even with face of full brick veneer
    - vi. Install required accessories to accommodate wall opening and top of wall details.
6. Weep System for Concealed Shelf Angle:

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- a. Rainscreen Drainage Plane: Sure Cavity (SC 5016 or SC 5032), 10MM Sure Cavity (SCMM 2516 or SCMM 2532), or Gravity Cavity (GC 1832)
  - i. Install Sure Cavity or Gravity Cavity on vertical surface of flashing, WRB, and vertical leg of shelf angle lintel with 4 inches (102 mm) fabric skirt overlapping the back edge of concealed steel lintel / shelf angle weep (CLW 9040).
  - ii. Trim 4 inches (102 mm) fabric skirt to appropriate length.
- b. Concealed Steel Lintel / Shelf Angle Weep (CLW 9040).
  - i. Install Concealed Steel Lintel / Shelf Angle Weeps on horizontal leg of shelf angle over drip plate and flashing system.
  - ii. Cut (CLW 9040) to required size.
  - iii. Position (CLW 9040) with the front nose edge over the front edge of the shelf angle flashing and the back edge into the vertical void created by the Sure Cavity (SC 5016 or SC 5032), 10MM Sure Cavity (SCMM 2516 or SCMM 2532), or Gravity Cavity (GC 1832)
  - iv. Spread bed joint of mortar and lay masonry unit (lip brick).
  - v. Finish tool joint.
  - vi. Clean out and finish-tool mortar joint up under lip of lip brick.
  - vii. Install required accessories to accommodate wall opening and top of wall details.
- c. Vent Strip (VS 3845):
  - i. Fasten Vent Strip (VS 3845) to bottom of expansion pad that is adhered to bottom side of shelf angle.
  - ii. Position Vent Strip with front edge extending past front edge of expansion pad and back edge extended into vertical void created by Sure Cavity (SC 5016 or SC 5032), 10MM Sure Cavity (SCMM 2516 or SCMM 2532), or Gravity Cavity (GC 1832)
  - iii. Lay up top course of brick and tuckpoint mortar on top joint.
  - iv. Finish tool joint.
  - v. Cut off excess vent strip even with face of brick veneer.
  - vi. Install required accessories to accommodate wall opening and top of wall details.
- d. Interface with Other Work: Provide proper installation of other materials and work as required for a complete and properly functioning system. Install systems in accordance with manufacturer's instructions and as follows.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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7. Edge Metal (MEM 3168) for enclosing the edge of Sure Cavity (SC 5016 or SC 5032) or Control Cavity (CC 4800) on the rake edge of sloped roof and the vertical edge of wall panel:
  - a. Edge Metal (MEM 3168) used on the rake edge of roof.
    - i. Install Edge Metal on top of the rake roof edge drip cap or roof edge.
    - ii. Apply flashing tape to the interior edge of Edge Metal and the interior edge of the rake roof Edge Metal and onto the roof deck.
    - iii. Install roofing paper over the interior edge of rake roof Edge Metal.
    - iv. Install edge of Sure Cavity (SC 5016 or SC 5032) or Control Cavity (CC 4800) over nailing flange and into Edge Metal.
    - v. Install roofing shingles.
  - b. Edge Metal (MEM 3168) for enclosing Sure Cavity (SC 5016 or SC 5032) or Control Cavity (CC 4800) at the edge of a wall panel.
    - i. Install Edge Metal on the vertical edge of a wall panel over end cap edge metal.
    - ii. Apply flashing tape to the interior edge of Edge Metal and onto wall sheathing.
    - iii. Install WRB over the interior edge of Edge Metal.
    - iv. Install edge of Sure Cavity or Control Cavity.
    - v. Install siding.
8. Vented Edge Metal (VMEM 3168) for enclosing and weeping the bottom edge of Control Cavity (CC 4800) at the edge of roof overhang or Sure Cavity (SC 5016 or SC 5032) at the bottom of wall panels:
  - a. Vented Edge Metal (VMEM 3168) use on bottom edge of roof.
    - i. Install Vented Edge Metal on top of the drip cap or roof edge metal on the bottom edge of roof.
    - ii. Position bottom edge of water stop/ice shield over nailing flange of Vented Edge Metal.
    - iii. Install roofing papers over water stop/ice shield and nailing flange of Vented Edge Metal.
    - iv. Install bottom edge of first course of Sure Cavity or Control Cavity into Vented Edge Metal.
    - v. Install shingles.

## **SECTION 040523-MASONRY ACCESSORIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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b. Vented Edge Metal (VMEM 3168) use at bottom of wall.

i. Install Vented Edge Metal at bottom of wall to transition construction joint created by bottom edge of sheathing and top outside edge of foundation wall.

ii. Apply flashing tape to the top edge of Vented Edge Metal and onto sheathing.

iii. Install WRB over 3-1/2 inches (88.9 mm) back flange of Vented Edge Metal.

iv. Back-wrap 4 inches (102 mm) fabric skirt of Sure Cavity for bug screen.

v. Install edge of Sure Cavity or Control Cavity over nailing flange and into Vented Edge Metal.

vi. Install siding.

9. Mortar Belt (MB 3500) for trash mortar control in CMU Walls

a. Install Mortar Belt centered on CMU wall every 4 to 6 courses.

b. Do not use when CMU cells are less than 5 inches (127mm) wide.

c. Install necessary accessories for complete installation.

10. Trash Mortar Diverter (TMD 9548) for trash mortar control in cavity walls with air spaces (cavities) of 1-1/2 inches (38 mm) to 3 inches (76 mm):

a. Install Trash Mortar Diverter into wall cavity with "V" in downward position and with short leg edge to the weather side.

b. Install Trash Mortar Diverter in a (checkerboard) or (stair step) or (architect approved) pattern within the wall cavity.

c. Install necessary accessories such as wall ties and flashing for complete installation.

**D. Interface with Other Work:** Provide proper installation of other materials and work as necessary for a complete and properly functioning system.

### **3.5 PROTECTION**

**A.** Protect installed thin veneer system from damage during construction.

**B.** Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

**END OF SECTION**

## **DIVISION 5 – METALS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I - GENERAL**

#### **1.1 DESCRIPTION**

**A. Work included in this Section:**

1. Provide all engineering, labor, materials, equipment, and services, etc., required to engineer, furnish, and install all miscellaneous metal work and related accessories as indicated on the Drawings, specified herein, or otherwise required for a complete and proper job.
2. The Work shall include, but shall not necessarily be limited to:
  - a. Miscellaneous structural steel.
  - b. Miscellaneous steel plates and angles.
  - c. Miscellaneous steel brake metal, pans, closures, trim, and other configurations.
  - d. Miscellaneous carpenter's iron as required.
  - e. Miscellaneous frames, brackets, and supports for hardware, window systems, and equipment including all mechanical, electrical, medical, athletic, and theatrical equipment. Including seismic bracing for all miscellaneous metal frames, stands, and supports.
  - f. Miscellaneous frames and supports for special doors, operable walls, mesh partitions, overhead supported toilet partitions.
  - g. Bollards.
  - h. Pit covers and frames.
  - i. Expansion joint covers.
  - j. Steel corner guards.
  - k. Trench drains.
  - l. Roof blocking fastening requirements.
  - m. Masonry wall top clips.
3. It shall be a requirement of the Work of this Section to thoroughly review all of the Contract Documents and provide any and all miscellaneous metal work required for a complete and proper job.

**B. Related Work Specified Elsewhere:**

1. SECTION 03300:  
CAST-IN-PLACE CONCRETE

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **2. DIVISION 26: ELECTRICAL**

#### **1.2 SUBMITTALS**

##### **A. Product Data:**

Submit product data for manufactured products specified herein.

##### **B. Shop Drawings:**

1. Submit shop drawings for each item or assembly. Shop drawings shall accurately and clearly show in detail the construction, sizes, gauges, dimensions, methods of assembly, supports, finishes, and all other pertinent data and information.

a. Submit stair, ladder, and railing shop drawings drawn at not less than 1/4" scale with components shown in related positions. Provide larger scale custom details, control details and dimensions not governed by job conditions. Show all required field measurements.

b. Submit lintel fabrication schedule including location, type, size, length, and finish (primed or galvanized coating class).

##### **C. Certifications:**

1. Submit manufacturer's certification that the stairs, platforms, railings, and ladders provided are in full compliance with the requirements of the Contract Documents, and are totally suitable for the proposed installations when installed in accordance with the shop drawings.

2. Submit certificates indicating that each welder has satisfactorily passed AWS qualification tests for welding processes involved and if pertinent, has undergone re-certification.

3. Steel fabricator's in-plant special inspections program including: registration of special inspections program, written procedural and quality control manuals and evidence of periodic auditing of fabrication practices by an approved inspection agency.

#### **1.3 PRODUCT HANDLING**

##### **A. Deliver of Materials:**

Deliver, store and handle components in such a manner as to prevent damage to finished surfaces.

##### **B. Storage of Materials:**

Store components in a dry, clean location, away from uncured masonry and concrete. Cover with tarpaulin or polyethylene sheeting.

#### **1.4 QUALITY ASSURANCE**

##### **A. Welding Standards:**

Comply with applicable provisions of ASW D1.1 "Structural Welding Code- Steel" and ASW D1.3 "Structural Welding Code Sheet Steel."

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- B. Stair and railing fabricator shall be a certified member of AISC who participates in a recognized quality assurance program and who is regularly inspected by an independent testing/inspection agency.
  - 1. In the absence of the above requirements, the fabricator shall be required to hire and pay for an independent testing/inspection agency approved by the Owner, to monitor fabrication and perform random testing of all stairs and railing fabrication procedures.
  - 2. The fabricator shall submit evidence to the Owner indicating satisfactory completion of projects of similar scope and that fabrication facilities are adequate to meet production requirements.
- C. Fabricator's Qualifications:

Only fabricators that maintain an agreement with an approved independent inspection or quality control agency to conduct periodic in-plant inspections at the fabricator's plant, at a frequency that will assure the fabricator's conformance to the requirements of the inspection agency's approved quality control program will be approved for this project.

### **1.5 TESTING AND INSPECTIONS**

- A. General:

Stair and railing materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified testing agency. Such inspections and tests shall not relieve the Contractor of responsibility for providing his own inspections, quality control and materials and fabrication procedures in compliance with specified requirements. Any non-compliant materials or fabricated components shall be removed and replaced.
- B. The fabricator shall submit evidence of in-plant inspections in conformance with IBC "Structural Tests and Inspections- Inspection of Fabricators (1700).
- C. Testing and inspection shall be formed as required by the building code, the Contract Documents or as otherwise directed by the Project Manager. The cost of field-testing and inspection shall be paid for by the Owner. If Work is found not to conform to the Contract Documents, the Contractor shall be responsible for the cost of all further testing.
- D. The Contractor shall cooperate with and facilitate testing and inspection by the testing agency. The Contractor shall, at his own expense, furnish the testing agency stair and railing shop drawings.
- E. Shop and field bolted connections and shop and field welded connections shall be inspected.

### **1.6 STRUCTURAL PERFORMANCE**

- A. Handrails and Guardrails:

Engineer, fabricate, and install handrails and guardrails to comply with requirements of ASTM E985. ASTM E894 and to withstand the following structural loads without exceeding the allowable design working stress of the materials involved including anchors and connections. Apply each load to produce the maximum stress in each of component.

  - 1. Handrails shall be rigid, free of vibration and able to withstand a concentrated force of 200 pounds applied at any point in any direction and, but not simultaneously, a uniform load of 50 pounds per foot applied in any direction.



## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. Top Guardrails Member shall be rigid and able to withstand a concentrated force of 200 pounds applied at any point and in any direction and, but not simultaneously, a uniform load of 50 pounds per foot applied in any direction, and a simultaneous uniform load of 100 pounds per foot applied vertically downward to the top of the guard.
  - a. Infill areas of guardrails shall be rigid and able to withstand a horizontal concentrated force of 200 pounds applied on one square foot at any point in the system including panels, intermediate rails, balusters, or other elements. This loading condition shall not be applied simultaneously with the other loading conditions for guardrails.
  - b. Guardrail System shall withstand stresses resulting from railing system loads specified above.

### **1.7 WARRANTIES**

- A. Color Galvanizing:  
Provide manufacturer's standard product warrant against excessive corrosion, peeling, chipping, or other failure for a period of twenty (20) years.

## **PART II -PRODUCTS ("GREEN")**

### **2.1 GENERAL**

- A. Note:  
It is the Owner's intent to use energy conserving, environmentally friendly materials to the greatest extent practical. The Contractor is therefore encouraged to use recycled steel products.
- B. Miscellaneous metal items shall be standard approved products, fabricated in accordance with best shop practices and, wherever possible, shop assembled, ready for erection.
- C. Metals shall be free from defects impairing strength, durability, or appearance and shall be best commercial quality for purposes specified. Metals shall be made with structural properties to safely sustain and withstand strains, stresses, to which they will be normally subjected.
- D. Gauges herein specified are minimums and shall refer to U. S. Standard for sheet steel, plate iron, and steel.

### **2.2 MATERIALS**

- A. Steel Plates, Shapes and Bars:  
ASTM A-36.
- B. Sheet Steel:  
Cold-rolled: ASTM A-366  
Hot-rolled: ASTM A-569
- C. Steel Tubing:  
Cold-formed: ASTM A-500  
Hot-formed: ASTM A-501
- D. Steel Pipe:

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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ASTM A-53.

**E. Fasteners:**

Provide plated fasteners complying with ASTM A 240/A 666, Stainless Steel Type 316, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.

**1. Bolts and Nuts:**

ASTM A307, Grade A

ASTM A563.

**2. Machine Screws:**

ANSI B18.6.3.

**3. Lag Bolts:**

ANSI B18.2.1.

**4. Plain Washers:**

Round, carbon steel, ANSI B18.22.1.

**5. Lock Washers:**

Helical, spring type, carbon steel, ANSI B18.21.1.

**6. Expansion Anchors:**

Carbon steel components zinc-plated to comply with ASTM B633.

**F. Note:**

The fabricator shall no stamp, stencil, or otherwise place his identification on any portion of miscellaneous metals intended to remain exposed to view.

### **2.3 PAINTING AND PROTECTIVE COATING**

**A. General:**

All ferrous metal that is not stainless steel herein specified shall be properly cleaned and shop primed, except at the following locations:

1. Anchors that are built into masonry shall be coated with bituminous paint, unless specified to be galvanized.
2. Ferrous metal to be encased in concrete shall be left unpainted, unless specified or noted otherwise. Aluminum to be encased in concrete shall be coated with bituminous paint.
3. Where hot-dip galvanized metal is specified or shown, it shall not be shop primed.
4. Where sprayed-on fireproofing is specified or shown, metal shall not be shop primed.
5. Where metal is scheduled to receive ceramic tile finish it shall not be shop primed.

**B. Surface Preparation:**

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Exterior steel shall meet requirements of the Steel Structures Painting Council, SS PC-SP6 Commercial Blast Cleaning Standard.
2. Interior steel and steel to be fireproofed shall meet requirements of SS PC-SP3 Power Tool Cleaning Standard.
- C. Shop Primer for Ferrous Metal shall be Tnemec "37 H Chem Prime Universal Phenolic Primer," at 2.0- 3.0 mils DFT.
- D. For items that are not stainless steel. Galvanizing Repair Paint shall be high zinc content paint Tnemec 90-97.
- E. Bituminous Paint shall be cold-applied mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

### **2.4 GALVANIZING**

- A. All exterior steel, including lintels, rails, bollards, grates, frames, and all other steel that has any portion exposed to the weather, shall be hot-dip galvanized. Interior steel shall be hot-dip galvanized where so noted or specified. Hot-dip galvanized products shall not be shop primed.
- B. Products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips shall be hot-dip galvanized in accordance with ASTM A-123, latest edition.
- C. Iron and steel hardware shall be hot-dip galvanized in accordance with ASTM A-153, latest edition.
- D. Assembled steel products shall be hot-dip galvanized in accordance with ASTM A-386, latest edition.
- E. The weight of coating shall be as designated in ASTM "Comparison of Coating Weight Requirements for Hot- Dip Galvanized Products" in accordance with the class and thickness of material.
- F. Where hot-dip galvanizing prior to completion of fabrication (cutting or welding operations) cannot be avoided, joints and cuts shall be finished with four (4) full coats of touch-up galvanizing repair paint as recommended by the fabricator.
- G. Hot-dip galvanizing shall be done by a member of the American Galvanizers Association, Inc.
- H. All hot-dipped galvanized material shall be stamped to indicate ASTM designation and ounces per square foot of zinc coating required by the Specifications.
- I. A notarized affidavit of compliance to the galvanizing specified shall be submitted from the galvanizer upon request.
- J. The galvanizing bath shall contain high grade zinc and other early materials. Immediately before galvanizing the steel shall be immersed in a bath of zinc ammonium chloride. The use of wet kettle process is prohibited.

### **2.5 SHOP COATING OF GALVANIZED STEEL**

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. The following miscellaneous metal components shall receive factory applied architectural finish over hot-dip galvanizing:

1. All exterior rails.
2. All exterior bollards.

- B. Finish shall be "Primergalv" by Duncan Galvanizing, or approved equal. Colors shall be selected by the Project Manager from the manufacturer's full range of available colors. Coating shall maintain a pull-off strength of 500 psi when tested in accordance with ASTM D4541.

1. Factory-Applied Universal Primer:

Where galvanized steel is specified to receive a factory primer for field applied topcoat, provide factory-applied polyamide epoxy primer over specially prepared galvanized steel, 2.0 mils dry film thickness minimum. Apply primer within 12 hours after galvanizing at the galvanizer's plant in a controlled environment meeting applicable environmental regulations, and as recommended by the coating manufacturer.

2. Factory-Applied High-Performance Architectural Finish:

Where galvanized steel is specified to receive a factory applied architectural finish, provide factory-applied polyurethane color coating, 2.5 mils dry film thickness minimum, over primed galvanized steel as previously referenced. Apply coating at the galvanizer's plant, immediately after the application of the prime coat, in a controlled environment meeting applicable environmental regulations, and as recommended by coating manufacturer.

### **2.6 ROOF BLOCKING FASTENING REQUIREMENTS**

- A. Perimeter roof blocking shall be secured to decking, structural steel, spaced steel angles, or plates, as indicated on the Drawings.
- B. The Contractor shall provide additional steel angles and plates to suit specific job conditions.
- C. Where joist or beams do not extend out of roof edge, provide single or back-to-back steel angles or steel plates welded to perimeter steel beams in configurations indicated on the Drawings or otherwise required for support of blocking at 2'-0" O.C. intervals. Provide pre-drilled holes in steel for bolting of blocking at 24" O.C. with 1/2" bolts.

### **2.7 MASONRY WALL TOP CLIPS**

- A. Provide steel clip angles at both sides of the tops of masonry walls secured to building structure. In general, size, spacing, and attachment of wall clips shall be determined by whether the wall is non-structural (architectural) or is a structural element (fire wall, load-bearing wall or shear wall for example) and shall be as indicated on the Drawings. Wall clips specified herein or partition top anchors specified in Section 04200: Unit Masonry and Mortar shall be provided for all masonry walls unless specifically indicated otherwise.

### **2.8 MISCELLANEOUS FRAMING AND SUPPORTS**

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Provide steel framing and supports for applications indicated that are not a part of structural steel scope as required to complete the Work. Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent construction. Fabricate from steel shapes, plates, and steel bars of welded construction using mitered joints for field connections. Cut, drill, and tap units to receive hardware, hangers, and similar items. Equip units with integrally welded anchors for casting into concrete or building into masonry.

### **2.9 BOLLARDS**

- A. Unless otherwise indicated on the Drawings, bollards shall be six (6") inches diameter galvanized steel pipe (to be filled with concrete). Bollards shall be not less than 6'-6" in length with 3'-6" exposed above finish grade.

### **2.10 PIT COVERS AND FRAMES**

- A. Unless otherwise indicated on the Drawings, steel pit covers shall be 1/4" thick galvanized steel checker plate. Frames shall be appropriately sized galvanized steel angles with suitable stops and anchoring devices.

### **2.11 EXPANSION JOINT COVERS**

- A. Metal expansion joint covers shall be manufactured by Balco Inc., CIS Construction Specialties, MM Systems Corp., or approved equal.

### **2.12 TRENCH DRAINS**

- A. Trench drain grates, covers, pans, and frames shall be heavy-duty, H20 wheel loading, cast iron grates and frames with an integral galvanized steel-formed pan. Units shall be 12-1/2" wide, Model No. TCMB-10/TGMB-10, as manufactured by McKinley, or approved equal.

### **2.13 METAL CHANNEL FRAMING SYSTEMS (UNISTRUT)**

- A. Various building materials and equipment such as suspended lights and service columns shall be provided with concealed metal channel framing systems as required to permanently and safely anchor such items to suitable building primary structural components.
- B. Metal channel framing systems shall be Unistrut Metal Framing as manufactured by UNISTRUT Corporation, or approved equal. Framing shall be electrogalvanized steel. Systems shall be complete and shall be properly engineered, fabricated, and installed by the manufacturer or its authorized representative/installer. Installer shall have not less than five (5) years experience.
- C. The Work of Channel Framing systems shall include, but shall not necessarily be limited to:
  - 1. Field inspection to verify job conditions, dimensions, and suitability of primary structure to receive channel framing.
  - 2. Engineering of all channel framing, attachments between framing members, attachments between framing systems and building structure, and anchor points to receive attachments by the manufacturer of the building material or equivalent to be supported by the channel framing systems.

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Coordination of framing load capacity and anchor point types and locations with the requirements of the related material or equipment manufacturer.
4. Submission of structural calculations including, but not limited to design criteria, stress and deflection analysis and selected framing, fittings and anchors prepared by a professional structural engineer licensed in the United States of America or the United States Virgin Islands.
5. Submission of shop drawings.

### **2.14 LOOSE STEEL LINTELS**

- A. Loose lintels shall be fabricated from A-36 steel from angles, shapes and masonry anchors of size and type scheduled for openings in masonry walls, unless otherwise indicated on the Drawings.
- B. All dimensions for locations of rails shall be field measured. Drawing dimensions shall be considered approximate and actual field conditions shall be ascertained before fabrication of rails.
- C. In general, heights of handrails shall be 2'-10" above step nosing. Heights of guardrails shall be 3'-6" above finish floor, unless otherwise noted on the Drawings. Handrails shall be mounted to provide 2-1/4" minimum clear space to walls or other surfaces at stairs and 1-1/2" minimum clear space at all other locations.
- D. Space intermediate balusters as indicated on the Drawings or as otherwise required providing maximum clear space between all members of less than four (4") inches. Guardrails shall not have an ornamental pattern that would provide a ladder effect. Space railing posts as indicated on the Drawings, and in accordance with railing engineering requirements.
- E. In general, handrails at stairs shall extend a minimum of 12" beyond the top riser and at least 12" plus the width of one tread beyond the bottom riser. At the top, the handrail extension shall be parallel to the working surface. At the bottom, the handrail shall continue to slope for a distance of the width of one tread from the bottom riser, with the remainder parallel to the walking surface.
- F. In general, handrails at ramps shall be parallel to the walking surface at all locations and shall extend a minimum of 12" beyond the top of the ramp and at least 12" beyond the bottom of the ramp.
- G. Steel Railing Fittings shall be as per Julius Blum and Co., or approved equal. All fittings for exterior use shall be galvanized. Fittings shall be:
  1. Weld on caps:  
No. 938
  2. Round slip flanges:  
No. 611 and No. 1611
  3. Wall returns:  
No. 665 and No. 1665
  4. Brackets:  
No. 386 and No. 1386

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART III - EXECUTION**

#### **3.1 VERIFYING CONDITIONS**

- A. Coordinate all work with the work of other trades. Verify all field dimensions and that the work fits the work of other trades. Perform all cutting, fitting, and drilling required. Furnish all necessary templates and patterns required to build items into work of other trades. Provide holes and connections for the attachment of work of other trades.

#### **3.2 GENERAL FABRICATION AND INSTALLATION**

- A. Metal surfaces shall be clean and free from mill scale, flake rust, and rust pitting, well-formed and finished to shape and size, with sharp lines and angles and smooth surfaces. Shearing and punching shall leave clean true lines and surfaces. Weld or rivet permanent connections. Welds and flush rivets shall be finished flush and smooth on surfaces that will be exposed after installation. Welds shall be continuous unless otherwise noted. Welds shall not have voids or pockets and shall be ground to provide smooth transitions between metal surfaces. Do not use screws or bolts where they can be avoided; where used, heads shall be countersunk, screwed up tight and threads nicked to prevent loosening.
- B. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall give ample strength and stiffness. Joints exposed to weather shall be formed to exclude water. Provide holes and connections for the work of other trades.
- C. Castings shall be size determined by work type for which they form parts. Each member if possible shall be in one piece, make joints at moldings or fillets. Casting thickness shall be uniform, sufficient to ensure perfect workmanship, required strength for design use. Make castings clean, smooth, true to pattern, free from defects. Moldings, ornaments shall be rather more deeply cut than indicated to counteract flattening effects of casting, finishing; exactly reproduce form, feeling of models. Edges shall be sharp, come from molds clean, smooth, perfect.
- D. Non-slip surfaces shall be made safe for foot traffic with non-slip abrasive embedded uniformly in wearing surface at casting time.
- E. Connections and accessories shall be adequate to safely sustain, withstand stresses, strains, to which they will be normally subjected.
  - 1. Connections to steel unless otherwise specified shall be steel.
  - 2. Connections to genuine wrought iron work shall be wrought iron or steel.
  - 3. Connections to cast iron, unless otherwise specified shall be steel.
  - 4. Bolts, nuts, screws for exterior work shall be electrogalvanized, unless otherwise noted.
- F. Furnish all standard screws, bolts, washers, and other such fastening devices as are necessary for attaching this work to other materials. Anchors and other connecting devices required in concrete or masonry shall be built-in as the work progresses. NOTE: Special attention shall be given to the firm and secure anchoring of overhead mounted materials and equipment.

## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- G. Do cutting, punching, drilling, tapping required for attachment of other work coming in contact with miscellaneous metal where indicated or where directions for same are given prior to or with review of shop drawings.
- H. Unless otherwise indicated, bolt, and screw heads shall be flat countersunk in exposed faces of ornamental or finished character; elsewhere as required. Cut off bolts, screws, etc., where exposed, flush with nuts, or other adjacent metal. Except as otherwise required, weld shop-assembled connections; welds, bolts, or machine screws may be used for field connections. Exposed fastenings shall be the same materials, color, and finish as metal to which they apply, unless otherwise required.
- I. Make up threaded connections tightly so that threads will be entirely concealed by fittings.
- J. Work to be built in with masonry shall be of form required for anchorage, or be provided with suitable anchors, expansion shields, toggle bolts, etc. as required for proper anchorage. Fastening to wood plugs in masonry shall not be permitted.
- K. Install all supporting members, fastening, framing, hangers, bracing, brackets, straps, bolts, angles, and the like required to set, connect work rigidly and properly to structural steel, masonry, other construction.
- L. All items shall be installed plumb, straight, square, level and in proper elevation, plane, location and alignment with other work.

### **3.3 STEEL RAILING FABRICATION AND INSTALLATION**

- A. Fabricate handrails and railing systems to comply with the requirements indicated for design, dimensions, details, finish, member sizes and anchorage but not less than that required to support structural loads.
- B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, unless otherwise indicated. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to joined end and weld all around. Form changes in direction of railings by welding fabricated flush elbow fittings, by radius bends as indicated, or by flush radius bends. Remove burrs and splatter.
- C. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each configuration required. Maintain cylindrical cross section of pipe throughout the entire bend without buckling, twisting, cracking or otherwise deforming.
- D. For components exposed to exterior or moist environments, provide weep holes or other means of evacuating entrapped water. All exterior rails, fittings and brackets shall be hot-dipped galvanized after fabrication.
- E. Provide wall returns at all ends to adjacent surfaces and secure as required. Close exposed ends by welding 3/16" thick steel plate in place, except where clearance of end of pipe and adjoining wall surface is less than 1/4", or unless otherwise detailed.
- F. Welds shall be continuous and thoroughly fused without undercutting or overlap. Grind exposed welds smooth to form a uniformly smooth surface.



## **SECTION 05500 – MISCELLANEOUS METALWORK**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- G. Provide miscellaneous steel for connection of rail supports as detailed on the Drawings. Do not support railing temporarily by any means that does not satisfy structural performance requirements.
- H. Set rails plumb and aligned. Set rails horizontal or parallel to rake of stairs. Support wall handrails on brackets, in accordance with railing engineering requirements. Space closer together if so indicated on the Drawings. Connect railing posts to stair framing by direct welding, unless otherwise indicated.
- I. Install handrail brackets away from handrail ends and finish ends with return fittings. Use drill-in expansion anchors at concrete or masonry walls. Mount handrails only on gypsum board assemblies that have been reinforced to receive railing anchors.
- J. Provide expansion joints in railings at intervals not to exceed forty (40') feet. Provide slip joints with internal sleeves extending two (2") inches beyond the joint on either side. Fasten the internal sleeve securely on one side only. Locate expansion joints within six (6") inches of posts.
- K. Where railings are to be set in concrete, railing posts shall be set in 6" matching sleeves as follows: Clean dust and foreign matter from sleeves. Moisten interior of hole and surrounding surface with clean water. Mix fast setting cement with water and stir until a smooth, creamy consistency is produced. Pour mixture into annular space until it overflows the hole. Taper cement away from rails to promote proper drainage. Wipe off excess, leaving a build-up of approximately 1/8".

### **3.4 EXPANSION JOINT COVERS**

- A. Covers shall extend full width of openings.
- B. Covers shall be installed level, plumb, and flush with finish surfaces, and shall be fastened with anchor shields and bolts in strict confidence with the manufacturer's instructions and recommendations.
- C. Provide all corners, tees, transitions, etc., as required for a complete and proper job.
- D. Provide fire rated expansion joint covers with all required safing insulation and fire stopping at fire rated locations. Entire assembly shall be installed in strict accordance with the manufacturer's instructions and tested assemblies.

**END OF SECTION**

# **SECTION 05600 – MANHOLE FRAMES AND COVERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I - GENERAL**

### **1.1 REQUIREMENTS INCLUDED**

- A. Furnish and install cast iron manhole frames and covers on all manholes unless otherwise shown on the Drawings.

### **1.2 REQUIREMENTS**

- A. Section 03346:  
Cast-in-Place Concrete.

### **1.3 QUALITY ASSURANCE**

- A. All castings shall be at least Class 30 conforming to the ASTM Standard Specifications for Gray Casting, Designation A48.
- B. All essential details of design shall conform to the Drawings.

## **PART II - PRODUCTS**

### **2.1 MATERIALS**

- A. The castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sand holes, and defects of every nature which would render them unfit for the service for which they are intended.
- B. Contact surfaces of covers and frame seats shall be machined at the foundry before shipment to prevent rocking of covers in any orientation.
- C. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
- D. Prior to being shipped from the foundry, castings shall be sandblasted and given two coats of coal-tar-pitch varnish, applied in a satisfactory manner so as to make a smooth coating, tough, tenacious, and not brittle with any tendency to scale off.
- E. Coatings that have been damaged in transit of handling shall be repaired by the Contractor to the satisfaction of the Engineer.

## **PART III - EXECUTION**

### **3.1 INSTALLATION**

- A. Set manhole frames with the tops conforming accurately to the grade of the pavement or finished ground surface or as shown on the Drawings.
- B. Set frames concentric with the top of the masonry in a full bed of mortar, so that the space between the top of the manhole masonry and the bottom flange at the frame shall be completely filled and made watertight.

## **SECTION 05600 – MANHOLE FRAMES AND COVERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- C. Place a thick ring of mortar extending to the outer edge of the masonry all around and on the top of the bottom flange.
- D. Finish the mortar so that it will be smooth and have a slight slope to shed water away from the frame.
- E. When the work on each manhole is complete, clean the frame seat and set the cover in place.

**END OF SECTION**

**DIVISION 6- WOODS AND PLASTICS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN  
ISLANDS

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## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I -GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes the following:
  - 1. Framing with dimension lumber.
  - 2. Wood furring, grounds, nailers, and blocking.
  - 3. Subflooring.
  - 4. Underlayment.

#### **1.3 DEFINITIONS**

- A. Rough Carpentry:  
Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

#### **1.4 SUBMITTALS**

- A. General:  
Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for the following products:
  - 1. Underlayment.
  - 2. Construction adhesives.
- C. Material certificates for dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the American Lumber Standards Committee's (ALSC) Board of Review.
- D. Wood treatment data as follows, including chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated materials:
  - 1. For each type of preservative treated wood product, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
  - 2. For fire retardant treated wood products, include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.

## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- E. Material test reports from a qualified independent testing agency indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with requirements indicated.

### **1.5 QUALITY ASSURANCE**

- A. Single-Source Responsibility for Fire-Retardant-Treated Wood:  
Obtain each type of fire-retardant treated wood product from one source and by a single producer.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
  - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

## **PART II - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Available Manufacturers:  
Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Wood-Preservative-Treated Materials:
    - a. Baxter: J. H. Baxter Co.
    - b. Chemical Specialties, Inc.
    - c. Continental Wood Preservers, Inc.
    - d. Hickson Corp.
    - e. Hoover Treated Wood Products, Inc.
    - f. Osmose Wood Preserving, Inc.
  - 2. Fire-Retardant-Treated Materials, Interior Type A:
    - a. Baxter: J. H. Baxter Co.
    - b. Chemical Specialties, Inc.
    - c. Continental Wood Preservers, Inc.
    - d. Hickson Corp.
    - e. Hoover Treated Wood Products, Inc.

## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **2.2 LUMBER, GENERAL**

**A. Lumber Standards:**

Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

**B. Inspection Agencies:**

Inspection agencies, and the abbreviations used to reference them, include the following:

1. NELMA - Northeastern Lumber Manufacturers Association.
2. NLGA - National Lumber Grades Authority (Canadian).
3. RIS- Redwood Inspection Service.
4. SPIB - Southern Pine Inspection Bureau.
5. WCLIB- West Coast Lumber Inspection Bureau.
6. WWPA- Western Wood Products Association.

**C. Grade Stamps:**

Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

**D. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.**

1. Provide dressed lumber, S4S, unless otherwise indicated.

### **2.3 WOOD-PRESERVATIVE-TREATED MATERIALS**

**A. General:**

Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPAC2 (lumber) and AWPAC9 (plywood).

Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

1. Do not use chemicals containing chromium or arsenic.

**B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb./cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:**

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPAC M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

### **2.4 FIRE-RETARDANT-TREATED MATERIALS**

#### **A. General:**

Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPAC C20 (lumber) and AWPAC C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.

#### **1. Research or Evaluation Reports:**

Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.

#### **B. Interior Type A:**

For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:

1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
3. Contact with treated wood does not promote corrosion of metal fasteners.

### **2.5 DIMENSION LUMBER**

#### **A. General:**

Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.

#### **B. Framing Other than Non-Load-Bearing Partitions:**

Provide framing of the following grade and species:

#### **1. Grade:**

No. 2.

#### **2. Species:**

Southern pine; SPIB.

#### **3. Species:**

Mixed southern pine; SPIB.



## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **4. Species:**

Any species above.

## **2.6 MISCELLANEOUS LUMBER**

### **A. General:**

Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

### **B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.**

### **C. Moisture Content:**

19 percent maximum for lumber items not specified to receive wood preservative treatment.

### **D. Grade:**

For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No.3 Common grade per NELMA, NLGA, or WWPA; No.2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

## **2.7 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS**

### **A. General:**

Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).

#### **1. Thickness:**

Provide panels meeting requirements specified but not less than thickness indicated.

#### **2. Span Ratings:**

Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."

### **B. Subflooring:**

APA-rated sheathing.

#### **1. Exposure Durability Classification: Exposure 1.**

#### **2. Span Rating: As required to suit joist spacing indicated.**

## **2.8 STRUCTURAL-USE PANELS FOR UNDERLAYMENT**

### **A. General:**

Over smooth subfloors, provide underlayment not less than 1/4 inch (6.4 mm) thick. Over board or uneven subfloors, provide underlayment not less than 11/32 inch (8.7 mm) thick.

### **B. Plywood Underlayment for Carpet:**

For underlayment under 19/32 inch (15.1 mm) thick, provide plywood panels with fully sanded face and as follows:

## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Grade:  
APA Underlayment Interior.

### **2.9 FASTENERS**

- A. General:  
Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Wire, Brads, and Staples:  
FS FF-N-105.
- C. Power-Driven Fasteners:  
CABO NER-272.
- D. Wood Screws:  
ASME B18.6.1.
- E. Lag Bolts:  
ASME B18.2.1. (ASME B18.2.3.8M)
- F. Bolts:  
Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

### **2.10 MISCELLANEOUS MATERIALS**

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturers.

## **PART III - EXECUTION**

### **3.1 INSTALLATION, GENERAL**

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. CABO NER-272 for power-driven staples, P-nails, and allied fasteners.
  2. Published requirements of metal framing anchor manufacturer.
  3. "Recommended Nailing Schedule" of referenced framing standard and with AFPA's "National Design Specifications for Wood Construction."
  4. "Table 23-1-Q--Nailing Schedule" of the Uniform Building Code.
  5. "Table 2305.2--Fastening Schedule" of the BOCA National Building Code.
  6. "Table 1705.1--Fastening Schedule," of the Standard Building Code.
- F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.
- G. Use stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
- H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

### **3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS**

- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to form work before concrete placement.
- C. Install permanent grounds of dressed, preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### **3.3 WOOD FRAMING, GENERAL**

- A. Framing Standard:  
Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Install framing members of size and at spacing indicated.
- C. Do not splice structural members between supports.

### **3.4 INSTALLATION OF STRUCTURAL-USE PANELS**

- A. General:

## **SECTION 06100 – ROUGH CARPENTRY**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

1. Comply with "Code Plus" provisions of above-referenced guide.

### **B. Fastening Methods:**

Fasten panels as indicated below:

2. Combination Subflooring-Underlayment:

Glue and nail to framing throughout.

- a. Space panels 1/8 inch (3 mm) at edges and ends.

3. Subflooring:

Glue and nail to framing throughout.

- a. Space panels 1/8 inch (3 mm) at edges and ends.

4. Underlayment:

Nail to subflooring.

- a. Space panels 1/32 inch (0.8 mm) at edges and ends.

**END OF SECTION**

## **DIVISION 7-THERMAL AND MOISTURE PROTECTION**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

# **SECTION 07130 SELF ADHESIVE WATERPROOFING MEMBRANE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I – GENERAL**

### **I.1 SECTION INCLUDES**

- A. Surface preparation.
- B. Application of rolled, self-adhering waterproofing membrane system.

### **I.2 RELATED SECTIONS**

- A. Section 03346- Cast-in-Place Concrete.

### **I.3 REFERENCES**

- A. American Railway Engineering & Maintenance of Way Association (AREMA) Specification Chapter 29- Waterproofing.
- B. ASTM D146-97:  
Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Fabrics Used in Roofing and Waterproofing.
- C. ASTM D412-98a(2002)el:  
Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -Tension.
- D. ASTM D570-98:  
Standard Test Method for Water Absorption of Plastics.
- E. ASTM E96-00el (Method B):  
Standard Test Methods for Water Vapor Transmission of Materials.
- F. ASTM E154-99:  
Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.

### **I.4 SUBMITTALS**

- A. Comply with Section 01300- Submittals.
- B. Submit manufacturer's product data and application instructions.

### **I.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.
- C. Store membrane cartons on pallets.
- D. Do not store at temperatures above 90° F (32° C) for extended periods.

# **SECTION 07130 SELF ADHESIVE WATERPROOFING MEMBRANE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- E. Keep away from sparks and flames.
- F. Completely cover when stored outside. Protect from rain.
- G. Protect materials during handling and application to prevent damage or contamination.

## **I.6 ENVIRONMENTAL REQUIREMENTS**

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Protect rolls from direct sunlight until ready for use.

## **PART II -- PRODUCTS**

### **II.1 MANUFACTURERS**

- A. W. R. Meadows, Inc., P. O. Box 338, Hampshire, Illinois 60140-0338. Telephone (800) 342-5976 or (847) 683-4500. Fax (847) 683-4544. Website [www.wrmeadows.com](http://www.wrmeadows.com).

### **II.2 MATERIALS**

- A. Rolled, Self-Adhering Waterproofing Membrane: Polymeric waterproofing membrane protected by release paper on cross-laminated polyethylene carrier film with exposed polymeric membrane strips on both sides protected by pull-off release strips.

#### **1. Performance Based Specification:**

Waterproofing membrane shall have the following characteristics:

##### **a. Compliance:**

- i. AREMA Specification Chapter 29- Waterproofing.

##### **b. Thickness:**

###### **i. Carrier Film:**

- 1) 4 mils.

###### **ii. Polymeric Membrane:**

- 1) 56 mils.

##### **c. Tensile Strength, ASTM D 412, Die C.**

- i. Carrier Film: 5,900 psi (40.71 MPa) minimum.
- ii. Polymeric Membrane: 5,90 psi (4.07 MPa) minimum.

##### **d. Elongation, ASTM D 412, Die C:**

## **SECTION 07130 SELF ADHESIVE WATERPROOFING MEMBRANE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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i. Polymeric Membrane:

*1)* 455 percent minimum.

e. Peel Adhesion:

i. Dry:

*1)* 7 to 11 pounds/inch (125 to 196 g/mm) width, minimum.

ii. Wet:

*1)* 7 to 12 pound/inch (125 to 214 g/mm) width, minimum.

f. Pliability, ASTM D 146:

i. 180 Degree Bend:

*1)* Unaffected.

ii. 1 inch (25.4 mm) Mandrel at -25° F(-32° C):

*1)* Unaffected.

g. Water Vapor Permeance, ASTM E 96, Method B:

i.  $2.72 \times 10^{-9}$  g/Pa-s-m<sup>2</sup>.

h. Water Absorption, ASTM D 570:

i. 0.1 percent, 72 hours maximum.

i. Resistance to Hydrostatic Head:

i. Equivalent to 240 feet (73.1 m) of water.

j. Puncture Resistance, ASTM E 154:

i. 67 pounds.

k. Exposure to Fungi, Soil Test:

i. Pass, 16 weeks.

l. Color:

i. Carrier Film:

*1)* White

ii. Polymeric Membrane:



## **SECTION 07130 SELF ADHESIVE WATERPROOFING MEMBRANE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

1) Black.

### **II.3 ACCESSORIES**

#### **A. Primer:**

1. Mel-Prime Water Base Primer.
2. Mel-Prime VOC Compliant Solvent Base Primer or Standard Solvent Base Primer.
3. Equivalent Substitutions will be considered in accordance with Division 1.

#### **B. Flashing and Fillets:**

1. Mel-Rol Liquid Membrane.
2. Equivalent Substitutions will be considered in accordance with Division 1.

#### **C. Pointing Mastic:**

1. Pointing Mastic.

#### **D. Termination Bar:**

1. Sealtight Termination Bar.

#### **E. Corner Tape:**

1. Detail Strip

#### **F. Waterproofing Protection Course:**

1. Protection Course.

#### **G. Rolled Matrix Drainage System:**

1. Mel-Drain™ Rolled Matrix Drainage System.
2. Equivalent Substitutions will be considered in accordance with Division 1.

## **PART III --EXECUTION**

### **III.1 EXAMINATION**

- A. Examine surfaces to receive membrane. Notify Owner's Representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

### **III.2 SURFACE PREPARATION**

## **SECTION 07130 SELF ADHESIVE WATERPROOFING MEMBRANE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
- C. Do not apply waterproofing to surfaces unacceptable to manufacturer.
- D. Concrete surfaces must be clean, smooth and free of standing water.
- E. Patch all holes and voids and smooth out any surface misalignments.

### **III.3 APPLICATION**

- A. Apply waterproofing membrane system in accordance with manufacturer's instructions.
- B. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.
- C. Prime surfaces to be covered in one working day with applicable primer. Re-prime uncovered surfaces next day.
- D. Inspect membrane before covering and repair as necessary. Cover tears and inadequate overlaps with membrane. Seal edges of patches with pointing mastic.
- E. Perform flood testing of horizontal applications, as required. Mark leaks and repair when membrane dries.
- F. Avoid use of products which contain tars, solvents, pitches, polysulfide polymers, or PVC materials that may come into contact with waterproofing membrane system.

### **III.4 PROTECTION**

- A. Protect membrane on vertical and horizontal applications with immediate application of waterproofing protection course, if no drainage system is used, or rolled matrix drainage system. Use pointing mastic as an adhesive.
- B. Backfill immediately using care to avoid damaging waterproofing membrane system.

**END OF SECTION**

# **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I - GENERAL**

### **I.1 RELATED DOCUMENTS**

- A. Drawings and other Contract Documents, listed in the agreement between the Owner and Contractor, apply to this Section.

### **I.2 SUMMARY**

- A. Section includes standing-seam metal roof panels.

### **I.3 PREINSTALLATION MEETINGS**

- A. Pre-installation Conference: Conduct conference at Project site.

### **I.4 DESIGN AND PERFORMANCE REQUIREMENTS**

- A. Complete engineered system by manufacturers engineering department including:

- B. Design Load:

1. Calculate wind uplift using ASCE-'10
  - a. Wind Speed 175mph
  - b. Facility Category IV
2. Calculate clip spacing
3. Verify stress and deflection of panel meet project design load
4. Verify project design load conditions with ASTM 1592
5. Verify project design load conditions with UL580 class 90

- C. Air Infiltration:

1. <.01 cfm/sf @ 20 psf pressure differential per ASTM E 1680

- D. Water Resistance:

1. No water penetration under 5 gal/hr spray at 20 psf pressure differential per ASTM E 1646

- E. Static Water Pressure Head Test:

1. No leakage up to 6 hours per ASTM E 2140-01

- F. UL-Approved Rated Fire Roofs:

1. 1, 1 ½ and 2 hour fire-rated assemblies per UL construction numbers P225, P510, P514, P516, P701 and P715

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **G. UL90 Rating:**

1. 24 ga. steel or 0.032" 18" aluminum panels with stainless steel clips installed over 16 ga. purlins (Grade 50 steel) spaced at maximum of 5'-0" O.C.
2. 24 ga. steel or 0.032" 18" Aluminum panels with stainless steel clips at maximum of 3'-0" O.C. installed over Loadmaster Roof Deck System.
3. 24. ga. steel or 0.032" 18" Aluminum panels with stainless steel clips spaced a maximum of 45-0" o.c. installed over 22 ga. metal deck and up to 6" of rigid insulation and bearing plates to support clips.
4. 24 ga. steel or 0.032" 18"aluminum panels with stainless steel clips spaced at maximum of 2'-0" O.C. over ½" plywood decking

### **H. ASTM 1592:**

1. 24 ga. 18" Steel Panels:
  - a. 38.55 psf @ 5'
  - b. 107.88 psf @ 15"
2. 22 ga 18" Steel Panels
  - a. 57.76 psf @ 5'
  - b. 122.97 psf @ 15"
3. .040" 18" Aluminum Panels
  - a. 52.12 psf @ 4'
  - b. 157.70 psf @ 1'

### **I. Factory Mutual:**

1. I-180 22 ga 18" Steel Panels @ 2.5'
2. I-120 24 ga 18" Steel Panels @2.5'
3. I-120 22 ga 18" Steel Panels @ 5'
4. I-90 24 ga 18" Steel Panels @3'-4"
5. I-75 22 ga 18" Steel Panels @5'
6. I-60 24 ga 18" Steel Panels @ 5'

### **J. Panels must have job site forming capabilities for projects with long panel runs over 50'**

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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K. Panels must be able to have factory radius down to 10°

### **I.5 SUBMITTALS**

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. If a WTW is required, shop drawings must be reviewed by the manufacturer prior to installation

D. Samples: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.
2. Include similar Samples of trim and accessories involving color selection.

E. Qualification Data:

1. For Installer.

F. Product Test Reports:

1. For each product, for tests performed by a qualified testing agency.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

I. Maintenance Data: For metal panels to include in maintenance manuals.

### **I.6 QUALITY ASSURANCE**

A. Installer Qualifications:

1. Installer of sheet metal roofing for a minimum of 10 years documented experience.

B. Panel Manufacturer:

1. Minimum of 10 years experience in manufacturing architectural roof panels in a permanent stationary indoor facility. Provide facility information if requested.

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **I.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Store panels, flashings and accessories in a safe, dry environment under a waterproof breathable covering to prevent water damage. Allow for adequate ventilation to prevent condensation. Panels and flashings with strippable film shall not be stored in direct sunlight.
- D. Remove strippable protective covering on metal panels during installation.
- E. Upon receipt of delivery of metal panel system, and prior to signing the delivery ticket, the installer is to examine each shipment for damage and for completion of the consignment.

### **I.8 FIELD CONDITIONS**

- A. Weather Limitations:
  - 1. Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

### **I.9 COORDINATION**

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leak proof, secure, and noncorrosive installation.

### **I.10 WARRANTY**

- A. Material and Workmanship Warranty: Manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period:  
Two years from date of Substantial Completion.
- B. Paint Finish Warranty: 30 years from date of Substantial Completion. If metallic colors are used, the "fade" part of the warranty shall be removed.
  - 1. 30 years for Kynar type finish.

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. 20 years for Metallic/Mica finish, Custom finish

C. Installer's Warranty: Submit installer's warranty, signed by Installer, covering the Work of this Section, including all components of roof panels for the following warranty period:

1. Warranty Period: Five years from date of Substantial Completion

D. Weather-tight Warranty:

1. Warranty Period: Twenty years from date of Substantial Completion

### **PART II – PRODUCTS**

#### **II.1 STANDING-SEAM METAL ROOF PANELS**

A. AZ50 Galvalume Steel:

1. Material Gauge: 22 gauge

2. Exterior Finish: As selected from manufacturer's premium finishes

3. Color: As selected from manufacturer's full range.

B. Aluminum:

1. Material Thickness: 0.040 thick

2. Surface: Smooth, flat finish

3. Exterior Finish: As selected from manufacturer's premium finishes

4. Color: As selected from manufacturer's full range

C. Rib Spacing: Manufacturer's standard

D. Panel Coverage: 18 inches

E. Panel Height: 2 inch

#### **II.2 MATERIALS**

A. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet (Galvalume) complying with ASTM A 792/A 792M, Class AZ50/AZ55 coating designation; structural quality. Pre-painted by the coil coating process to comply with ASTM A 755/A 755M.

B. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

#### **II.3 MISCELLANEOUS MATERIALS**

## SECTION 07620 FLASHING AND SHEET METAL

### GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Miscellaneous Metal Sub-framing and Furring: Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weather-tight panel system including trim, copings, fasciae, mullions, sills, corner units, panel clips, flashings, sealants, gaskets, fillers, panel closures, and similar items. Match material and finish of metal panels unless otherwise indicated.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping stainless steel screws designed to withstand design loads.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.
  - 1. Sealant Tape: Buytl
  - 2. Joint Sealant: One Part Poly
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## II.4 FABRICATION

- A. General: Provide factory-formed metal roof panel system complying with ASTM E 1514 requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Form panels in continuous lengths, end laps are not permitted.
- D. Field forming of panels shall be done by factory employees operating the machines.
- E. Fabricate metal panel joints with factory-installed butyl sealant that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- F. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.



## SECTION 07620 FLASHING AND SHEET METAL

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
  - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

### II.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
  1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  2. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  3. Three-Coat Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.
- D. Aluminum Panels and Accessories:

## **SECTION 07620 FLASHING AND SHEET METAL**

### **GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES VEHICLE TESTING FACILITY**

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Mica Fluoropolymer: AAMA 2605. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Three-Coat Metallic Fluoropolymer: AAMA 2605. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
4. Exposed Anodized Finish:
  - a. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker
  - b. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker

## **PART III – EXECUTION**

### **III.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
  1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
  2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### **III.2 METAL PANEL INSTALLATION**

## SECTION 07620 FLASHING AND SHEET METAL

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Shim or otherwise plumb substrates receiving metal panels.
  2. Flash and seal metal panels at perimeter of all openings. Refer to manufacturers recommendations.
  3. Install flashing and trim as metal panel work proceeds.
  4. Panels to be in one continuous length, long length roofs must be field formed by Manufacturer.
  5. Provide weather-tight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized- steel fasteners for surfaces exposed to the interior.
  2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
  2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so metal roof panels, and factory-applied sealant are completely engaged.
- F. Accessory Installation: Install accessories with positive anchorage to building and weather tight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### **III.3 ERECTION TOLERANCES**

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### **III.4 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Prepare inspection reports.
- D. Installer must have installation shop drawings on site at all times.

### **III.5 CLEANING AND PROTECTION**

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**

# **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I - GENERAL**

### **I.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

### **I.2 SUMMARY**

- A. This Section includes the following:
  - 1. Metal counter flashing and base flashing (if any)
  - 2. Metal wall flashing and expansion joints
  - 3. Built-in metal valleys, gutters, and scuppers
  - 4. Gutters and downspouts (rain drainage)
  - 5. Exposed metal trim/fascia units
  - 6. Miscellaneous sheet metal accessories
  - 7. Elastic expansion joints
- B. Integral masonry flashings are specified as masonry work in sections of Division 4.
- C. Roofing accessories installed integral with roofing membrane are specified in roofing system sections as roofing work.
- D. Roof accessory units of premanufactured, set-on type are specified in Division 7 Section "Roof Accessories."

### **I.3 SUBMITTALS**

- A. General:
  - Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data, Flashing, Sheet Metal, and Accessories:
  - Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.
- C. Samples of the following flashing, sheet metal, and accessory items:
  - 1. 12-inch-long samples of factory-fabricated products exposed as finished work. Provide complete with specified factor finish.

### **I.4 PROJECT CONDITIONS**

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

### **PART II – PRODUCTS**

#### **II.1 SHEET METAL FLASHING AND TRIM MATERIALS**

- A. Stainless Steel (07620.A):  
AISI Type 302/304, complying with ASTM A 167, 2D annealed finish, soft, except where harder temper required for forming or performance; (20 gage) except as otherwise indicated.
- B. Extruded Aluminum (07620.B):  
Manufacturer's standard extrusions of sizes and profiles indicated, 60063-T52, AA-C22A41 clear anodized finish; 0.080-inch minimum thickness for primary legs of extrusions.

#### **II.2 FABRICATED UNITS**

- A. General Metal Fabrication:
  - 1. Shop-fabricate work to greatest extent possible.
  - 2. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices.
  - 3. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work.
  - 4. Form work to fit substrates.
  - 5. Comply with material manufacturer instructions and recommendations for forming material.
  - 6. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams:
  - 1. Fabricate nonmoving seams in sheet metal with flat-lock seams.
  - 2. For metal other than aluminum, tin edges to be seamed, form seams, and solder.
  - 3. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions:

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

### **D. Sealant Joints:**

1. Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

### **E. Separations:**

1. Provide for separation of metal from non-compatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

### **F. Aluminum Extrusion Units:**

1. Fabricate extruded aluminum running units with formed or extruded aluminum joint covers for installation behind main members where possible. Fabricate mitered and welded corner units.

## **II.3 ELASTIC EXPANSION JOINTS**

### **A. General:**

1. Provide factory-fabricated units of size and profile indicated complete with prefabricated corner units, intersection units, and splicing materials.
2. Provide complete with elastic sheet flashing forming the primary joint membrane, in a supported, "bellows" arrangement designed for securement to both sides of expansion joints. Underside of bellows insulated with adhesively applied, flexible, closed-cell rubber or plastic not less than 3/8-inch thick.

### **B. Type:**

1. Metal flanged edges, 3 to 4 inches wide, formed to profiles as indicated to fit curbs and designed for nailing to curb substrate. Provide metal flanges in the following thicknesses:
  - a. Zinc-coated steel:
    - i. 22 or 24 gage
  - b. Looped Bellows Width:
    - i. 5 to 6 inches, exclusive of flanges

### **C. Available Manufacturers:**

Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Afco Products, Inc.
2. Celotex Corporation
3. International Permalite/Roofing Components Group
4. Manville/Roofing Systems Division
5. Phoenix Building Products, Inc.
6. York Manufacturing, Inc.

### **PART III -- EXECUTION**

#### **III.4 INSTALLATION REQUIREMENTS**

##### **A. General:**

1. Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual."
2. Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated.
3. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

##### **B. Underlayment:**

1. Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.

##### **C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.**

##### **D. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.**

##### **E. Install counterflashing in reglets, either by snap-in seal arrangement or by welding in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.**

##### **F. Install elastic flashing in accordance with manufacturer's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water from flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.**



## **SECTION 07620 FLASHING AND SHEET METAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- G. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches O.C. Fabricate seams at joints between units with minimum 3-inch overlap, to form a continuous, waterproof system.
- H. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters. Install "beehive"-type strainer-guard at conductor heads, removable for cleaning downspouts.

### **III.5 CLEANING AND PROTECTION**

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Protection:  
Advise contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

**END OF SECTION**

# **SECTION 077123 ROOF GUTTERS AND DOWNSPOUTS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I -- GENERAL**

- A. The work shall consist of furnishing and installation of roof gutters and downspouts on existing buildings as shown on the drawings.

## **PART II - - MATERIAL**

- A. Roof gutters and downspouts may be made of aluminum or galvanized steel. Aluminum gutters shall have a minimum nominal thickness of 0.027 inches. Aluminum downspouts shall have a minimum nominal thickness of 0.020 inches. Galvanized steel gutters and downspouts shall be at least 28 gage. Dissimilar metals shall not be in contact with each other.
- B. Roof gutters and downspouts may also made of plastic pipe. Plastic downspouts shall be Schedule 40 PVC, ASTM D-1785, and painted if exposed to direct sunlight.
- C. No used materials shall be installed in this project.
- D. Supports
  - 1. Gutters shall be supported at a maximum spacing of 48 inches for galvanized steel or 32 inches for aluminum.
  - 2. Gutters supported by spikes and ferrules shall be installed only where the existing rafters and fascia boards are sound and free from rotten wood.
  - 3. Unsound fascia boards shall be replaced. If unsound wood exists in existing rafters, gussets made from new lumber may be attached to the existing rafters for supporting new fascia boards and the gutters.
  - 4. Gutters shall be attached by means of hangers if sufficient backing is not available for the use of spikes and ferrules.
  - 5. Downspouts shall be securely fastened at the top and bottom with intermediate supports that are a maximum of 10 feet apart.

## **PART III -- INSTALLATION**

- A. Gutters shall be installed with the minimum fall specified on the drawings. If the minimum fall is not specified on the drawings, gutters shall be installed with sufficient slope so they drain to the downspouts.
- B. Gutters shall have the minimum cross section dimensions as shown on the drawings.
- C. The opening in the gutter into the downspout shall equal the minimum downspout size shown on the drawings.
- D. Where applicable, the connection between the downspouts and underground outlets will prevent contaminated surface water from entering outlet.

## **E. PROTECTION**

## **SECTION 077123 ROOF GUTTERS AND DOWNSPOUTS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Gutters and downspouts shall be installed so that they are protected from damage by livestock and equipment.

**END OF SECTION**

## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I - GENERAL**

#### **I.1 SUMMARY**

**A. Section Includes:**

1. The sealing of joints indicated on schedule at the end of this section.
2. The sealing of exterior joints, including:
  - a. Exterior face of building expansion joints.
  - b. Panel joints.
  - c. Coping joints.
  - d. Joints around perimeter of frame.
3. The sealing of interior joints including:
  - a. Joints around perimeter of frame.
  - b. Control joints in plaster.
  - c. Control joints in gypsum board.
  - d. Control joints in emu walls.

**B. Joints of a nature similar to that of joints indicated on the schedule shall be sealed with the same sealer, whether indicated on drawings to be sealed or not.**

**1. Related Sections:**

- a. Fire stopping/smoke stopping sealers:  
Elsewhere in Division 7
- b. Joint sealers in roofing work:  
Elsewhere in Division 7
- c. Joint sealers in waterproofing work:  
Elsewhere in Division 7

## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **I.2 REFERENCES**

- A. ASTM C 719-93 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle); 1993.
- B. ASTM C 834-95- Standard Specification for Latex Sealants; 1995.
- C. ASTM C 920-95- Standard Specifications for Elastomeric Joints Sealants 1995.
- D. ASTM C 1193-91- Standard Guide for Use of Joint Sealants; 1991.
- E. ASTM D 3405-78 - Standard Specification for Joint Sealants, Hot-poured for Concrete and Asphalt Pavements; 1978.
- F. ASTM D 3406-85(91) - Standard Specification for Joint Sealant, Hot-Applied, Elastomeric -Type, for Portland cement Concrete Pavements 1985 (Reapproved 1991).
- G. FS A-A-272- Caulking Compounds; 1980.
- H. FS SS-S-200E- Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland cement Concrete Pavement; 1984 (Amended 1988).

### **I.3 DEFINITIONS**

- A. Substrates:
  - 1. M-type substrates:  
Concrete, concrete masonry units, brick, mortar and natural stone. The term "masonry" means brick, stone, and concrete masonry work.
  - 2. G-type substrates:  
Glass and transparent plastic glazing sheets
  - 3. A-type substrates:  
Metals, porcelain, glazed tile, and smooth plastics
  - 4. O-type substrates:  
Woods, unglazed tile; substrates not included under other categories

### **I.4 SUBMITTALS**

- A. Product Data:
  - 1. Manufacturer's data on each joint sealer, with instruction for substrate preparation and installation.
- B. Samples for Color Selection:
  - 1. Cured samples of actual products showing manufacturer's full range of colors. (Products exposed to view only).

## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **C. Certified Product Test Reports:**

1. Independent testing agency reports showing compliance with all specified requirements.
2. Reports may be on tests conducted up to 24 months before submission, provided the products tested were aged specimens of the same formulation as that to be used.

### **D. Field Installation Test Reports.**

### **E. Certificates:**

For each sealer, provide manufacturer's certificates stating that the product complies with the specifications and is appropriate for the use it is being put to.

### **F. Installer's Preconstruction Inspection Report:**

List all conditions detrimental to performance of joint sealer work.

## **1.5 QUALITY ASSURANCE**

### **A. Field Installation Tests:**

Before installation, test the adhesion of all sealers to actual substrates.

1. Seal at least 5-foot lengths of joints and cure properly. Try to pull sealer out of joint by hand, by method recommended by sealer manufacturer.
2. Select test joint representative of joints to be sealed by the product to be tested.
3. Perform tests for each type of sealer used on exterior and each type of elastomeric sealant used on interior.
4. Do tests in the presence of the Project Manager.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- ### **A. Deliver materials in original containers or bundles with labels showing manufacturer, product name or designation, color, shelf life, and installation instructions.**

## **1.7 PROJECT CONDITIONS**

### **A. Environmental Limitations:**

Do not install sealers if any of the following conditions exist.

1. Air or substrate temperature exceeds the range recommended by sealer manufacturers.
2. Substrate is wet or damp.

### **B. Dimensional Limitations:**

Do not install sealers if joint dimensions are less than or greater than that recommended by sealer manufacturer; notify alternative procedures.

## **1.8 WARRANTY**

## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Submit written warranty signed by Contractor and installer guaranteeing correct failures in sealer work that occur within 10 years after substantial completion, without reducing or otherwise limiting any other rights to correction which the owner may have under the contract documents. Failure is defined as failure to remain weathertight due to faulty materials or workmanship. Correction is limited to replacement sealers.

### **PART II -- PRODUCTS**

#### **II.1 MATERIALS - GENERAL**

- A. General:  
Provide only products which are recommended and approved by their manufacturer for the specific use to which they are put and which comply with all requirements of the contract documents.
  - 1. For each generic product, use only materials from one manufacturer.
  - 2. Provide only materials which are compatible with each other and joint substrates.
  - 3. Colors of exposed sealers:  
As selected by the Owner's Representative from manufacturer's standard colors

#### **II.2 ELASTOMERIC SEALANTS**

- A. Elastomeric Sealants General:  
Chemically curing elastomeric sealants types indicated, complying with ASTM C 920, including specific type, Grade, Class, and Uses indicated, as well as all other requirements specified.
  - 1. For M-type substrates:  
Comply with requirements for Use M
  - 2. For G-type substrates:  
Comply with requirements for Use G
  - 3. For A-type substrates:  
Comply with requirements for Use A
  - 4. For O-type substrates:  
Comply with requirements for Use M. (minimum) and use O for the particular substrate.
- B. Two-Part Pourable Polysulfide Sealant:  
Type M, Grade P, Class 12-1/2 T
- C. Medium Movement Silicone Sealant:  
One- or two-part non-acid-curing, Grade NS, Class 25, Use NT, plus movement capability of more than 25 percent but less 50 in both extension and compression.
- D. Silicone Sealant for Use T:

## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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One-part, non-acid-curing, Grade NS, Class 25, Use T, Use M, plus movement capability of 50 percent in both extension and compression.

- E. Multipart Pourable Urethane Sealant:  
Type M, Grade P, Class 25, Use T
- F. No sag Urethane Sealant for Use T:  
Type S or M, Grade NS, Class 25, Use T
- G. One-part No sag Urethane Sealant:  
Type S, Grade P, Class 25, Use T

### **II.3 SOLVENT-RELEASE-CURING SEALANTS**

- A. Butyl Sealant:  
No sag, one part, solvent-release-curing; complying with FS A-A-272, Type III, no staining; paintable.

### **II.4 LATEX SEALANTS**

- A. Acrylic-Latex Emulsion Sealant:  
One-part, No sag, mildew-resistant, paintable; complying with ASTM C 834.

### **II.5 SEALANT BACKERS**

- A. Backers- General:  
No staining; recommended or approved by sealant manufacturer for specific use.
- B. Backers Rods:  
Flexible, nonabsorbent, compressible polyurethane foam either open-cell or non-gassing closed-cell, unless otherwise restricted by sealant manufacturer; preformed to appropriate size and shape.

### **II.6 MISCELLANEOUS MATERIALS**

- A. Primers:  
As recommended by sealer manufacturer.
- B. Cleaners:  
As recommended by sealer manufacturer and not damaging to substrates.
- C. Masking Tape:  
Nonabsorbent, no staining.
- D. Tooling Agents:  
Approved by sealant manufacturer; no staining to sealant and substrate.

## **PART III – EXECUTION**

### **III.1 EXAMINATION**



## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Examine joints for characteristics that may affect sealer performance including configuration and dimensions.
- B. Do not begin joint sealer work until unsatisfactory conditions have corrected.

### **III.2 PREPARATION**

- A. Cleaning:  
Just before starting sealer installation, clean out joints accord with recommendations of sealer manufacturers and as follows:
  - 1. Remove all material that could impair adhesion, including dust, dirt, coatings, paint, oil, and grease. Exception: Materials tested to show acceptable adhesion and compatibility.
  - 2. Dry out damp and wet substrates thoroughly.
  - 3. Clean M-type and O-type substrates by suitable mechanical or chemical methods.
  - 4. Remove loose particles by vacuuming or by blowing with oil-free compressed air.
  - 5. Concrete: Remove laitance and form-release coatings.
  - 6. Clean A-type and G-type substrates by chemical or other method which will not damage the substrate.
  - 7. Use methods which will not leave residues that will impair adhesion.
- B. Priming:  
Prime substrates as recommended by sealer manufacturer.
- C. Marking Tape:  
Use masking tape to keep primers and sealers off of adjacent surfaces which would be damaged by contact or by cleanup. Remove tape as soon as practical.
- D. Install fillers where needed to provide proper joint depth or support for sealant backers.

### **III.3 INSTALLATION**

- A. Comply with sealer manufacturers' installation instructions and recommendations, except where more restrictive requirements are specified.
- B. Gun Applied and Pourable Sealants:  
Comply with recommendations of ASTM C 1193.
- C. Backers:  
Install backers at depth required to result in shape and depth of installed sealant which allows the most joint movement without failure.
  - 1. Make backers continuous, without gaps, tears, or punctures. Do not stretch or twist backers.
- D. Sealants:

## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Use methods recommended by manufacturer; completely fill the joint; make full contact with bond surfaces; tool no sag sealants to smooth surface eliminating air pockets.

1. Use concave joint shape shown in Figure 5A in ASTM C 1193, where not otherwise indicated.

### **III.4 PROTECTION AND CLEANING**

- A. Cleaning surfaces adjacent to joints as work progresses and before sealants set using methods and materials approved by manufacturers of sealers and of surfaces to be cleaned.
- B. Protect joint sealers from contamination and damage.
- C. Remove and replace damage sealers.

### **3.5 SCHEDULE OF JOINT SEALERS**

- A. General:  
Unless otherwise indicated, joints around perimeter of frames, where indicated to be sealed, are to be sealed using sealer specified for the substrate to the frame.
- B. Exterior Joints for Which No Other Sealer Is Indicated:
  1. Use one of the following sealants:
    - a. Medium movement silicone sealant
    - b. One-part no sag urethane sealant
    - c. One-part no sag low-modulus urethane sealant
  2. Backer:  
Backer rod
  3. Joint shape:  
Concave joint configuration
- C. Interior Joints for Which No Other Sealer Is Indicated:
  1. Use one of the following sealants:
    - a. Acrylic-emulsion latex sealant
  2. Backer:  
Backer rod
  3. Joint shape:  
Concave joint Configuration

## **SECTION 07900 JOINT SEALERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **D. Exterior Joints Well Protected from Weather and Not Subject to Movement.**

#### **1. Use one of the following sealants:**

a. Any sealer

#### **2. Backer:**

Backer rod.

### **E. Vehicular Paving Joints, Not Over 1-1/2 Percent Slope.**

#### **1. Use one of the following sealants:**

a. Silicone sealant for Use T

b. Two-part cold-applied urethane paving sealant.

c. One-part cold-applied urethane paving sealant.

d. PVC/coal tar paving sealant (ASTM D 3406).

e. Rubber-asphalt paving sealant (ASTM D 3405).

#### **2. Use bond-breaker tape.**

#### **3. Backer: Joint filler specified elsewhere.**

### **F. Interior Floor Joints And Pedestrian Paving Joints, Less than 1-1/2 Percent Slope:**

#### **1. Use one of the following sealants:**

a. Two-part pourable polysulfide sealant.

b. Silicone sealant for Use T.

c. Two-part pourable urethane sealant.

d. Two-part no sag urethane sealant for Use T.

e. One-part pourable urethane sealant.

#### **2. Backer:**

Backer rod.

#### **3. Joint shape:**

Concave joint configuration.

**END OF SECTION**

## **DIVISION 9 - FINISHES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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# **SECTION 09253 – SALT RETAINING WATER REPELLENT RENOVATION STUCCO**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I -GENERAL**

### **1.1 SUMMARY**

- A. Section Includes:  
Application of salt-retaining water repellent stucco for masonry substrates. Specification includes surface preparation.
- B. Related Sections:  
Related sections include the following:
  - 1. Section 09772- Silicate Coatings.

### **1.2 REFERENCES**

- A. General:  
The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Deutsches Institut fur Normung (DIN), European Standard (EN), and International Organization for Standardization (ISO):
  - 1. DIN EN 998-1, Specification for mortar for masonry- Part I:
  - 2. Rendering and plastering mortar.
  - 3. DIN V 18550, strength standard for render and rendering systems.
- C. WTA, acronym for International Association for Science and Technology of Building Maintenance and Monuments Preservation, [www.wta.de/en](http://www.wta.de/en).
  - 1. Technical Bulletin 2-9-04/D, Renovation Mortar Systems.

### **1.3 DEFINITIONS**

- A. Gentle Cleaner:  
A detergent used to remove soiling from mineral surfaces.
- B. Renovation Stucco:  
A dry sacked specification grade stucco mix.+
- C. Base Coat:  
First coat of renovation stucco.
- D. Finish Coat:  
Second coat of renovation stucco.

### **1.4 SYSTEM DESCRIPTION**

## **SECTION 09253 – SALT RETAINING WATER REPELLENT RENOVATION STUCCO**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**A. Gentle Cleaner:**

A neutral biodegradable cleaning concentrate for gentle cleaning of mineral surfaces.

**B. Renovation Stucco:**

A WTA certified materials-compatible highly vapor permeable water repellent restoration/renovation render based on trass binders and hydraulic cement with elevated salt retention capacity. Install over mineral surfaces.

### **1.5 SUBMITTALS**

**A. Product Data:**

Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Provide published documentation describing materials, characteristics, and limitations.

**B. Samples:**

Submit samples for verification purposes, fabrication techniques and workmanship.

**C. Manufacturer's Instructions:**

Submit manufacturer's instructions including technical data sheets, material safety data sheets, mixing instructions, application requirements, special procedures, and conditions requiring special attention.

### **1.6 QUALITY ASSURANCE**

**A. Qualifications:**

**1. Manufacturer Qualifications:**

Provide evidence that Manufacturer is a firm engaged in the manufacture of silicate coatings of types required, and whose products have been in satisfactory use in similar service for a minimum of ten years.

**2. Applicator Qualifications:**

a. Provide evidence Applicator is a firm having a minimum of three years of successful application experience with projects similar in type and scope to that required for this Project, and approved by the manufacturer.

**B. Mock ups:**

Prior to application of the work, fabricate and erect mock ups for each type of finish and application to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock ups to comply with the following requirements using materials indicated for final unit of work. Locate mock ups as directed by the Owner's Representative. Demonstrate the proposed range of aesthetic effects and workmanship to be expected in the completed work. Obtain the Owner's Representative's acceptance of mock ups before start of final unit of work.

1. Retain and maintain mock ups during construction in undisturbed condition as a standard for judging completed unit of work.

# **SECTION 09253 – SALT RETAINING WATER REPELLENT RENOVATION STUCCO**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to the Project site in suppliers or manufacturer's original wrappings and containers, labeled with manufacturer's name, material and product brand name, and lot number, if any.
- B. Store materials in their original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

## **1.8 PROJECT CONDITIONS**

- A. Environmental Requirements:
  - 1. Substrate and ambient air temperature must be above 41°F (5°C).
  - 2. Do not apply when rain is expected, in high winds, or onto hot substrates.

## **1.9 WARRANTY**

- A. Product warranty from date of Substantial Completion is 1 (one) year.

## **PART II - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design:

Items specified are to establish a standard of quality for design, function, materials, compatibility, performance, warranty, and appearance. Equivalent products by listed manufacturers are acceptable. The Owner's Representative is the sole judge of the basis of what is equivalent.
- B. KEIM Mineral Coatings of America, Inc., 10615 Texland Blvd. #600, Charlotte, North Carolina 28273. Telephone 704-588-4811. Email keim-info@keim.com.

### **2.2 MATERIALS**

- A. Gentle Cleaner:

Provide detergent having these qualities:

  - 1. Neutral pH concentrate diluted with clean water.
  - 2. Removes well-adhering dust, fats, oil, and carbon-based pollutants from mineral surfaces.
  - 3. Environmentally harmless and biodegradable.
  - 4. NoVOC.
- 5. Basis of Design:

"KEIM Stone Cleaner N", KEIM Mineral Coatings of America, Inc.

## **SECTION 09253 – SALT RETAINING WATER REPELLENT RENOVATION STUCCO**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **B. Renovation Stucco:**

Provide dry bagged salt-retaining water repellent renovation stucco having these qualities:

1. Trass binders and hydraulic cement basis.
2. Strength corresponding to DIN V 18550, mortar category CS II and P II.
3. Compliant to DIN EN 998-1 as a rendering and plastering mortar.
4. Certified by WTA to Technical Bulletin 2-9-04/D as a renovation mortar system for salt-loaded substrates, high vapor permeability, and water repellency.
5. NoVOC.
6. Basis of Design:  
"KEIM Porosan Top Coat", KEIM Mineral Coatings of America, Inc.

## **2.3 EQUIPMENT**

### **A. Tools:**

1. Gentle Cleaner:  
Apply by brush or injected through steam cleaner or pressure washer. Clean up with water.
2. Renovation Stucco:  
Mix with continuous automatic mixing pump or paddle on drill motor. Apply using ordinary stucco tools. Clean up with water.

## **2.4 FINISHES**

### **A. Renovation Stucco base coat:**

Scarify surfaces of stucco base coat to provide a key for subsequent finish stucco coat application.

### **B. Renovation Stucco finish coat:**

Reproduce texture of surrounding surfaces or finish as directed by Owner's Representative.

## **PART III - EXECUTION**

### **3.1 EXAMINATION**

#### **A. Verification of Conditions:**

Confirm by examination the areas and conditions under which the work is to be applied for compliance with manufacturer's instructions. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Verify substrate is secure, sound, dry, absorbent, and free of dirt, grease, salts, oil-based paints, release agents, curing agents, and other bond breakers.
2. Verify substrate has no pretreatments or priming materials applied.



# **SECTION 09253 – SALT RETAINING WATER REPELLENT RENOVATION STUCCO**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Applicator.

## **3.2 PREPARATION**

### **A. Protection:**

Lay ground cloths and take measures as necessary to protect surfaces subject to contact by products specified by this Section.

### **B. Prepare stucco surfaces:**

1. Remove biological growth.
2. Sound existing stucco. Remove loose or delaminated layers to sound substrate.
3. Remove salt-laden debris from project site. Prevent debris from contacting unprotected ground.
4. Remove crumbly stucco to sound substrate by high pressure water spray or by mechanical means.
5. Do not allow salt contaminated rinse water to contact project site.

### **C. Remove soiling and pollutants with Gentle Cleaner: Brush Cleaning Method**

1. Mechanically remove thick soil deposits.
2. Dilute 1:10 with clean water (1 part gentle cleaner to 10 parts clean water.)
3. Clean contaminated surfaces with diluted gentle cleaner. Allow to rest minimum 1 hour.
4. Reapply diluted gentle cleaner to contaminated surfaces. Rinse from bottom of facade to top and then back down with clean water to prevent loosened soil from re-depositing onto the cleaned surface.

### **D. Remove soiling and pollutants with Gentle Cleaner: Steam Cleaner or Pressure Washer Method**

1. Dilute 1:10 with clean water (1 part gentle cleaner to 10 parts clean water.)
2. Add diluted gentle cleaner to additive reservoir of cleaning equipment. Adjust product delivery for best effect.
3. Clean contaminated surfaces from bottom to top. Rinse cleaned surfaces from bottom of facade to top and then back down with clean water to prevent loosened soil from re-depositing onto the cleaned surface.

## **3.3 APPLICATION**

- ### **A. Conform to reviewed product data, manufacturer's written instructions, and provisions of the Contract Documents.**

## **SECTION 09253 – SALT RETAINING WATER REPELLENT RENOVATION STUCCO**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **B. Plan the work properly.**

1. Work ahead of the sun on shaded facades.
2. Do not apply on sun heated substrate.
3. Work to logical stopping points (corners, seams, architectural features, etc.)
4. Observe recommended minimum curing periods.
5. Unless otherwise stated below, protect from wind and rain prior to, during, and for a minimum 24 hours after application.

### **C. Renovation Stucco, base coat:**

1. Ensure surfaces and substrates are completely dry.
2. Brush salt formations from surfaces. Blow surfaces clean with filtered compressed air. Do not use water.
3. Pre-wet surfaces to ensure all contact areas are dampened. Sponge off standing water.
4. Prepare renovation stucco according to product technical data sheet.
5. Place stucco into voids left from delaminated or crumbly stucco removal in one coat to plane of existing stucco. Maximum lift 3/4 inch (20 mm). Scarify fresh stucco surface after 4 hours to key for next lift.
6. Cure minimum 28 days.

### **D. Renovation Stucco, finish coat:**

1. Ensure all contact areas are dry. Do not pre-wet surfaces.
2. Prepare renovation stucco according to product technical data sheet.
3. Apply renovation stucco finish coat in one lift minimum 3/8 inch (10 mm) over all stucco surfaces where indicated in construction documents.
4. Finish as directed in 2.4 FINISHES.
5. Protect freshly applied stucco from drying too quickly. Moist cure if necessary.
6. Cure minimum 10 days before applying silicate coating system.

## **3.4 CLEANING**

A. Clean tools, spills, and accidental drips immediately with plenty of water.

B. Leave applications clean and premises free from residue and debris from work of this Section.

**SECTION 09253 – SALT RETAINING WATER REPELLENT RENOVATION  
STUCCO**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**END OF SECTION**

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART I - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - Application of lime remover and three coats of silicate coating over water repellency.
  - Specification includes surface preparation.
- B. Related Sections:
  - Related sections include the following:
    - 1. Section 09253 - Salt-Retaining Water Repellent Renovation Stucco

#### **1.2 REFERENCES**

- A. General:
  - The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. B. ASTM (ASTM):
  - 1. ASTM E 96, "Standard Test Methods for Water Vapor Transmission of Materials."
  - 2. ASTM E 514, "Standard Test Method for Water Penetration and Leakage Through Masonry."
  - 3. ASTM G 154, "Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials."
- C. Deutsches Institut fur Normung (DIN), European Standard (EN), and International Organization for Standardization (ISO):
  - 1. DIN 18 363 2.4.1, manufacturing standard for silicate paint.
  - 2. DIN EN 13 300, manufacturing standard for interior silicate paint.
  - 3. DIN EN 1062, manufacturing standard for sol silicate paint.
  - 4. ISO 11998, "Paints and varnishes - Determination of wet-scrub resistance and clean ability of coatings."
  - 5. ISO 6504-3, "Paints and varnishes- Determination of hiding power- Part 3: Determination of contrast ratio of light-colored paints at a fixed spreading rate."
  - 6. ISO 2813, "Paints and varnishes - Determination of specular gloss of non-metallic paint films at 20 degrees, 60 degrees and 85 degrees."
  - 7. EN 1062-3, "Paints and varnishes- Coating materials and coating systems for exterior masonry and concrete- Part 3: Determination of liquid water permeability."

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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8. DIN EN 1504-2, "Products and systems for the protection and repair of concrete structures- Definitions, requirements, quality control and evaluation of conformity - Part 2: Surface protection systems for concrete."
9. DIN EN ISO 7783-2, "Coating materials and coating systems for exterior masonry and concrete – Part 2: Determination and classification of water-vapor transmission rate (permeability)."
10. DIN 4102-A2, "Fire Behavior of Building Materials and Building Components- Part 2: Building Components; Definitions, Requirements and Tests."
11. DIN 18363, "Construction Contract Procedures (VOB) Part C: General Technical Specifications in Construction Contracts (ATV) Painting and Varnishing."

### **1.3 DEFINITIONS**

- A. Lime remover:  
A liquid silicic acid.
- B. Water repellency:  
A water repelling liquid that is applied to mineral surfaces prior to the application of the silicate base coat.
- C. Silicate coating base coat:  
The first applied coat of the silicate coating.
- D. Silicate coating, intermediate coat:  
The second applied coat of the silicate coating.
- E. Silicate coating, top coat: The third applied coat of the silicate coating.
- E. Dilution:  
A silicate based diluent.

### **1.4 SYSTEM DESCRIPTION**

- A. A materials-compatible highly vapor permeable decorative coating system offering severe weathering protection for exterior exposure. Install over mineral surfaces.
  1. Lime Remover:  
A silicic acid based cleaner used to open sinter layers on rendered plaster surfaces to ensure they are absorbent. May be used to remove lime efflorescence and calcium carbonate deposits from mineral surfaces.
  2. Water Repellency:  
A solvent-free liquid silane that is drawn into the capillaries of the substrate and by chemical reaction forms a micro-thin silica gel coating within repelling liquid water and salt ions by reducing surface tensions while maintaining substrate vapor permeability.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **3. Silicate Coating:**

An incombustible three coat system with UV and alkaline resistant inorganic pigments in the specified color with biocides. Coatings penetrate the surface and in a chemical reaction with the substrate results in covalent bonds forming a hard amorphous microporous layer with extremely high vapor permeability that is unaffected by acids, UV exposure, or airborne pollutants. Provides weathering protection without reducing substrate vapor permeability.

## **1.5 SUBMITTALS**

### **A. Product Data:**

Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications. Provide published documentation describing materials, characteristics, and limitations.

### **B. Samples:**

Submit samples for verification purposes, fabrication techniques and workmanship.

### **C. Manufacturer's Instructions:**

Submit manufacturer's instructions including technical data sheets, material safety data sheets, mixing instructions, application requirements, special procedures, and conditions requiring special attention.

## **1.6 QUALITY ASSURANCE**

### **A. Qualifications:**

#### **1. Manufacturer Qualifications:**

- a. Provide evidence that Manufacturer is a firm engaged in the manufacture of silicate coatings of types required, and whose products have been in satisfactory use in similar service for a minimum of ten years.

#### **2. Applicator Qualifications:**

- a. Provide evidence Applicator is a firm having a minimum of three years of successful application experience with projects similar in type and scope to that required for this Project and approved by the manufacturer.

### **B. Mock ups:**

Prior to application of the work, fabricate and erect mock ups for each type of finish and application to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock ups to comply with the following requirements using materials indicated for final unit of work. Locate mock ups as directed by the Owner's Representative. Demonstrate the proposed range of aesthetic effects and workmanship to be expected in the completed work. Obtain the Owner's Representative's acceptance of mock ups before start of final unit of work.

1. Retain and maintain mock ups during construction in undisturbed condition as a standard for judging completed unit of work.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with manufacturer's name, material and product brand name, and lot number, if any.
- B. Store materials in their original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

### **1.8 PROJECT CONDITIONS**

- A. Environmental Requirements:
  - 1. Substrate and ambient air temperature must be under 86° F (30 °C). Maintain temperature during and after application.
  - 2. Do not apply when rain is expected, in high winds, or onto hot substrates.

### **1.9 WARRANTY**

- A. Warranty period from date of Substantial Completion is 15 years.

## **PART II - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design:

Items specified are to establish a standard of quality for design, function, materials, compatibility, performance, warranty, and appearance. Equivalent products by listed manufacturers are acceptable. The Owner's Representative is the sole judge of the basis of what is equivalent.
- B. KEIM Mineral Coatings of America, Inc., 10615 Texland Blvd. #600, Charlotte, North Carolina 28273. Telephone 704-588-4811. Email keim-info@keim.com.

### **2.2 MATERIALS**

- A. Lime Remover:

Silicic acid based cleaner that is diluted with water that reacts immediately upon application. No VOC.

  - 1. Basis of Design:

"KEIM Lime Remover", KEIM Mineral Coatings of America, Inc.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **B. Water Repellency:**

A solvent-free silane based proprietary water repellent with 100% active ingredient. Produces a silica gel micro-coating within the capillaries of the substrate by a chemical reaction with the humidity of the air and of the substrate. The silica gel coating breaks surface tensions preventing water and salts migration yet maintains water vapor diffusion of substrate. Less than 10 g/l VOC.

#### **1. Basis of Design:**

"KEIM Silan 100", K.EIM Mineral Coatings of America, Inc.

### **C. Silicate Coating, Base Coat, Intermediate Coat, and Top Coat:**

Provide silicate based opaque coating meeting or conforming to:

1. DIN 18 363 2.4.1, manufacturing standard for silicate paint.
2. DIN EN 1504-2/2.2, Products and systems for the protection and repair of concrete structures/Surface protection systems for concrete.
3. DIN 4102-A2, non-flammable standard- will not burn.
4. ASTM E 96 Vapor Permeability- 83 perms.
5. ASTM G 154 Accelerated Weathering- no fading, cracking, peeling.
6. ASTM E 514 62-MPH Wind-Driven Rain Test - no water penetration.
7. With biocides.
8. Less than gram I per liter VOC (Volatile Organic Content).
9. Basis of Design:  
"KEIM Royalan", KEIM Mineral Coatings of America, Inc.

### **D. Dilution for Silicate Coating:**

Provide silicate dilution meeting or conforming to:

1. DIN 4102-A2, non-flammable standard- will not burn.
2. ASTM E 96 Vapor Permeability- 83 perms.
3. Less than 1 gram per liter VOC (Volatile Organic Content).
4. Basis of Design:  
"KEIM Royalan Dilution", KEIM Mineral Coatings of America, Inc.

## **2.3 EQUIPMENT**

### **A. Tools:**

#### **1. Lime Remover:**

Apply by brush or Hudson style sprayer, rinse off with low pressure spray.



## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

2. Water Repellency:

Apply by natural bristle brush, roller, or low pressure Hudson-style sprayer.

3. Silicate Coating, Base Coat, Intermediate Coat, and Top Coat:

Apply by natural bristle facade brush, professional roller, or professional airless spray equipment and back-roll as required for even distribution.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **2.4 FINISHES**

- A. Lime Remover:  
Leave surface clean from removed particles.
- B. Silicate Coating; Base Coat, Intermediate Coat, and Top Coat:  
Apply evenly to a smooth mineral matte finish without lap lines, voids, "holidays", or drips.

## **PART III - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification of Conditions:  
Confirm by examination the areas and conditions under which the work is to be applied for compliance with manufacturer's instructions. Do not proceed with the work until unsatisfactory conditions have been corrected.
  - 1. Verify substrate is secure, sound, dry, and absorbent, and free of dirt, grease, salts, oil-based paints, release agents, curing agents, and other bond breakers.
  - 2. Pressure wash surfaces exposed to airborne salts or sea water with plenty of clean water.
  - 3. Verify substrate has no pretreatments or priming materials applied.
  - 4. Verify Renovation Stucco finish coat has cured minimum 10 days.
  - 5. Verify other materials to be coated are fully cured to manufacturer recommendations.
  - 6. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Applicator.

### **3.2 PREPARATION**

- A. Protection:  
Lay ground cloths and take measures as necessary to protect surfaces subject to contact by products specified by this Section.

### **3.3 APPLICATION**

- A. Conform to reviewed product data, manufacturer's written instructions, and provisions of the Contract Documents.
- B. Plan the work properly.
  - 1. Work ahead of the sun on shaded facades.
  - 2. Work to logical stopping points (corners, seams, architectural features, etc.).
  - 3. Apply coatings maintaining a wet edge to desired finish as indicated in FINISHES Article.
  - 4. Protect from wind and rain prior to, during, and for a minimum 24 hours after application.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **C. Lime Remover:**

1. Brush off visible salt formations (efflorescence).
2. Dampen renovation stucco base coat patches and fills with clean water. When dry to touch yet still visibly damp, proceed with lime remover.
3. Dilute lime remover 1:3 with clean water (1 part lime remover to 3 parts clean water.)
4. Apply to Renovation Stucco finish coat surfaces from bottom working to the top. Reaction is immediate.
5. Rinse treated areas with clean water from bottom to top and back down to prevent loosened particles from depositing into the surface.
6. Allow surfaces to completely dry out and inspect for salt efflorescence. Should efflorescence reappear remove with clean water rinsing from bottom of facade to top and back down. Repeat until efflorescence does not reappear.

### **D. Water Repellency:**

1. Apply to saturation by flooding over substrate.
2. Repeat application after 10 minutes. Wipe excess material from substrate.
3. Observe 4 hours for repellency to penetrate and immediately thereafter begin application of silicate base coat.

### **E. Silicate Coating:**

#### **1. Base Coat:**

Dilute silicate coating with maximum 20 percent dilution (25kg with 5 liters dilution). Stir well by hand or 600-800 RPM mixing equipment.

- a. Apply base coat of diluted silicate coating.
- b. Observe minimum 12 hours curing time.

#### **2. Intermediate Coat:**

Do not dilute. Stir well by hand or 600-800 RPM mixing equipment.

- a. Apply intermediate coat of undiluted silicate coating.
- b. Observe minimum 12 hours curing time.

#### **3. Top Coat:**

Do not dilute. Stir well by hand or 600-800 RPM mixing equipment. a. Apply top coat of undiluted silicate coating.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **3.4 CLEANING**

- A. Lime Remover:  
Clean tools with clean water.
- B. Water Repellency:  
Clean tools immediately with benzene or similar solvent.
- C. Silicate Coating:  
Clean tools, spills, and accidental drips immediately with plenty of water.
- D. Leave applications clean and premises free from residue and debris from work of this Section.

**END OF SECTION**

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **PART 1 • GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. This Section includes surface preparation and field painting of the following:
  - 1. Exposed interior items and surfaces.
  - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Owner's Representative will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Distribution cabinets.
  - 2. Finished metal surfaces include the following:
    - a. Anodized aluminum
    - b. Stainless steel
    - c. Chromium plate
    - d. Copper
    - e. Bronze and brass
  - 3. Labels:

Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code required labels or equipment name, identification, performance rating, or nomenclature plates.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **1.3 DEFINITIONS**

**A. General:**

Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85- degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60- degree meter.
4. Semi-gloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60- degree meter.

### **1.4 SUBMITTALS**

**A. Product Data:**

For each paint system specified. Include block fillers and primers.

**1. Material List:**

Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

**2. Manufacturer's Information:**

Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

**3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).**

**B. Samples for Verification:**

Of each color and material to be applied, with texture to simulate actual conditions.

**C. Qualification Data:**

For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Owner's Representative and owners, and other information specified.

### **1.5 QUALITY ASSURANCE**

**A. Applicator Qualifications:**

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in- service performance.

**B. Source Limitations:**

Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

**A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:**

1. Product name or title of material
2. Product description (generic classification or binder type)
3. Manufacturer's stock number and date of manufacture
4. Contents by volume, for pigment and vehicle constituents
5. Thinning instructions
6. Application instructions
7. Color name and number
8. VOC content

**B. Store materials not in use in tightly covered containers in a well-ventilated area. Maintain containers used in storage in a clean condition, free of foreign materials and residue.**

1. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

### **1.7 PROJECT CONDITIONS**

**A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are below 90°F (32°C).**

**B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are below 95°F (35°C).**

**C. Do not apply paint when the relative humidity exceeds 85 percent; or at temperatures less than 5°F (3°C) above the dew point; or to damp or wet surfaces.**

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and within temperature limits specified by manufacturer during application and drying periods.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **1.8 EXTRA MATERIALS**

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.

1. Quantity:

Furnish the Owner with a 1-gallon can of each type of finish coat of each color, taken from lots furnished for the work.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

A. Available Products:

Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.

B. Manufacturers Names:

The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:

1. Devoe & Raynolds Co. (Devoe).
2. Fuller-O'Brien Paints (Fuller).
3. Glidden Co. (The) (Glidden).
4. Benjamin Moore & Co. (Moore).
5. PPG Industries, Inc. (PPG).
6. Pratt & Lambert, Inc. (P & L).
7. Sherwin-Williams Co. (S-W).
8. Martin Seymour Co. (MS).

#### **2.2 PAINT MATERIALS, GENERAL**

A. Material Compatibility:

Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality:

Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names:



## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

### **C. Colors:**

Match colors indicated by reference to manufacturer's color designations.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

#### **A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.**

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

#### **B. Coordination of Work:**

Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Owner's Representative about anticipated problems using the materials specified over substrates primed by others.

### **3.2 PREPARATION**

#### **A. General:**

Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

#### **B. Cleaning:**

Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

#### **C. Surface Preparation:**

Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Provide barrier coats over incompatible primers or remove and re-prime.
2. Ferrous Metals:
  3. Clean un-galvanized ferrous metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
  4. Galvanized Surfaces:

Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

### **D. Materials Preparation:**

Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

### **E. Tinting:**

Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

## **3.3 APPLICATION**

### **A. General:**

Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
8. Sand lightly between each succeeding enamel or varnish coat.

### **B. Scheduling Painting:**

Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touch up painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

### **C. Application Procedures:**

Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

#### **1. Brushes:**

Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.

#### **2. Rollers:**

Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**3. Spray Equipment:**

Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

**D. Minimum Coating Thickness:**

Apply paint materials no thinner than manufacturers recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

**E. Mechanical and Electrical Work:**

Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

**F. Mechanical items to be painted include, but are not limited to, the following:**

1. Piping, pipe hangers, and supports
2. Equipment supports
3. Accessory items

**G. Electrical items to be painted include, but are not limited to, the following:**

1. Conduit and fittings

**H. Prime Coats:**

Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

**I. Pigmented (Opaque) Finishes:**

Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

**J. Transparent (Clear) Finishes:**

Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

**K. Completed Work:**

Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

### **3.4 CLEANING**

## **SECTION 09772 – SILICATE COATINGS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

### **A. Cleanup:**

At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

### **3.5 PROTECTION**

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Owner's Representative.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA Pl.

### **3.6 EXTERIOR PAINT SCHEDULE**

#### **A. Ferrous Metal:**

Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

##### **1. Semi-gloss, Acrylic-Enamel Finish:**

2 finish coats over a rust-inhibitive primer.

##### **a. Primer:**

Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

##### **b. First and Second Coats:**

Semi-gloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

**END OF SECTION**

## **DIVISION 10 - SPECIALTIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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# **SECTION 104416 - FIRE EXTINGUISHERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I -GENERAL**

### **1.1 RELATED DOCUMENTS**

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

- A. Related Sections:  
N/A

### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

### **1.4 INFORMATIONAL SUBMITTALS**

- A. Warranty: Sample of special warranty.

### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

### **1.6 QUALITY ASSURANCE**

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Provide fire extinguishers approved, listed, and labeled by FMG.

### **1.7 COORDINATION**

Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure function.

### **1.8 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
- B. Failures include, but are not limited to, the following:
1. Failure of hydrostatic test according to NFPA 10.

## **SECTION 104416 - FIRE EXTINGUISHERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. Faulty operation of valves or release levers.

C. Warranty Period: One (1) year from date of Substantial Completion.

### **PART II -PRODUCTS**

#### **2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS**

A. Fire Extinguishers: Type A,B&C, 20 Lb, and capacity for each mounting bracket indicated.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Amerex Corporation.
2. Badger Fire Protection; a Kidde company.
3. Buckeye Fire Equipment Company.
4. Fire End & Croker Corporation.
5. J. L. Industries, Inc.; a division of Activar Construction Products Group.
6. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
7. Larsen's Manufacturing Company.
8. Moon-American.
9. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
10. Potter Roemer LLC.
11. Ansul, a Tyco International Company

C. Valves: Nickel-plated, polished brass body.

D. Handles and Levers: **Stainless steel**

E. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

F. Multipurpose Dry-Chemical Type in Aluminum Container: UL-rated 20-A:120-B:C, 20-lb (9.1-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.

#### **2.2 MOUNTING BRACKETS**

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.



## **SECTION 104416 - FIRE EXTINGUISHERS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**B.** Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

1. Amerex Corporation.
2. Badger Fire Protection; a Kidde company.
3. Buckeye Fire Equipment Company.
4. Fire End & Croker Corporation.
5. J. L. Industries, Inc.; a division of Activar Construction Products Group.
6. Larsen's Manufacturing Company.
7. Potter Roemer LLC.
8. Ansul, a Tyco International Company.

**C.** Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

1. Orientation: **Vertical.**

### **PART III -EXECUTION**

#### **3.1 EXAMINATION**

- A.** Examine fire extinguishers for proper charging and tagging.
- B.** Remove and replace damaged, defective, or undercharged fire extinguishers.
- C.** Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.2 INSTALLATION**

- A.** General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B.** According to NFPA 10, maximum mounting height for fire extinguishers weighing 40 lb (18 kg) or less is 60 inches (1524 mm); for those weighing more, it is 42 inches (1067 mm).
- C.** Mounting Brackets: **54 inches (1372 mm)** above finished floor to top of fire extinguisher.
- D.** Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

**END OF SECTION**

## **SECTION 108600 – CONVEX MIRRORS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Convex Mirrors.

#### **1.2 RELATED SECTIONS**

- A. Section 06 10 00 - Rough Carpentry.

#### **1.3 SUBMITTALS**

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation Instructions.
- C. Shop Drawings:
  - 1. Locate each specified unit in project.
  - 2. Indicate mounting height of each unit.
  - 3. Include anchoring and fastening details.
- D. Selection Samples: Manufacturer's standard color fans for selection of colors and finishes.
- E. Verification Samples: Submit samples of each product specified, illustrating color and finish. Approved samples will be returned to the Contractor and may be used in the project.
- F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment of all components.

#### **1.4 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Minimum ten years documented experience producing products specified.
- B. Installer Qualifications: Minimum five years documented experience installing products specified.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products after building is enclosed, other work within spaces where products are to be installed is substantially complete, and installation is ready to take place.
- B. Protect products from damage before, during and after installation.

## **SECTION 108600 – CONVEX MIRRORS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- C. Store products in manufacturer's unopened packaging until ready for installation.

### **1.6 COORDINATION AND SEQUENCING**

- A. Coordinate installation of blocking, bracing and backing to receive products of this section.
- B. Supply installation templates, required reinforcing, and recessed anchorage devices in timely fashion to installers of related work that will receive products of this section.

## **PART II - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: Ketcham Medicine Cabinets & Accessories; div. of Fred Silver & Co., Inc. , which is located at: 3505 Veterans Memorial Hwy. Suite L; Ronkonkoma, NY 11779; Toll Free Tel: 877-MY-KETCHAM; Tel: 631-615-6151; Fax: 631-615-6155 ; Email: request info (sales@ketchamcabinets.com); Web: www.ketchamcabinets.com | www.fredsilver.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

### **2.2 CONVEX MIRRORS**

- A. Outdoor Round Safety and Security Mirrors:
  - 1. Features:
    - a. Ceiling mounted or wall mounted
    - b. Weather resistant white gloss hardboard backing
    - c. Available in Acrylic, Glass, and Polycarbonate
    - d. Installation hardware included
  - 2. Model: PLXR-36:
  - 3. Size: 36 inch diameter
  - 4. Lens Material: Acrylic Outdoor
  - 5. Distance Covered: 36 feet
  - 6. Backing: Weather Resistant White Gloss Hardboard Backing
  - 7. Hardware Kit: D - Includes "J" Bracket, Base Plate, Mounting Plate, Bolt Package, and Pivot Mount

## **PART III - EXECUTION**

### **3.1 EXAMINATION**

## **SECTION 108600 – CONVEX MIRRORS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Do not begin installation until substrates have been properly prepared.
- B. Verify that mounting surfaces and prepared openings are sized and located in accordance with approved shop drawings. Verify that blocking, reinforcement and anchoring devices are the correct type, have been located correctly, and have been installed properly.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### **3.2 PREPARATION**

- A. Provide templates and rough-in measurements as required.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **3.3 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install plumb, level and rigidly anchored to substrate.
- C. Locate accessories as indicated on the drawings. Adjust to provide the optimal visual field.

### **3.4 CLEANING**

- A. Remove labels after Work is complete.
- B. Clean surfaces as required, following procedures and employing cleaning materials as recommended by accessories manufacturer.

### **3.5 PROTECTION**

- A. Protect installed products from damage by subsequent construction activities, until completion of project.
- B. Field repair of damaged product finishes is prohibited. Replace products that have been damaged by subsequent construction activities.

**END OF SECTION**

**DIVISION 26 - ELECTRICAL**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART 1- GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following electrical materials and methods:

1. Supporting devices for electrical components
2. Electrical Identification
3. Touchup painting

**1.3 SUBMITTALS**

- A. General:

Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

- B. Product Data for each type of product specified.

- C. Samples of color, lettering style, and other graphic representation required for each identification product for Project.

**1.4 QUALITY ASSURANCE**

- A. Comply with NFPA 70 for components and installation.

- B. Listing and Labeling:

Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled":  
As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

**1.5 SEQUENCING AND SCHEDULING**

- A. Coordinate electrical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
- C. Coordinate installing required supporting devices and set sleeves in poured in place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.

**SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- E. Coordinate connecting electrical service to components furnished under other Sections. Refer to Division 15.
- F. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."
- G. Coordinate installing electrical identification after completion of finishing where identification is applied to field finished surfaces.

**PART 2 - PRODUCTS**

**2.1SUPPORTING DEVICES**

- A. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components.
  - 1. Material:  
Stainless steel, except as otherwise indicated
  - 2. Metal Items for Use Outdoors or in Damp Locations:  
Stainless steel, except as otherwise indicated
- B. Steel channel supports have 9/16-inch (14-mm) diameter holes at a maximum of 8 inches (203 mm) O.C., in at least 1 surface.
  - 1. Fittings and accessories mate and match with channels and are from the same manufacturer.
- C. Nonmetallic Channel and Angle Systems:  
Structural grade, factory formed, fiberglass resin channels and angles with 9/16-inch (14-mm) diameter holes at a maximum of 8 inches (203 mm) O.C., in at least 1 surface.
  - 1. Fittings and accessories mate and match with channels or angles and are from the same manufacturer.
  - 2. Fitting and Accessory Material:  
Same as channels and angles, except metal items may be stainless steel.
- D. Raceway and Cable Supports:  
Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click" type hangers.
- E. Cable Supports for Vertical Conduit:  
Factory fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot dip galvanized finish.
- F. Expansion Anchors:  
Carbon-steel wedge or sleeve type.

**SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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G. Toggle Bolts:

All-steel springhead type.

H. Powder-Driven Threaded Studs:

Heat-treated steel.

**2.2 ELECTRICAL IDENTIFICATION**

A. Manufacturer's Standard Products:

Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Raceway and Cable Labels:

Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.

1. Type:

Preprinted, flexible, self-adhesive, vinyl. Legend is over-laminated with a clear, weather and chemical resistant coating.

2. Color:

Black legend on orange field

3. Legend:

Indicates voltage

C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables:

Self-adhesive vinyl tape not less than 3 mils thick by 1 inch wide (0.08 mm thick by 25 mm wide)

D. Engraved, Plastic Laminated Labels, Signs, and Instruction Plates:

Engraving stock, melamine plastic laminate punched for mechanical fasteners 1/16-inch (1.6-mm) minimum thick for signs up to 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick for larger sizes. Engraved legend in black letters on white face.

E. Interior Warning and Caution Signs:

Preprinted, aluminum, baked enamel finish signs, punched for fasteners, with colors, legend, and size appropriate to the application.

F. Fasteners for Plastic Laminated and Metal Signs:

Self-tapping stainless steel screws or No. 10/32 stainless steel machine screws with nuts and flat and lock washers.

**2.3 TOUCHUP PAINT**

A. For Equipment:

Provided by equipment manufacturer and selected to match equipment finish.

B. For Non-equipment Surfaces:

Matching type and color of undamaged, existing adjacent finish.

C. For Galvanized Surfaces:



**SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Zinc-rich paint recommended by item manufacturer.

**PART 3 - EXECUTION**

**3.1 EQUIPMENT INSTALLATION REQUIREMENTS**

- A. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.
- B. Install items level, plumb, and parallel and perpendicular to other building systems and components. Install equipment to facilitate service, maintenance, and repair or replacement of components.
- C. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Give right of way to raceways and piping systems installed at a required slope.

**3.2 ELECTRICAL SUPPORTING METHODS**

- A. Damp Locations and Outdoors:  
Stainless steel materials or nonmetallic, U-channel system components.
- B. Dry Locations:  
Steel materials.
- C. Support Clamps for PVC Raceways:  
Click type clamp system.
- D. Conform to manufacturer's recommendations for selecting supports.
- E. Strength of Supports:  
Adequate to carry all present and future loads, times a safety factor of at least 4; 200-lb (90-kg) minimum design load.

**3.3 INSTALLATION**

- A. Install wires in raceway according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Conductor Splices:  
Keep to the minimum and comply with the following:
  - 1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
  - 2. Use splice and tap connectors that are compatible with conductor material.
- C. Connect outlets and components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

**SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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D. Install devices to securely and permanently fasten and support electrical components.

E. Raceway Supports:

Comply with NFPA 70 and the following requirements:

1. Conform to manufacturer's recommendations for selecting and installing supports.
2. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
3. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
4. Spare Capacity:  
Size supports for multiple conduits so capacity can be increased by a 25 percent minimum in the future.
5. Support individual horizontal raceways with separate, malleable iron pipe hangers or clamps.
6. Hanger Rods:  
1/4-inch (6-mm) diameter or larger threaded steel, except as otherwise indicated.
7. Spring Steel Fasteners:  
Specifically designed for supporting single conduits or tubing. May be used in lieu of malleable iron hangers for I-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to channel and slotted angle supports.
8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports, with no weight load on raceway terminals.

F. Vertical Conductor Supports:

Install simultaneously with conductors.

G. Miscellaneous Supports:

Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.

H. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

I. Fire stopping:

Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Perform fire stopping as specified in Division 7 Section "Fire stopping" to reestablish the original fire resistance rating of the assembly at the penetration.

J. Fastening:

Unless otherwise indicated, securely fasten electrical items and their supporting hardware to the building structure. Perform fastening according to the following:

## **SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and by machine screws, welded threaded studs," or spring tension clamps on steel.
2. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts, machine screws, or wood screws.
3. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or any other items.
4. In partitions of light steel construction use sheet-metal screws.
5. Select fasteners so the load applied to any fastener does not exceed 25 percent of the proof test load.

### **K. Install identification devices where required.**

1. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
2. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.
3. Self-Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.
4. Identify raceways and cables of certain systems with color banding as follows:
  - a. Bands:  
Colored adhesive marking tape. Make each color band 2 inches (51 mm) wide, completely encircling conduit, and place adjacent bands of 2-color markings in contact, side by side.
  - b. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25 feet (8 m) in congested areas.
  - c. Colors:  
As follows:
    - 1) Fire-Alarm System:  
Red.
    - 2) Security System:  
Blue and yellow.
    - 3) Telecommunications System:  
Green and yellow.
5. Tag or label power circuits for future connection and circuits in raceways and enclosures with other circuits. Identify source and circuit numbers in each cabinet, pull box, junction box, and outlet box. Color coding may be used for voltage and phase indication.

**SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**3.4 TOUCHUP PAINTING**

- A. Thoroughly clean damaged areas and provide primer, intermediate, and finish coats to suit the degree of damage at each location.
- B. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

**END OF SECTION**

**SECTION 260510- COMMON WORK RESULTS FOR ELECTRICAL**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Sleeves for raceways and cables
2. Sleeve seals
3. Grout
4. Common electrical installation requirements

**1.2 SUBMITTALS**

A. Product Data:

For sleeve seals

**PART 2 - PRODUCTS**

**2.1 SLEEVES FOR RACEWAYS AND CABLES**

A. Steel Pipe Sleeves:

ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends

B. Cast Iron Pipe Sleeves:

Cast or fabricated "wall pipe," equivalent to ductile iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

C. Sleeves for Rectangular Openings:

Galvanized sheet steel

1. Minimum Metal Thickness:

- a. For sleeve cross section rectangle perimeter less than 50 inches ( 1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch ( 1.3 mm).
- b. For sleeve cross section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

**2.2 SLEEVE SEALS**

A. Description:

Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers:

Subject to compliance with requirements

2. Basis of Design Product:

Subject to compliance with requirements, provide or comparable product by one of the following:

- a. Advance Products & Systems, Inc.

**SECTION 260510- COMMON WORK RESULTS FOR ELECTRICAL**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- b. Calpico, Inc.
- c. Metraflex Co.
- d. Pipeline Seal and Insulator, Inc.
- 3. Sealing Elements:  
EPDM, NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
- 4. Pressure Plates:  
Stainless steel. Include two for each sealing element.
- 5. Connecting Bolts and Nuts:  
Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **2.3 GROUT**

A. Nonmetallic, Shrinkage Resistant Grout:

ASTM C 1107, factory packaged, nonmetallic aggregate grout, noncorrosive, no staining, mixed with water to consistency suitable for application and a 30-minute working time.

## **PART 3 - EXECUTION**

### **3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION**

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall mounting items.
- C. Headroom Maintenance:  
If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment:  
Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way:  
Give to piping systems installed at a required slope.

### **3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS**

- A. Electrical penetrations occur when raceways, cables, wire ways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls:  
Install sleeves for penetrations unless core drilled holes or formed openings are used. Install sleeves

**SECTION 260510- COMMON WORK RESULTS FOR ELECTRICAL**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire Rated Assemblies:

Install sleeves for penetrations of fire rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

I. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire Rated Walls and Floors:

Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

J. Fire Rated Assembly Penetrations:

Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Fire stopping."

K. Roof Penetration Sleeves:

Seal penetration of individual raceways and cables with flexible boot type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior Wall Penetrations:

Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior Wall Penetrations:

Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

### **3.3 SLEEVE-SEAL INSTALLATION**

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### **3.4 FIRE STOPPING**

A. Apply fire stopping to penetrations of fire rated floor and wall assemblies for electrical installations to

**SECTION 260510- COMMON WORK RESULTS FOR ELECTRICAL**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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restore original fire resistance rating of assembly. Fire stopping materials and installation requirements are specified in Division 07 Section "Penetration Fire Stopping."

**END OF SECTION**



# **SECTION 260519- LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

A. This Section includes the following:

1. Building wires and cables rated 600 V and less
2. Connectors, splices, and terminations rated 600 V and less
3. Sleeves and sleeve seals for cables

### **1.2 SUBMITTALS**

A. Product Data:

For each type of product indicated.

B. Field quality control test reports.

### **1.3 QUALITY ASSURANCE**

A. Electrical Components, Devices, and Accessories:

Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

## **PART 2 - PRODUCTS**

### **2.1 CONDUCTORS AND CABLES**

A. Copper Conductors:

Comply with NEMA WC 70.

B. Conductor Insulation:

Comply with NEMA WC 70 for Types THW and THHN-THWN.

### **2.2 CONNECTORS AND SPLICES**

A. Available Manufacturers:

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. 0-ZJGedney; EGS Electrical Group LLC
4. 3M; Electrical Products Division
5. Tyco Electronics Corp.

# **SECTION 260519- LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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B. Description:

Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

## **2.3 SLEEVES FOR CABLES**

A. Steel Pipe Sleeves:

ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Coordinate sleeve selection and application with selection and application of fire stopping specified in Division 07 Section "Penetration Fire stopping."

## **2.4 SLEEVE SEALS**

A. Basis of Design Product:

Subject to compliance with requirements, provide or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.
5. Hilti, Inc.

B. Description:

Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements:  
EPDM, NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates:  
Stainless steel. Include two for each sealing element.
3. Connecting Bolts and Nuts:  
Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## **PART 3 - EXECUTION**

### **3.1 CONDUCTOR MATERIAL APPLICATIONS**

A. Feeders:

Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

## **SECTION 260519- LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

A. Service Entrance:

Type THW, single conductors in raceway

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace:

Type THHN-THWN, single conductors in raceway

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions:

Type THHN-THWN, single conductors in raceway.

### **3.3 INSTALLATION OF CONDUCTORS AND CABLES**

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables or raceway.

D. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

E. Identify and color code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

F. Tighten electrical connectors and terminals according to manufacturer's published torque tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

G. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

I. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

H. Wiring at Outlets:

Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

### **3.4 FIRESTOPPING**

A. Apply fire stopping to electrical penetrations of fire rated floor and wall assemblies to restore original fire resistance rating of assembly according to Division 07 Section "Penetration Fire stopping."

### **3.5 FIELD QUALITY CONTROL**

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

## **SECTION 260519- LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  3. Infrared Scanning:  
After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
    - a. Follow up Infrared Scanning:  
Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    - b. Instrument:  
Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    - c. Record of Infrared Scanning:  
Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- C. Test Reports:  
Prepare a written report to record the following:
1. Test procedures used
  2. Test results that comply with requirements
  3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

**END OF SECTION**

# **SECTION 260526- GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART 1 - GENERAL**

### **1.1 SUMMARY**

A. This Section includes methods and materials for grounding systems and equipment.

### **1.2 SUBMITTALS**

A. Product Data:

For each type of product indicated.

B. Field quality-control test reports.

### **1.3 QUALITY ASSURANCE**

A. Electrical Components, Devices, and Accessories:

Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

## **PART 2 - PRODUCTS**

### **2.1 CONDUCTORS**

A. Insulated Conductors:

Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors:

ASTM B 3

2. Stranded Conductors:

ASTM B 8

3. Tinned Conductors:

ASTM B 33

4. Bonding Cable:

28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter

5. Bonding Conductor:

No. 4 or No. 6 AWG, stranded conductor

6. Bonding Jumper:

Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

7. Tinned Bonding Jumper:

Tinned copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide

# **SECTION 260526- GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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and 1/16 inch (1.6 mm) thick.

## **2.2 CONNECTORS**

A Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes:

Copper or copper alloy, bolted pressure type, with at least two bolts

1. Pipe Connectors:

Clamp type, sized for pipe.

C. Welded Connectors:

Exothermic welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

## **2.3 GROUNDING ELECTRODES**

A. Ground Rods:

Copper clad steel; 3/4 inch by 10 feet (19 mm by 3 m) in diameter

## **PART 3- EXECUTION**

### **3.1 APPLICATIONS**

A. Conductors:

Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors:

Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors:

Green colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations:

Bolted connectors

2. Underground Connections:

Welded connectors except at test wells and as otherwise indicated.

3. Connections to Ground Rods at Test Wells:

Bolted connectors

4. Connections to Structural Steel:

Welded connectors

# SECTION 260526- GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## 3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits
2. Lighting circuits
3. Receptacle circuits
4. Single phase motor and appliance branch circuits
5. Three phase motor and appliance branch circuits
6. Flexible raceway runs
7. Armored and metal-clad cable runs

8. Busway Supply Circuits:

Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on bus way.

9. Computer and Rack Mounted Electronic Equipment Circuits:

Install insulated equipment grounding conductor in branch circuit runs from equipment area power panels and power distribution units.

B. Air Duct Equipment Circuits:

Install insulated equipment grounding conductor to duct mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater and Heat Tracing Cables:

Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Isolated Grounding Receptacle Circuits:

Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

E. Isolated Equipment Enclosure Circuits:

For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

F. Signal and Communication Equipment:

For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service

# SECTION 260526- GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets:  
Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.

2. Terminal Cabinets:  
Terminate grounding conductor on cabinet grounding terminal.

- G. Metal Poles Supporting Outdoor Lighting Fixtures:  
Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch circuit conductors.

## 3.3 INSTALLATION

A. Grounding Conductors:

Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods:

Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells:

Ground rod driven through drilled hole in bottom of hand hole. Hand holes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells:  
Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers:

Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure:  
Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports:  
Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:



# **SECTION 260526- GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. **Metal Water Service Pipe:**

Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. **Water Meter Piping:**

Use braided type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3. **Bond each above ground portion of gas piping system downstream from equipment shutoff valve.**

E. **Bonding Interior Metal Ducts:**

Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

## **3.4 FIELD QUALITY CONTROL**

A. **Testing Agency:**

Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports.

B. **Perform the following tests and inspections and prepare test reports:**

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
  - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
  - b. Perform tests by fall of potential method according to IEEE 81.

C. **Report measured ground resistances that exceed the following values:**

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less:  
5 ohms
2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA:  
3 ohms
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA:  
3 ohms
4. Power Distribution Units or Panelboards Serving Electronic Equipment:  
2 ohm(s)

## **SECTION 260526- GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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D. Excessive Ground Resistance:

If resistance to ground exceeds specified values, notify Owner's Representative promptly and include recommendations to reduce ground resistance.

**END OF SECTION**

**SECTION 260529- HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

**1.2 PERFORMANCE REQUIREMENTS**

A. Delegated Design:

Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength:

Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

**1.3 SUBMITTALS**

A. Product Data:

For steel slotted support systems

B. Shop Drawings:

Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports

C. Welding certificates

**1.4 QUALITY ASSURANCE**

A. Welding:

Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."

B. Comply with NFPA 70.

**PART 2 - PRODUCTS**

**2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

**SECTION 260529- HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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A. Steel Slotted Support Systems:

Comply with MFMA-4, factory fabricated components for field assembly.

1. Manufacturers:

Subject to compliance with requirements, provide products by one of the following:

- a. Allied Tube & Conduit
- b. Cooper B-Line, Inc.; a division of Cooper Industries
- c. ERICO International Corporation
- d. GS Metals Corp.
- e. Thomas & Betts Corporation
- f. Unistrut; Tyco International, Ltd.
- g. Wesanco, Inc.

2. Metallic Coatings:

Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings:

Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

4. Painted Coatings:

Manufacturer's standard painted coating applied according to MFMA-4.

5. Channel Dimensions:

Selected for applicable load criteria.

B. Raceway and Cable Supports:

As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices:

Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit:

Factory fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints:

ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components:

Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners:

Threaded steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear,

**SECTION 260529- HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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and pullout capacities appropriate for supported loads and building materials where used.

a. **Manufacturers:**

Subject to compliance with requirements, provide products by one of the following:

- 1) Hilti, Inc.
- 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
- 3) MKT Fastening, LLC
- 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit

2. **Mechanical Expansion Anchors:**

Insert wedge type, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. **Manufacturers:**

Subject to compliance with requirements, provide products by one of the following:

- 1) Cooper B-Line, Inc.; a division of Cooper Industries.
- 2) Empire Tool and Manufacturing Co., Inc.
- 3) Hilti, Inc.
- 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
- 5) MKT Fastening, LLC.

3. **Concrete Inserts:**

Steel or malleable iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. **Clamps for Attachment to Steel Structural Elements:**

MSS SP-58, type suitable for attached structural element.

5. **Through Bolts:**

Structural type, hex head, and high strength. Comply with ASTM A 325.

6. **Toggle Bolts:**

All steel springhead type

7. **Hanger Rods:**

Threaded steel

## **2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES**

A. **Description:**

Welded or bolted, structural steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. **Materials:**

Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

**SECTION 260529- HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART 3 - EXECUTION**

**3.1 APPLICATION**

- A Comply with NECA I and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway:  
Space supports for EMT and IMC, as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables:  
Install trapeze type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
  - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch (38 mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

**3.2 SUPPORT INSTALLATION**

- A Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods:  
In addition to methods described in NECA I, EMT and IMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies:  
Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface Mounted Equipment and Components:  
Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood:  
Fasten with lag screws or through bolts
  - 2. To New Concrete:  
Bolt to concrete inserts
  - 3. To Masonry:  
Approved toggle type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete:  
Expansion anchor fasteners
  - 5. Instead of expansion anchors, powder actuated driven threaded studs provided with lock washers and nuts may be used in existing standard weight concrete, 4 inches (100 mm) thick or greater. Do not use

**SECTION 260529- HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.

6. To Steel:

Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts

7. To Light Steel:

Sheet metal screws

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces:

Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### **3.3 INSTALLATION OF FABRICATED METAL SUPPORTS**

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding:

Comply with AWS D1.1/D1.1M

### **3.4 CONCRETE BASES**

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.

3. Install anchor bolts according to anchor bolt manufacturer's written instructions.

### **3.5 PAINTING**

A. Touchup:

Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup:

**SECTION 260529- HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Comply with requirements in Division 09 Painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces:

Clean welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

**END OF SECTION**



**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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**PART 1- GENERAL**

**1.1 SUMMARY**

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. See Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks and manholes, and underground hand holes, boxes, and utility construction.

**1.2 SUBMITTALS**

- A. Product Data:  
For surface raceways, wire ways and fittings, floor boxes, hinged cover enclosures, and cabinets.
- B. Shop Drawings:  
For custom enclosures and cabinets. Include plans, elevations, sections, details, and attachments to other work.

**1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories:  
Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

**PART 2 - PRODUCTS**

**2.1 METAL CONDUIT AND TUBING**

- A. Rigid Steel Conduit:  
ANSI C80.1
- B. IMC:  
ANSI C80.6
- C. EMT:  
ANSI C80.3
- D. FMC:  
Zinc coated steel.
- E. LFMC:  
Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquid tight), EMT, and Cable:  
NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
  - 1. Conduit Fittings for Hazardous (Classified) Locations:  
Comply with UL 886.
  - 2. Fittings for EMT:

**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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Steel, compression type

**2.2 NONMETALLIC CONDUIT AND TUBING**

- A. ENT:  
NEMA TC 13
- B. RNC:  
NEMA TC 2, unless otherwise indicated.
- C. LFNC:  
UL 1660
- D. Fittings for ENT and RNC:  
NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC:  
UL 514B

**2.3 METAL WIREWAYS**

- A. Manufacturers:  
Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hoffman.
  - 3. Square D; Schneider Electric
- B. Description:  
Sheet metal sized and shaped as indicated, NEMA 250, Type 1 or 3R, unless otherwise indicated.
- C. Fittings and Accessories:  
Include couplings, offsets, elbows, expansion joints, adapters, hold down straps, end caps, and other fittings to match and mate with wire ways as required for complete system.
- D. Wire way Covers:  
Screw cover type
- E. Finish:  
Manufacturer's standard enamel finish

**2.4 NON-METALLIC WIREWAYS**

- A. Manufacturers:  
Subject to compliance with requirements, provide products by one of the following:
  - 1. Hoffman
  - 2. Lamson & Sessions; Carlon Electrical Products
- B. Description:

**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.

C. Fittings and Accessories:

Include couplings, offsets, elbows, expansion joints, adapters, hold down straps, end caps, and other fittings to match and mate with wire ways as required for complete system.

**2.5 SURFACE RACEWAYS**

A. Surface Metal Raceways:

Galvanized steel with snap-on covers. Prime coating, ready for field painting.

1. Manufacturers:

Subject to compliance with requirements, provide products by one of the following:

- a. Thomas & Betts Corporation
- b. Walker Systems, Inc.; Wiremold Company
- c. Wiremold Company; Electrical Sales Division

B. Surface Non-metallic Raceways:

Two piece construction, manufactured of rigid PVC with texture and color selected by Owner's Representative from manufacturer's standard colors.

1. Manufacturers:

Subject to compliance with requirements, provide products by one of the following:

- a. Butler Manufacturing Company; Walker Division
- b. Enduro Systems, Inc.; Composite Products Division
- c. Hubbell Incorporated; Wiring Device-Kellems Division
- d. Lamson & Sessions; Carlon Electrical Products
- e. Panduit Corp.
- f. Walker Systems, Inc.; Wiremold Company
- g. Wiremold Company (The); Electrical Sales Division

**2.6 BOXES, ENCLOSURES, AND CABINETS**

A. Sheet Metal Outlet and Device Boxes:

NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes:

NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes:

NEMA OS 2.

**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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- D. Metal Floor Boxes:  
Cast metal, fully adjustable, rectangular
- E. Nonmetallic Floor Boxes:  
Nonadjustable, round
- F. Small Sheet Metal Pull and Junction Boxes:  
NEMA OS I.
- G. Cast-Metal Access, Pull, and Junction Boxes:  
NEMA FB 1, galvanized, cast iron with gasketed cover.
- H. Hinged Cover Enclosures:  
NEMA 250, Type 1, with continuous hinge cover with flush latch, unless otherwise indicated.
  - 1. Metal Enclosures:  
Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures:  
Plastic
- I. Cabinets:
  - 1. NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.

**PART 3- EXECUTION**

**3.1 RACEWAY APPLICATION**

- A. Outdoors:  
Apply raceway products as specified below, unless otherwise indicated:
  - 1. Exposed Conduit:  
Rigid steel conduit
  - 2. Concealed Conduit, Aboveground:  
Rigid steel conduit, EMT
  - 3. Underground Conduit:  
RNC, Type EPC-40-PVC, direct buried
  - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment):

**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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LFMC

5. Boxes and Enclosures, Aboveground:  
NEMA 250, Type 3R

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage:  
EMT
2. Exposed, Not Subject to Severe Physical Damage:  
EMT
3. Exposed and Subject to Severe Physical Damage:  
Rigid steel conduit. Includes raceways in the following locations:
  - a. Loading dock.
  - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
  - c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions:  
EMT
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor Driven Equipment):  
FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations:  
Rigid steel conduit
7. Raceways for Optical Fiber or Communications Cable:  
EMT
8. Boxes and Enclosures:  
NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations

C. Minimum Raceway Size:  
3/4-inch (21-mm) trade size

D. Raceway Fittings:  
Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit:  
Use threaded rigid steel conduit fittings, unless otherwise indicated.

### **3.2 INSTALLATION**

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes.

**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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Install horizontal raceway runs above water and steam piping.

- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.
- I. Raceway Terminations at Locations Subject to Moisture or Vibration:

Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- K. Raceways for Optical Fiber and Communications Cable:

Install as follows:

  - 1. 3/4-Inch (19-mm) Trade Size and Smaller:

Install raceways in maximum lengths of 50 feet (15m).
  - 2. 1-Inch (25-mm) Trade Size and Larger:

Install raceways in maximum lengths of 75 feet (23m).
  - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where otherwise required by NFPA 70.
- M. Expansion-Joint Fittings for RNC:

**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30°F (17°C), and that has straight-run length that exceeds 25 feet (7.6 m).

1. Install expansion joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
  - a. Outdoor Locations Not Exposed to Direct Sunlight:  
125°F (70°C) temperature change.
  - b. Outdoor Locations Exposed to Direct Sunlight:  
155°F (86°C) temperature change
  - c. Indoor Spaces Connected with the Outdoors without Physical Separation:  
125°F (70°C) temperature change
  - d. Attics:  
135°F (75°C) temperature change
2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree Fahrenheit (0.06 mm per meter of length of straight run per degree Celsius) of temperature change.
3. Install each expansion joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

**N. Flexible Conduit Connections:**

Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi recessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

**O. Recessed Boxes in Masonry Walls:**

Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

P. Set metal floor boxes level and flush with finished floor surface.

Q. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

### **3.3 FIRESTOPPING**

- A. Apply fire stopping to electrical penetrations of fire rated floor and wall assemblies to restore original fire resistance rating of assembly. Fire stopping materials and installation requirements are specified in Division 07 Section "Penetration Fire stopping."

### **3.4 PROTECTION**

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

**SECTION 260533- RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

**END OF SECTION**



# **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART 1 GENERAL**

### **1.1 - SUMMARY:**

- A. This Section includes underground conduits and ducts, duct banks, manholes and other underground utility structures.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 2 Section "Earthwork" for general requirements for excavation, backfill and related items for ducts, manholes and hand holes.
  - 2. Division 3 Section "Cast-In-Place Concrete" for cast-in-place concrete requirements.
  - 3. Division 7 Section "Sheet Membrane Waterproofing" for waterproofing of manholes and hand holes.
  - 4. Division 7 Section "Bituminous Damp proofing" for damp proofing of manholes and hand holes.

### **1.2 - DEFINITIONS:**

- A. Duct Bank: 2 or more conduits or other raceway installed underground in the same trench or concrete envelope.
- B. Manhole: An underground utility structure, large enough for a person to enter, connecting with ducts to afford facilities for installing and maintaining cables.
- C. Vault: An underground utility structure, large enough for a person to enter, connecting with ducts to afford facilities for installing, operating, and maintaining equipment and wiring.

### **1.3 - SUBMITTALS:**

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for metal accessories for manholes and hand holes, conduit and duct, duct bank materials, and miscellaneous components.
- C. Shop drawings showing details and design calculations for precast manholes and hand holes, including reinforcing steel. Stamp drawings with seal of registered professional structural engineer.
- D. Certificate for concrete and steel used in underground precast concrete utility structures, according to ASTM C 858.
- E. Inspection report for factory inspections, according to ASTM C 1037.
- F. Coordination drawings showing duct profiles and coordination with other utilities and underground structures. Include plans and sections drawn to accurate scale.
- G. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Owner's Representative and Owner, and other information specified.

## **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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H. Field test reports indicating and interpreting test results relative to compliance with performance requirements of "Field Quality Control" Article in Part 3 of this Section.

I. Record Documents: Show dimensioned locations of underground ducts, hand holes, and manholes.

### **1.4 - QUALITY ASSURANCE:**

A. Manufacturer Qualifications: Firm experienced in manufacturing underground precast concrete utility structures of types and sizes required and similar to those indicated for this Project. Firm must have a record of successful in-service performance.

B. Comply with NFPA 70 "National Electrical Code" and ANSI C2 "National Electrical Safety Code" for components and installation.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. Coordinate layout and installation of ducts, manholes, and hand holes with final arrangement of other utilities as determined in the field.

E. Coordinate elevations of duct bank entrances into manholes with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit field conditions and ensure duct runs drain to manholes, and as approved by the Owner's Representative.

### **1.5 - DELIVERY, STORAGE, AND HANDLING:**

A. Deliver ducts to site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping and deforming.

B. Store precast concrete units at site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

## **PART 2 - PRODUCTS**

### **2.1 - MANUFACTURERS:**

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering the specified products that may be incorporated in the Work include, but are not limited to, the following:

1. Precast Division; Carder Concrete Products.

2. Christy Concrete Products, Inc.

3. Elmhurst-Chicago Stone Co.

4. Riverton Concrete Products.

## **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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5. A. Rotondo & Sons, Inc.

6. Rotondo/Penn-Cast, Inc.

7. Smith-Midland Corp.

8. Utility Vault Co.

9. Wausau Concrete Co.

### **D. Frames and Covers:**

1. Campbell Foundry Co.

2. East Jordan Iron Works, Inc.

3. McKinley Iron Works, Inc.

4. Neenah Foundry Co.

### **E. Nonmetallic Ducts:**

1. Arnco Corp.

2. Breeze-Illinois, Inc.

3. CANTEX, Inc.

4. Carlon; Lamson & Sessions Company.

5. Pipe and Plastic Group; Certaineed Products Corp.

6. Cole-Flex Corp.

7. Electri-Flex Co.

8. Spiraduct, Inc.

## **2.2 - CONDUIT AND DUCT:**

A. Rigid Steel Conduit: ANSI C80.1, galvanized.

B. Plastic-Coated Rigid Steel Conduit and Fittings: NEMA RN 1.

C. Rigid Plastic Conduit: NEMA TC 2, Schedule 40 PVC, rated for use with 90 deg C conductors under all installation conditions.

D. PVC Conduit and Tubing Fittings: NEMA TC 3.

E. Rigid Plastic Underground Conduit: UL 651A, Type EB PVC.

## **2.3 - UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES:**

A. Precast Units: Interlocking, mating sections, complete with accessory items, hardware, and features as indicated. Include concrete knockout panels for conduit entrance and sleeve for ground rod.

## **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- B. Design structure according to ASTM C 858.
- C. Structural Design Loading: ASTM C 857, Class A-16.
- D. Fabricate according to ASTM C 858.
- E. Joint Sealant: Continuous extrusion of asphaltic butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand the maximum hydrostatic pressures at the installation location with the ground water level at grade.
- F. Source Quality Control: Inspect structures according to ASTM C 1037.

### **2.4 - ACCESSORIES:**

- A. Duct Supports: Rigid PVC spacers selected to provide minimum duct spacings and concrete cover depths indicated, while supporting ducts during concreting.
- B. Frames and Covers: Cast iron with cast-in legend "LECTRIC." Machine cover-to-frame bearing surfaces.
- C. Sump Frame and Grate: Comply with FS RR-F-621, Type VII for frame and Type I for cover.
- D. Pulling Eyes in Walls: Eyebolt with reinforcing bar fastening insert. 2 inch (50 mm) diameter eye, 1 inch (25 mm) by 4 inch (100 mm) bolt. Working load embedded in 6 inch (150 mm), 4000 psi (27.6MPa) concrete: 13,000 pounds minimum tension.
- E. Pulling and Lifting Irons in Floor: 7/8 inch-diameter (21 mm), hot-dipped galvanized, bent steel rod, stress relieved after forming, and fastened to reinforced rod. Exposed triangular opening. Ultimate yield strength: 40,000 pounds shear and 60,000 pounds tension.
- F. Bolting Inserts for Cable Stanchions: Flared, threaded inserts of noncorrosive, chemical resistant, nonconductive thermoplastic material; 1/2 inch (12 mm) internal diameter by 2-3/4 inches (68 mm) deep, flared to 1-1/4 inch (30 mm) minimum at base. Tested ultimate pull-out strength: 12,000 pounds minimum.
- G. Expansion Anchors for Installation After Concrete is Cast: Zinc-plated carbon steel wedge type with stainless-steel expander clip 1/2 inch (12 mm) bolt size, 5300-pound rated pull-out strength, and 6800-pound rated shear strength minimum.
- H. Cable Stanchions: Hot-rolled, hot-dipped galvanized "T" section steel, 2-1/4 inch (56 mm) size, punched with 14 holes on 1-1/2 inch (35 mm) centers for cable arm attachment.
- I. Cable Arms: 3/16-inch (5 mm) thick hot-rolled, hot-dipped galvanized sheet steel pressed to channel shape, approximately two 12 inches (300 mm) wide by 14 inches (350 mm) long and arranged for secure mounting in horizontal position at any position on cable stanchions.
- J. Cable Support Insulators: High glaze, wet-process porcelain arranged for mounting on cable arms.
- K. Ground Rods: Solid copper clad steel, 3/4 inch (18 mm) diameter by 10-feet (3 m) length.
- L. Ground Wire: Stranded bare copper, No. 6 AWG minimum.
- M. Ladder: UL-listed, non-metallic, specifically designed for electrical manhole use. Minimum length equal

## **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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to the distance from the deepest manhole floor to grade. Ladder shall be permanently installed in manhole.

- N. Raceway Sealing Compound: Non-hardening, safe for human skin contact, not deleterious to cable insulation, workable at temperatures as low as 35 degrees F (1 degrees C), withstands temperature of 300 degrees F (149 degrees C) without slump, and adheres to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and the common metals.

### **2.5 - CONSTRUCTION MATERIALS:**

- A. Damp proofing: Conform to Division 7 Section "Bituminous Damp proofing."
- B. Waterproofing: Conform to Division 7 Section "Sheet Membrane Waterproofing."
- C. Brick: Conform to ASTM C 55, concrete brick Type I, Grade N.
- D. Mortar: Conform to ASTM C 270, Type M, except for quantities less than 2.0 cu. foot (60 L), where packaged mix complying with ASTM C 387, Type M may be used.
- E. Concrete: Conform to Division 3 Section "Cast-In-Place Concrete" for concrete and reinforcing.
1. Strength: 3000 psi (20.7 MPa) minimum 28-day compressive strength.
  2. Aggregate For Duct Encasement: 3/8 inch (10 mm) maximum size.

## **PART 3 - EXECUTION**

### **3.1 - APPLICATION:**

- A. Underground Ducts For Electrical Utility Service: Plastic conduit encased in "RED" colored concrete.
- B. Manholes: Underground precast concrete utility structures.

### **3.2 - EXAMINATION:**

- A. Examine site to receive ducts and manholes for compliance with installation tolerances and other conditions affecting performance of the underground ducts and manholes. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.3 - EARTHWORK:**

- A. Excavation and Backfill: Conform to Division 2 Section "Earthwork," but do not use heavy-duty, hydraulic-operated compaction equipment.
- B. Restore surface features at areas disturbed by excavation, and reestablish original grades except as otherwise indicated. Replace removed sod as soon as possible after backfilling is completed. Restore all areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary top soiling, fertilizing, liming, seeding, sodding, sprigging, or mulching. Perform according to Division 2 Section "Landscape Work."
- C. Warning Tape: Tape specifically manufactured for marking and locating underground utilities. Tape shall be polyethylene film, 6 inches wide, 0.004 inches thick and a minimum strength of 1,750 psi. Tape shall

## **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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carry continuous inscription naming the specific utility. Color shall be:

1. Electric – Red

D. Tape for nonmetallic utility lines shall have foil backing or wires sufficient for detection by metal detector to a depth of 3 feet. Tape to be run continuously from manhole to manhole and have 3 feet slack rolled up at each end.

E. Restore disturbed paving. Refer to "Cutting and Patching" in Division 1.

### **3.4 - CONDUIT AND DUCT INSTALLATION:**

A. Install nonmetallic conduit and duct as indicated according to manufacturer's written instructions.

B. Slope: Pitch ducts minimum of 4 inches per 100 feet (1:300) to drain toward manholes away from buildings and equipment. Slope ducts from a high point in runs between 2 manholes to drain in both directions.

C. Curves and Bends: Use manufactured elbows for stub-ups at equipment and at building entrances. Use manufactured long sweep bends. Use only factory fittings for elbows, bends or offsets. Field bending is not permitted. Risers to grade to be PVC coated steel elbows.

D. Make joints in ducts and fittings watertight according to manufacturer's instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.

E. Duct entrances to Manholes and Handholes: Space end bells approximately 12 inches (250 mm) on center for 6-inch ducts and varied proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet (3 m) from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into manhole walls from both sides to provide watertight entrances.

F. Building Entrances: Transition from underground duct to conduit 10 feet (3 m) minimum outside the building wall. Use fittings manufactured for the purpose. Follow appropriate installation instructions below.

1. Concrete-Encased Ducts: Install reinforcing in duct banks passing through disturbed earth near buildings and other excavations. Coordinate duct bank with structural design to support duct bank at wall without reducing structural or watertight integrity of building wall.

2. Waterproofed Wall and Floor Entrances: Install a watertight entrance-sealing device with the sealing gland assembly on the inside. Anchor device into masonry construction with 1 or more integral flanges. Secure membrane waterproofing to the device to make permanently watertight.

G. Concrete-Encased Nonmetallic Ducts: Support on plastic separators coordinated with duct size and required duct spacing, and install according to the following:

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, and secure separators to the earth and to ducts to prevent floating during concreting. Do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concreting: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not use power-driven agitating equipment unless specifically designed for duct bank application. Pour each run of envelope between manholes or other terminations

## **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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in 1 continuous operation. When more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (18 mm) reinforcing rod dowels extending 18 inches (450 mm) into the concrete on both sides of joint near the corners of the envelope.

3. Reinforcing: Reinforce duct banks where they cross disturbed earth and where indicated.
4. Forms: Use the walls of the trench to form the side walls of the duct bank where the soil is self-supporting and concrete envelope can be poured without soil inclusions, otherwise, use forms.
5. Minimum Clearances Between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.
6. Depth: Except as otherwise indicated, install top of duct bank at least 36 inches below finished grade.
- H. Stub-Ups: Use rigid steel conduit for stub-ups to equipment. For equipment mounted on outdoor concrete pads, extend steel conduit a minimum of 5 feet (1.5 m) from edge of pad. Install insulated grounding bushings on the terminations. Couple steel conduits to the ducts with adapters designed for the purpose and then encase coupling with 3 inches (75 mm) of concrete.
- I. Sealing: Provide temporary closure at terminations of ducts that are wired under this Project. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15 psi hydrostatic pressure.
  1. Provide nylon pull string with printed footage indicators having not less than 200 pounds tensile strength. Leave not less than 12 inches of slack at each end of the pull string. Identify with tags at each end the origin and destination of each empty conduit and indicate same on all empty or spare conduits on the as-built drawings.
- J. Pulling Cord: Install 100-pound-test nylon cord in ducts, including spares.
- K. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
  1. Where conduits enter through a foundation wall or stub-up through a slab on grade floor.
  2. Where required by the NEC.
- L. Install raceway/duct sealing compound inside of all underground raceways that stub into a building through a foundation wall or through a slab on grade floor.

### **3.5 - UNDERGROUND UTILITY STRUCTURE INSTALLATION:**

- A. Elevation: Install manholes with roof top at least 15 inches below finished grade.
- B. Drainage: Install drains in bottom of units where indicated. Arrange to coordinate with drainage provisions indicated or specified.
- C. Access: Install cast-iron frame and cover. For manholes, use 30 inch cover except as indicated. Install brick chimney to support frame and cover and to connect cover with roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney. Set frames in paved areas and

## **SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

traffic ways flush with finished grade.

- D. Waterproofing: Apply waterproofing to exterior surfaces of units. Apply according to Division 7 Section "Sheet Membrane Waterproofing." After ducts have been connected and grouted, and prior to backfilling, waterproof joints and connections and touch up abrasions and scars. Waterproof exterior of manhole chimneys after brick mortar has cured at least 3 days.
- E. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cable and conductors and as indicated.
- F. Hardware: Furnish removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, for installation under another Contract. For each manhole furnish 1 stanchion for each 30 linear inches of interior floor perimeter. In addition, furnish 1 arm for each stanchion, 3 insulators for each arm, and a total of 3 pulling eyes. Furnish materials complete with associated fasteners, packaged with protective covering for storage and with identification labels clearly describing contents.
- G. Field-Installed Bolting Anchors: Do not drill deeper than 3-7/8 inches (96 mm) for anchor bolts installed in the field. Use a minimum of 2 anchors for each cable stanchion.
- H. Grounding: Install ground rod through floor in each structure with top protruding 4 inches above floor. Seal the floor opening against water penetration with waterproof non-shrink grout. Ground exposed metal components and hardware with bare copper ground conductor. Train conductors neatly around corners. Install on walls and roof using cable clamps secured with expansion anchors.
- I. Precast Concrete Underground Structure Installation: Install as indicated, according to manufacturer's written instructions and ASTM C 891.
  - 1. Install units plumb and level and with orientation and depth coordinated with arrangement of connecting ducts to minimize bends and deflections required for proper entrances.
  - 2. Support units on a level bed of crushed stone or gravel, graded from the 1-inch sieve to the No. 4 sieve and compacted to same density as adjacent undisturbed earth.

### **3.6 - FIELD QUALITY CONTROL:**

- A. Testing: Demonstrate capability and compliance with requirements upon completion of installation of underground duct and utility structures.
  - 1. Grounding: Test manhole grounding to ensure electrical continuity of bonding and grounding connections. Measure ground resistance at each ground rod and report results. Use an instrument specifically designed for ground-resistance measurements.
  - 2. Duct Integrity: Rod ducts with a ball type mandrel 1/4 inch smaller in diameter than internal diameter of ducts. Where rodding indicates obstructions in ducts, remove the obstructions and retest. The Contractor shall notify prior to commencing integrity testing to request observation of procedures.
  - 3. Water Tightness: Make internal inspection of manholes 3 months after completion of construction for indications of water ingress. Where leakage is noted, remove water and seal leak sources. Reinspect after 2 months and reseal remaining leak sources. Repeat process at 2 month intervals until leaks are corrected.
- B. Correct installations where possible, and retest to demonstrate compliance. Otherwise, remove and replace



**SECTION 260543- UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

---

defective products and retest.

**3.7 - CLEANING:**

- A. Pull brush through full lengths of ducts. Use round bristle brush with a diameter 1/2 inch greater than internal diameter of duct.
- B. Clean internal surfaces of manholes including sump. Remove foreign material.

**END OF SECTION**

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:

1. Isolation pads
2. Spring isolators
3. Restrained spring isolators
4. Channel support systems
5. Restraint cables
6. Hanger rod stiffeners
7. Anchorage bushings and washers

- B. Related Sections include the following:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

**1.3 DEFINITIONS**

- A. The IBC:  
International Building Code
- B. ICC-ES:  
ICC-Evaluation Service

**1.4 PERFORMANCE REQUIREMENTS**

- A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC:  
D
2. Assigned Seismic Use Group or Building Category as Defined in the IBC:
  - a. Occupancy Category:  
IV
  - b. Seismic Design Category:

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

D

- c. Component Importance Factor:  
1.5
  - d. Component Response Modification Factor:  
2.5
  - e. Component Amplification Factor:  
1.5 for fixed equipment. 2.5. for flexible components
3. Design Spectral Response Acceleration at Short Periods (0.2 Second):  
1.1%
4. Design Spectral Response Acceleration at 1.0-Second Period:  
1.8%

**1.5 ACTION SUBMITTALS**

A. Product Data:

For the following:

- 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
- 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
  - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES acceptable to authorities having jurisdiction.
  - b. Annotate to indicate application of each product submitted and compliance with requirements.
- 3. Restrained Isolation Devices:  
Include ratings for horizontal, vertical, and combined loads.

B. Delegated Design Submittal:

For vibration isolation and seismic restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- 1. Design Calculations:  
Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
  - a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other electrical Sections for equipment mounted outdoors.
- 2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
- 3. Field fabricated supports

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

4. Seismic Restraint Details:

- a. Design Analysis:  
To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
- b. Details:  
Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacing. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
- c. Preapproval and Evaluation Documentation:  
By an evaluation service member of ICC-ES acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

**1.6 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings:  
Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
- B. Qualification Data:  
For professional engineer and testing agency
- C. Field quality control test reports

**1.7 QUALITY ASSURANCE**

- A. Comply with seismic restraint requirements in the IBC unless requirements in this Section are more stringent.
- B. Seismic restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic restraint designs must be signed and sealed by a qualified professional engineer.
- C. Comply with NFPA 70.

**PART 2 - PRODUCTS**

**2.1 VIBRATION ISOLATORS**

- A. Available Manufacturers:  
Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Ace Mountings Co., Inc.

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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2. Amber/Booth Company, Inc.
3. California Dynamics Corporation
4. Isolation Technology, Inc.
5. Kinetics Noise Control
6. Mason Industries
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation
9. Vibration Mountings & Controls, Inc.

**B. Pads:**

Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material:  
Oil and water resistant neoprene.

**C. Spring Isolators:**

Freestanding, laterally stable, open spring isolators

1. Outside Spring Diameter:  
Not less than 80 percent of the compressed height of the spring at rated load
2. Minimum Additional Travel:  
50 percent of the required deflection at rated load
3. Lateral Stiffness:  
More than 80 percent of rated vertical stiffness
4. Overload Capacity:  
Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates:  
Factory drilled for bolting to structure and bonded to 1/4-inch (6-mm) thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig (3447 kPa).
6. Top Plate and Adjustment Bolt:  
Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

**D. Restrained Spring Isolators:**

Freestanding, steel, open spring isolators with seismic or limit-stop restraint.

1. Housing:  
Steel with resilient vertical limit stops to prevent spring extension due to weight being removed; factory drilled baseplate bonded to 1/4-inch (6-mm) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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during installation.

2. Restraint:  
Seismic or limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter:  
Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel:  
50 percent of the required deflection at rated load.
5. Lateral Stiffness:  
More than 80 percent of rated vertical stiffness.
6. Overload Capacity:  
Support 200 percent of rated load, fully compressed, without deformation or failure.

## **2.2 SEISMIC-RESTRAINT DEVICES**

A. Available Manufacturers:

Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation
3. Cooper B-Line, Inc.; a division of Cooper Industries
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division
6. Mason Industries
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components:

Rated strengths, features, and application requirements shall be as defined in reports by an evaluation service member of ICC-ES acceptable to authorities having jurisdiction.

1. Structural Safety Factor:  
Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System:

MFMA-3, shop or field fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables:

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

- E. Hanger Rod Stiffener:  
Steel tube or steel slotted support system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.
- F. Bushings for Floor Mounted Equipment Anchor:  
Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.
- G. Bushing Assemblies for Wall Mounted Equipment Anchorage:  
Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
- H. Resilient Isolation Washers and Bushings:  
One-piece, molded, oil and water resistant neoprene, with a flat washer face.
- I. Mechanical Anchor:  
Drilled in and stud wedge or female wedge type in zinc coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- J. Adhesive Anchor:  
Drilled in and capsule anchor system containing polyvinyl or urethane methacrylate based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## **2.3 FACTORY FINISHES**

- A. Finish:  
Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish:  
Manufacturer's standard paint applied to factory assembled and tested equipment before shipping.
  - 1. Powder coating on springs and housings
  - 2. All hardware shall be galvanized. Stainless steel components for exterior use.
  - 3. Baked enamel or powder coat for metal components on isolators for interior use.
  - 4. Color code or otherwise mark vibration isolation and seismic control devices to indicate capacity range.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine areas and equipment to receive vibration isolation and seismic control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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- B. Examine roughing in of reinforcement and cast in place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 APPLICATIONS**

- A. Multiple Raceways or Cables:  
Secure raceways and cables to trapeze member with clamps approved for application by an evaluation service member of ICC-ES acceptable to authorities having jurisdiction.
- B. Hanger Rod Stiffeners:  
Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
- C. Strength of Support and Seismic Restraint Assemblies:  
Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

### **3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION**

- A. Equipment and Hanger Restraints:
  - 1. Install restrained isolators on electrical equipment.
  - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch (3.2 mm).
  - 3. Install seismic restraint devices using methods approved by an evaluation service member of ICC-ES acceptable to authorities having jurisdiction providing required submittals for component.
- B. Install bushing assemblies for mounting bolts for wall mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure:  
If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors:  
Protect threads from damage during anchor installation. Heavy duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.



**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

4. Adhesive Anchors:  
Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc coated steel anchors for interior and stainless steel anchors for exterior applications.

**3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION**

- A. Install flexible connections in runs of raceways, cables, wire ways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

**3.5 FIELD QUALITY CONTROL**

- A. Testing Agency:  
Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
  2. Schedule test with Owner, through Owner's Representative, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
  3. Obtain Owner's Representative approval before transmitting test loads to structure. Provide temporary load spreading members.
  4. Test at least four of each type and size of installed anchors and fasteners selected by Owner's Representative.
  5. Test to 90 percent of rated proof load of device.
  6. Measure isolator restraint clearance.
  7. Measure isolator deflection.
  8. Verify snubber minimum clearances.
  9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

**SECTION 260548- VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

**3.6 ADJUSTING**

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

**END OF SECTION**

**SECTION 260553- IDENTIFICATION FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Identification for raceways
2. Identification of power and control cables
3. Identification for conductors
4. Underground line warning tape
5. Warning labels and signs
6. Instruction signs
7. Equipment identification labels
8. Miscellaneous identification products

**1.2 SUBMITTALS**

A. Product Data:

For each electrical identification product indicated.

**1.3 QUALITY ASSURANCE**

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

**PART 2 -PRODUCTS**

**2.1 POWER RACEWAY IDENTIFICATION MATERIALS**

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less:  
Preprinted, flexible label laminated with a clear, weather and chemical resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Snap Around Labels for Raceways Carrying Circuits at 600 V or Less:  
Slit, pre-tensioned, flexible, pre-printed, color coded acrylic sleeve, with diameter sized to suit diameter

**SECTION 260553- IDENTIFICATION FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

of raceway or cable it identifies and to stay in place by gripping action.

- D. Snap Around, Color Coding Bands for Raceways Carrying Circuits at 600 V or Less:  
Slit, pre-tensioned, flexible, solid colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Write On Tags:  
Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion resistant grommet and cable tie for attachment to conductor or cable.
1. Marker for Tags:  
Permanent, waterproof, black ink marker recommended by tag manufacturer.

## **2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS**

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels:  
Preprinted, flexible label laminated with a clear, weather and chemical resistant coating and matching wrap around adhesive tape for securing ends of legend label.
- C. Write On Tags:  
Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion resistant grommet and cable tie for attachment to conductor or cable.
1. Marker for Tags:  
Permanent, waterproof, black ink marker recommended by tag manufacturer.
- D. Snap Around Labels:  
Slit, pre-tensioned, flexible, preprinted, color coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap Around, Color Coding Bands:  
Slit, pre-tensioned, flexible, solid colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

## **2.3 CONDUCTOR IDENTIFICATION MATERIALS**

- A. Color Coding Conductor Tape:  
Colored, self-adhesive vinyl tapes not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive Vinyl Labels:  
Preprinted, flexible label laminated with a clear, weather and chemical resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Marker Tapes:  
Vinyl or vinyl cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write On Tags:  
Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment

**SECTION 260553- IDENTIFICATION FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

---

to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

## **2.4 WARNING LABELS AND SIGNS**

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels:

Factory printed, multicolor, pressure sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. High Density Polyethylene (HDPE) Warning Signs:

1. Preprinted Dual Color Routed HDPE signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning:  
"DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning:  
"WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

## **2.5 INSTRUCTION SIGNS**

A. Routed, Dual Color HDPE, minimum 1/2 inch thick for signs up to 20 sq. inches (129 sq. m) and 3/4 inch thick for larger sizes.

1. Routed legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## **2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS**

A. Paint:

Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs:

Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

## **PART 3- EXECUTION**

**SECTION 260553- IDENTIFICATION FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**3.1 INSTALLATION**

- A. Location:  
Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products:  
Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color Coding Bands for Raceways and Cables:  
Each color coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- F. Underground Line Warning Tape:  
During backfilling of trenches install continuous underground line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
- G. Painted Identification:  
Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

**3.2 IDENTIFICATION SCHEDULE**

- A. Accessible Raceways and Metal Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground:  
Install labels at 10-foot (3-m) maximum intervals.
- B. Accessible Raceways and Cables within Buildings:  
Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. Emergency Power
  - 2. Power
  - 3. UPS
- C. Power Circuit Conductor Identification, 600 V or Less:  
For conductors in vaults, pull and junction boxes, manholes, and hand holes, use color-coding conductor tape to identify the phase.
  - 1. Color Coding for Phase and Voltage Level Identification, 600 V or Less:  
Use colors listed below for ungrounded service feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having

**SECTION 260553- IDENTIFICATION FOR ELECTRICAL SYSTEMS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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jurisdiction permit.

b. Colors for 208/120-V Circuits:

- 1) Phase A:  
Black
- 2) Phase B:  
Red
- 3) Phase C:  
Blue

c. Colors for 480/277-V Circuits:

- 1) Phase A:  
Brown
- 2) Phase B:  
Orange
- 3) Phase C:  
Yellow

D. Install instructional sign including the color code for grounded and ungrounded conductors using adhesive film type labels.

E. Conductors to Be Extended in the Future:

Attach write on tags or marker tape to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification:

Identify field installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines:

Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Install underground line warning tape for both direct buried cables and cables in raceway.

H. Workspace Indication:

Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush mounted panelboards and similar equipment in finished spaces.

**SECTION 260553- IDENTIFICATION FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting:  
Self-adhesive warning labels

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters and an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
  - a. Power transfer switches
  - b. Controls with external control power connections

J. Operating Instruction Signs:

Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs:

Install instruction signs with white legend and a red background with minimum 3/8-inch (10-mm) high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels:

On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

- a. Indoor Equipment:  
Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch (13-mm) high letters on 1-1/2-inch (38-mm) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- b. Outdoor Equipment:  
Engraved, laminated acrylic or melamine label.
- c. Elevated Components:  
Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

- a. Panel-boards:  
Typewritten directory of circuits in the location provided by panel board manufacturer. Panel board identification shall be self-adhesive, engraved, laminated acrylic or melamine label.



**SECTION 260553- IDENTIFICATION FOR ELECTRICAL SYSTEMS**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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- b. Enclosures and electrical cabinets
- c. Access doors and panels for concealed electrical items
- d. Switchgear
- e. Switchboards
- f. Emergency system boxes and enclosures
- g. Enclosed switches
- h. Enclosed circuit breakers
- i. Enclosed controllers
- j. Variable-speed controllers
- k. Push-button stations
- l. Power transfer equipment
- m. Contactors
- n. Power-generating units
- o. Monitoring and control equipment
- p. UPS equipment

**END OF SECTION**

## **SECTION 260923- LIGHTING CONTROL DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. Section Includes:

1. Occupancy and Vacancy Sensor Control

B. Related Sections:

1. Section 262416 - Panelboards
2. Section 262726 - Wiring Devices:  
Lighting Controls
3. Section 265100 - Interior Lighting Fixtures, Lamps And Ballasts:  
Fluorescent lighting ballasts controlled by central dimming control system.

#### **1.2 REFERENCES**

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE):

1. C62.41-1991 -Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

B. ASTM International (ASTM):

1. D4674-02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.

C. International Electro-technical Commission (IEC).

1. IEC 801-2 Electrostatic Discharge Testing Standard.
2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations- electronic switches.

D. International Organization for Standardization (ISO):

1. 9001:2000- Quality Management Systems.

E. National Electrical Manufacturers Association (NEMA)

1. WD1 (R2005) - General Color Requirements for Wiring Devices.

F. Underwriters Laboratories, Inc. (UL):

1. 94 - Flammability Rating
2. 916 - Energy Management Equipment.
3. 508 (2005) - Standard for Industrial Control Equipment.
4. 244A- Appliance Controls

## **SECTION 260923- LIGHTING CONTROL DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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5. 935 (2005) - Fluorescent Ballasts

### **1.3 SYSTEM DESCRIPTION**

- A. Permanently installed
  - 1. Ceiling mounted occupancy sensors
  - 2. Wall switch occupancy sensors
  - 3. Power packs

### **1.4 ACTION SUBMITTALS**

- A. Product Data:  
For each type of product.
- B. Shop Drawings:  
Show installation details for occupancy and light level sensors.
- C. Interconnection diagrams showing field installed wiring.
- D. Include diagrams for power, signal, and control wiring.

### **1.5 INFORMATIONAL SUBMITTALS**

- A. Field quality control reports.

### **1.6 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data:  
For each type of lighting control device to include in emergency, operation, and maintenance manuals.
- B. QUALITY ASSURANCE
- C. Manufacturer:  
Minimum 10 years experience in manufacture of architectural lighting controls.
- D. Manufacturer's Quality System:  
Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.
- E. PROJECT CONDITIONS
- F. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
  - 1. Ambient temperature:  
Under 40 degrees C (32 degrees to 104 degrees F).
  - 2. Relative humidity: Maximum 90 percent, non-condensing.
  - 3. Lighting control system must be protected from dust during installation.

## **SECTION 260923- LIGHTING CONTROL DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **1.7 WARRANTY**

- A. Provide manufacturer's 1 year parts warranty.
- B. Maintenance Material submittals
- C. Make ordering of new equipment for expansions, replacements, and spare parts available to end user.
- D. Make new replacement parts available for minimum of ten years from date of manufacture.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design Product:  
Lutron Occupancy Sensors. Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
  - 1. Bryant Electric; a Hubbell company
  - 2. Cooper Industries, Inc.
  - 3. Hubbell Building Automation, Inc.
  - 4. Leviton Mfg. Company Inc.
  - 5. Lutron Electronics Co., Inc.
  - 6. Sensor Switch, Inc.
  - 7. Square D; a brand of Schneider Electric.
  - 8. Watt Stopper.

### **2.2 GENERAL**

- A. Provide system software and hardware that is designed, tested, manufactured, and warranted by a single manufacturer.
- B. Architectural Lighting Controls:  
Ten year operational life while operating continually at any temperature in an ambient temperature range of 0°C (32°F) to 40°C (104°F) and 90 percent non-condensing relative humidity.
- C. Designed and tested to withstand discharges without impairment of performance when subjected to discharges of 15,000 volts per IEC 801-2.

### **2.3 SENSOR PERFORMANCE REQUIREMENTS**

- A. Sensing mechanism:
  - 1. Dual technology:

## **SECTION 260923- LIGHTING CONTROL DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue buildup.
  - b. Utilize an operating frequency of 32k Hz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005 percent tolerance.
- B. Field adjustable controls for time delay and sensitivity to override any adaptive features.
- C. Power failure memory:
- 1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and learned parameters saved in protected memory shall not be lost.
- D. Designed and tested to withstand discharges without impairment of performance when subjected to discharges of 15,000 volts per IEC 801-2.

### **2.4 WIRED CEILING AND WALL MOUNT SENSORS**

- A Product: LOS-CDT-500R-WH, LOS-CDT-IOOOR-WH, LOS-CDT-2000R-WH.
- B. Provide all necessary mounting hardware and instructions.
- C. Sensors shall be Class 2 devices.
- D. Indicate viewing directions on mounting bracket for all Ceiling mount sensors.
- E. Provide customizable mask to block off unwanted viewing areas for all ceiling mounted sensors using infrared technology.
- F. Provide swivel mount base for all wall mount sensors.
- G. Provide an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.

### **2.5 IN-WALL OCCUPANCY SENSORS**

- A. Digital wall box no-neutral switch with occupancy/vacancy sensor
  - 1. Product:  
MS-OPS6M-DV
  - 2. Switch shall be rated at 120/277 Volts 6 amps Lighting / 120 Volts 3 amps Fan Loads and shall not require a neutral connection in wall box.
    - a. Rated life:  
Minimum 100,000 cycles.
    - b. Load switched in manner that prevents arcing at mechanical contacts when power is applied to load circuits.
    - c. Fully rated output continuous duty for inductive, capacitive, and resistive loads.
  - 3. Utilize Infrared as its sensing mechanism coupled with Lutron XCT™ Technology for sensing fine

## **SECTION 260923- LIGHTING CONTROL DEVICES**

### **GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**

#### **VEHICLE TESTING FACILITY**

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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motions. Signal processing technology detects fine motion, passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.

4. Occupancy/vacancy sensor can be programmed to operate as an occupancy sensor (automatic-on and automatic-off functionality) or a vacancy sensor (manual-on and automatic-off functionality).
5. Provide adjustable timeout for I5, 30 minutes.
6. Provide ambient light sensor to prevent lights from turning on automatically if ambient light in room is higher than selected setting. Three settings shall be available to for selection by the user.
7. Provide ability when switch is manually turned off, to prevent sensor from turning lights back on automatically while room remains occupied. Once room is vacated, auto-on feature returns to normal operation after timeout duration has exhausted.
8. Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply eliminating any leakage current.
9. Protect your switch from power surges during a storm or from other equipment from within the building.
10. Design and test switches to withstand line-side surges without impairment to performance when subjected to surges of 6,000 volts, 200 amps per ANSI/IEEE C62.41 C.
11. This ensures product design life time under all installation conditions. For example products which are not de-rated when installed in a multi-gang installation may experience a reduced design lifetime because of an increased temperature rise.
12. Capable of operating at the rated capacity; this includes modified capacities for ganging configurations which require the removal of fins. Operation at rated capacity shall be possible across the full ambient temperature range, without shortening design lifetime.
13. Provide frequency compensation to assure switching capability on 50 or 60Hz lines.
14. Switches to be listed to UL 20, UL 508, ULI472, CSA C22.2 #14, NOM-003-SCFI

## **2.6 SENSOR POWER PACKS**

- A. Product:  
PP-277H
- B. Plenum rated.
- C. Control wiring between sensors and control units shall be Class 2, 18-24 AWG, stranded U.L. Classified, TEFLON jacketed cable suitable for use in plenums.
- D. Integrated, self-contained unit consisting internally of an isolated load switching control relay and a power supply to provide low-voltage power (PP-SH does not supply power).

## **2.7 SOURCE QUALITY CONTROL**

- A. Perform full-function testing on 100 percent of all system components and panel assemblies at the factory.

## **SECTION 260923- LIGHTING CONTROL DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART 3- EXECUTION**

#### **3.1 INSTALLATION**

- A. Install equipment in accordance with manufacturer's installation instructions.
- B. Provide complete installation of system in accordance with Contract Documents.
- C. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

#### **3.2 SERVICE AND SUPPORT**

##### **A. Startup and Programming**

- 1. Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation under following parameters:
  - a. Qualifications for factory-certified field service engineer:
    - 1) Minimum experience of 2 years training in the electrical/electronic field.
    - 2) Certified by the equipment manufacturer on the system installed.
  - b. Make a visit upon completion of installation of lighting control system:
    - 1) Verify connection and location of controls.
    - 2) Verify system operation control by control, zone by zone.
    - 3) Verify proper integration of manufacturers interfacing equipment.
    - 4) Obtain sign-off on system functions.

##### **B. Tech Support**

- 1. Provide factory direct technical support hotline 24 hours per day, 7 days per week.

#### **3.3 MAINTENANCE**

- A. Capable of providing on-site service support within 24 hours anywhere in continental United States and within 72 hours worldwide except where special visas are required.
- B. Offer renewable service contract on yearly basis, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system startup.

**END OF SECTION**

## **SECTION 262416 - PANELBOARDS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

#### **1.2 SUBMITTALS**

A. Product Data:

For each type of product indicated

B. Shop Drawings:

For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panel boards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

C. Field quality-control reports.

D. Panelboard schedules for installation in panelboards.

E. Operation and maintenance data.

#### **1.3 QUALITY ASSURANCE**

A. Electrical Components, Devices, and Accessories:

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

#### **1.4 WARRANTY**

A. Special Warranty:

Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage



## **SECTION 262416 - PANELBOARDS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

Five years from date of Substantial Completion.

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL REQUIREMENTS FOR PANELBOARDS**

A. Enclosures:

Flush-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations:

NEMA 250, Type I

b. Outdoor Locations:

NEMA 250, Type 3R

c. Kitchen Wash-Down Areas:

NEMA 250, Type 4X

d. Other Wet or Damp Indoor Locations:

NEMA 250, Type 3

2. Front:

Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.

3. Hinged Front Cover:

Entire front trim hinged to box and with standard door within hinged trim cover.

4. Directory Card:

Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location:

Top and bottom.

C. Phase, Neutral, and Ground Buses:

Hard-drawn copper, 98 percent conductivity

D. Conductor Connectors:

Suitable for use with conductor material and sizes.

1. Material:

Hard-drawn copper, 98 percent conductivity

2. Main and Neutral Lugs:

Compression type

3. Ground Lugs and Bus Configured Terminators:

Compression type

## **SECTION 262416 - PANELBOARDS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- 4. Feed-Through Lugs:  
Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- 5. Sub-feed (Double) Lugs:  
Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- E. Service Equipment Label:  
NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- F. Future Devices:  
Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- G. Panelboard Short-Circuit Current Rating:  
Fully rated to interrupt symmetrical short-circuit current available at terminals.

### **2.2 DISTRIBUTION PANELBOARDS**

- A. Basis of Design Product:  
Subject to compliance with requirements, provide a comparable product by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
  - 2. General Electric Company; GE Consumer & Industrial- Electrical Distribution
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric
- B. Panelboards:  
NEMA PB 1, power and feeder distribution type
- C. Doors:  
Secured with vault-type latch with tumbler lock; keyed alike.
- D. Mains:  
Circuit breaker.
- E. Branch Overcurrent Protective Devices:  
For Circuit-Breaker Frame Sizes 125 A and Smaller:  
Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices:  
For Circuit-Breaker Frame Sizes Larger Than 125 A:  
Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- G. Branch Overcurrent Protective Devices:  
Fused switches

## **SECTION 262416 - PANELBOARDS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

A. Basis of Design Product:

Subject to compliance with requirements, provide a comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Panelboards:

NEMA PB 1, lighting and appliance branch-circuit type

C. Mains:

Circuit breaker

D. Branch Overcurrent Protective Devices:

Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Contactors in Main Bus:

NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuits interrupting rating as panelboard.

1. External Control-Power Source:  
24-V control circuit.

F. Doors:

Concealed hinges; secured with flush latch with tumbler lock; keyed alike

G. Column-Type Panelboards:

Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

### **2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

A. Basis of Design Product:

Subject to compliance with requirements, provide or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
2. General Electric Company; GE Consumer & Industrial- Electrical Distribution
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric

B. Molded-Case Circuit Breaker (MCCB):

Comply with UL 489, with 100% rating to meet available fault currents.

## **SECTION 262416 - PANELBOARDS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Thermal-Magnetic Circuit Breakers:  
Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers:  
Magnetic trip element with front-mounted, field adjustable trip setting.
3. Electronic trip circuit breakers with RMS sensing; field replaceable rating plug or field replicable electronic trip; and the following field adjustable settings:
  - a. Instantaneous trip.
  - b. Long and short time pickup levels.
  - c. Long and short time adjustments.
  - d. Ground-fault pickup level, time delay, and  $I^2t$  response.
4. Current-Limiting Circuit Breakers:  
Frame sizes 400 A and smaller; let through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers:  
Single and two pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers:  
Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers:  
Comply with UL 1699; 120/240-V, single pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Lugs:  
Compression Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  - c. Application Listing:  
Appropriate for application; Type SWD for switching fluorescent lighting loads.
  - d. Ground-Fault Protection:  
Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  - e. Communication Capability:  
Circuit-breaker mounted communication module with functions and features compatible with power monitoring and control system specified in Division 26 Section "Electrical Power Monitoring and Control."
  - f. Shunt Trip:  
24-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
  - g. Handle Padlocking Device:

## **SECTION 262416 - PANELBOARDS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Fixed attachment, for locking circuit-breaker handle in on or off position.

h. Handle Clamp:

Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch:

NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle

1. Fuses, and Spare-Fuse Cabinet:

Comply with requirements specified in Division 26 Section "Fuses."

### **2.5 ACCESSORY COMPONENTS AND FEATURES**

A. Portable Test Set:

For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.

B. Mount top of trim 72 inches (1829 mm) above finished floor unless otherwise indicated.

C. Mount panel board cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges

E. Install filler plates in unused spaces.

F. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA I.

### **3.2 IDENTIFICATION**

A. Identify field installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates:

Label each panelboard with a nameplate complying with requirements for identification specified in

## **SECTION 262416 - PANELBOARDS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates:

Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

### **3.3 FIELD QUALITY CONTROL**

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

**END OF SECTION**

## **SECTION 262113 – ELECTRICITY METERING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART 1- GENERAL**

#### **1.1 SUMMARY**

- A. Section includes equipment for electricity metering by utility company.

#### **1.2 SUBMITTALS**

- A. Product Data:  
For each type of product indicated.
- B. Shop Drawings:  
Dimensioned plans and sections or elevation layouts and wiring diagrams.
- C. Field quality control reports.
- D. Operation and Maintenance Data:  
In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Application and operating software documentation
  - 2. Software licenses
  - 3. Software service agreement
  - 4. Hard copies of manufacturer's operating specifications, design user's guides for software and hardware, and PDF files on CD-ROM of the hard-copy Submittal.

#### **1.3 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories:  
Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### **PART 2 - PRODUCTS**

#### **2.1 EQUIPMENT FOR ELECTRICITY METERING BY UTILITY COMPANY**

- A. Meters will be furnished by Contractor and approval by utility company.
- B. Current-Transformer Cabinets:  
Comply with requirements of electrical-power utility company.
- C. Meter Sockets:  
Comply with requirements of electrical-power utility company.
- D. Meter Sockets:  
Steady state and short circuit current ratings shall meet indicated circuit ratings.

#### **2.2 EQUIPMENT FOR ELECTRICITY METERING BY OWNER**

- A. Basis of Design Product:

## **SECTION 262113 – ELECTRICITY METERING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Subject to compliance with requirements, provide product by one of the following:

1. National Meter Industries
  2. Osaki Meter Sales, Inc.
  3. SquareD; a brand of Schneider Electric
  4. E-Mon digital metering
  5. All meters must be approved by utility company prior to purchase.
- B. Kilowatt-hour Meter:  
Electronic three phase meters, measuring electricity used
1. Voltage and Phase Configuration:  
Meter shall be designed for use on circuits with voltage rating and phase configuration indicated for its application.
  2. Display:  
LCD with characters not less than 0.25 inch (6 mm) high, indicating accumulative kilowatt-hours and current kilowatt load. Retain accumulated kilowatt-hour in a nonvolatile memory, until reset.
  3. Display:  
Digital electromechanical counter, indicating accumulative kilowatt-hours.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Comply with equipment installation requirements in NECA 1.
- B. Install meters, raceways and equipment according to utility company's written requirements. Provide empty conduits for metering leads and extend grounding connections as required by utility company.
- C. Install modular meter center according to NECA 400 switchboard installation requirements.
- D. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
  1. Series Combination Warning Label:  
Self-adhesive type, with text as required by NFPA 70

### **3.2 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Tests and Inspections:
  1. Connect a load of known kilowatt rating, 1 .5 kW minimum, to a circuit supplied by metered feeder.
  2. Turn off circuits supplied by metered feeder and secure them in off condition.



## **SECTION 262113 – ELECTRICITY METERING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Run test load continuously for eight hours minimum, or longer, to obtain a measurable meter indication. Use test-load placement and setting that ensures continuous, safe operation.
  4. Check and record meter reading at end of test period and compare with actual electricity used, based on test load rating, duration of test, and sample measurements of supply voltage at test load connection. Record test results.
- C. Electricity metering will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

**END OF SECTION**

## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART 1 -GENERAL**

#### **1.1 SUMMARY**

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Wall switch and exterior occupancy sensors.

#### **1.2 SUBMITTALS**

A. Product Data:

For each type of product indicated

B. Shop Drawings:

List of legends and description of materials and process used for pre-marking wall plates.

C. Operation and Maintenance Data:

For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

#### **1.3 QUALITY ASSURANCE**

A. Electrical Components, Devices, and Accessories:

Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

### **PART 2- PRODUCTS**

#### **2.1 MANUFACTURERS**

A. Manufacturers' Names:

Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper)
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell)
3. Leviton Mfg. Company Inc. (Leviton)
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour)

#### **2.2 GENERAL WIRING-DEVICE REQUIREMENTS**

A. Wiring Devices, Components, and Accessories:

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranded building wire.
2. Devices shall comply with the requirements in this Section.

D. All 125V and 250V, 20A receptacles shall be listed as weather resistant type per 2008 NEC 406.8, Receptacles in Damp and Wet Locations.

### **2.3 STRAIGHT BLADE RECEPTACLES**

A. Convenience Receptacles, 125 V, 20 A:

Comply with NEMA WD I, NEMA WD 6 configuration 5-20R, and UL498.

1. Products:  
Subject to compliance with requirements, provide one of the following:
  - a. Cooper; 5351 (single), 5352 (duplex)
  - b. Hubbell; HBL5351 (single), CR5352 (duplex)
  - c. Leviton; 5891 (single), 5352 (duplex)
  - d. Pass & Seymour; 5381 (single), 5352 (duplex)

### **2.4 GFCI RECEPTACLES**

A. General Description:

Straight blade, non-feed through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products:  
Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - a. Cooper; GF20
  - b. Pass & Seymour; 2084

### **2.5 SNAP SWITCHES**

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products:  
Subject to compliance with requirements, provide one of the following:
  - a. Cooper:

## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way)

- b. Hubbell:  
CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way)
- c. Leviton:  
1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way)
- d. Pass & Seymour:  
20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way)

### **C. Pilot Light Switches, 20 A:**

- 1. Products:  
Subject to compliance with requirements, provide one of the following:
  - a. Cooper:  
2221PL for 120 V and 277 V
  - b. Hubbell:  
HPL1221PL for 120 V and 277 V
  - c. Leviton:  
1221-PLR for 120 V, 1221-7 PLR for 277 V
  - d. Pass & Seymour; PS20AC1-PLR for 120 V
- 2. Description:  
Single pole, with neon-lighted handle, illuminated when switch is "ON."

### **D. Key Operated Switches, 120/277 V, 20 A:**

- 1. Products:  
Subject to compliance with requirements, provide one of the following:
  - a. Cooper:  
2221L
  - b. Hubbell:  
HBL 1221L
  - c. Leviton:  
1221-2L
  - d. Pass & Seymour:  
PS20AC1-L
- 2. Description:  
Single pole, with factory supplied key in lieu of switch handle.

E. Single Pole, Double Throw, Momentary Contact, Center Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Products:

Subject to compliance with requirements, provide one of the following:

a. Cooper:

1995

b. Hubbell:

HBL1557

c. Leviton:

1257

d. Pass & Seymour:

1251

F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, I20/277 V, 20 A; for use with mechanically held lighting contactors, with factory supplied key in lieu of switch handle.

1. Products:

Subject to compliance with requirements, provide one of the following:

a. Cooper:

1995L

b. Hubbell:

HBL1557L.

c. Leviton:

1257L.

d. Pass & Seymour:

1251L

### **2.6 WALL PLATES**

A. Single and combination types to match corresponding wiring devices.

1. Plate Securing Screws:

Metal with head color to match plate finish.

2. Material for Finished Spaces:

Smooth, high-impact thermoplastic.

3. Material for Unfinished Spaces:

Smooth, high-impact thermoplastic.

4. Material for Damp Locations:

Thermoplastic with spring loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet Location, Weatherproof Cover Plates:

NEMA 250, complying with type 3R weather resistant thermoplastic with lockable cover.

### **2.7 FLOOR SERVICE FITTINGS**

## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Type:  
Modular, flush type, dual service units suitable for wiring method used
- B. Compartments:  
Barrier separates power from voice and data communication cabling
- C. Service Plate:  
Rectangular, solid brass with satin finish
- D. Power Receptacle:  
NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated
- E. Voice and Data Communication Outlet:  
Blank cover with bushed cable opening

### **2.8 FINISHES**

- A. Color:  
TBD by the Owner's Representative. Plates and screw heads shall match device color.
  - 1. Wiring Devices Connected to Normal Power System:  
White, unless otherwise indicated or required by NFPA 70 or device listing
  - 2. Wiring Devices Connected UPS Power System:  
Red
  - 3. TVSS Devices:  
Blue.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.

## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

### **D. Device Installation:**

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15 or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Every room shall have lighting control device whether indicated or not on plans.
11. Install a motor rated service switch at each connection to 120V fan motors whether indicated or not on plans.
12. Receptacles installed outdoors shall be GFCI type and have rain tight "In-Use" cover.
13. Adjust outlet heights in ceramic tile walls to be entirely in or entirely out of the tile. Outlets to be horizontal to most space conditions.
14. Coordinate device mounting with Architectural drawings prior to rough-in.
15. Device and Plate Color:
  - a. White:  
Devices connected to Normal Power Circuit.
  - b. Gray:  
Device connected to UPS Power Circuit.
  - c. Red:

## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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Devices connected to Emergency Power Circuit.

### **E. Receptacle Orientation:**

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

### **F. Device Plates:**

Do not use oversized or extra deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

### **G. Dimmers:**

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

### **H. Arrangement of Devices:**

1. Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top.
2. Group adjacent switches under single, multi-gang wall plates.
3. Align vertically receptacles, light switches and fire alarm devices when shown near each other.

## **3.2 IDENTIFICATION**

### **A. Comply with Division 26 Section "Identification for Electrical Systems."**

#### **1. Receptacles:**

Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

## **3.3 FIELD QUALITY CONTROL**

### **A. Perform tests and inspections and prepare test reports.**

#### **1. Test Instruments:**

Use instruments that comply with UL 1436.

#### **2. Test Instrument for Convenience Receptacles:**

Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

### **B. Tests for Convenience Receptacles:**

#### **1. Line Voltage:**

Acceptable range is 105 to 132V.



## **SECTION 262126 – WIRING DEVICES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. Percent Voltage Drop under 15-A Load:  
A value of 6 percent or higher is not acceptable.
3. Ground Impedance:  
Values of up to 2 ohms are acceptable.
4. GFCI Trip:  
Test for tripping values specified in UL 1436 and UL 943
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

**END OF SECTION**

## **SECTION 262813 – FUSES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

A. Section Includes:

Cartridge fuses rated 600 VAC and less for use in control circuits enclosed switches, enclosed controllers and motor-control centers.

#### **1.2 SUBMITTALS**

A. Product Data:

For each type of product indicated.

B. Operation and maintenance data

#### **1.3 QUALITY ASSURANCE**

A. Electrical Components, Devices, and Accessories:

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA FU 1 for cartridge fuses.

C. Comply with NFPA 70.

### **PART 2 - PRODUCTS**

#### **2.1 MANUFACTURERS**

A. Manufacturers:

Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.

2. Edison Fuse, Inc.

3. Ferraz Shawmut, Inc.

4. Littelfuse, Inc.

#### **2.2 CARTRIDGE FUSES**

A. Characteristics:

NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

### **PART 3 - EXECUTION**

#### **3.1 FUSE APPLICATIONS**

A. Motor Branch Circuits:

Class RK5, time delay

## **SECTION 262813 – FUSES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- B. Control Circuits:  
Class CC, fast acting

### **3.2 INSTALLATION**

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

### **3.3 IDENTIFICATION**

- A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

**END OF SECTION**

**SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Fusible switches
2. Non-fusible switches
3. Shunt trip switches
4. Molded case circuit breakers (MCCBs)
5. Enclosures

**1.2 DEFINITIONS**

A. NC:

Normally closed.

B. NO:

Normally open.

C. SPDT:

Single pole, double-throw

**1.3 SUBMITTALS**

A. Product Data:

For each type of enclosed switch, circuit breaker, accessory, and component indicated

B. Shop Drawings:

For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams:

For power, signal, and control wiring

C. Field quality-control reports

D. Operation and maintenance data

**1.4 QUALITY ASSURANCE**

A. Electrical Components, Devices, and Accessories:

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

**PART 2 - PRODUCTS**

**SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**2.1 FUSIBLE SWITCHES**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
  3. Siemens Energy & Automation, Inc.
  4. SquareD; a brand of Schneider Electric
- B. Type GD, General Duty, Single Throw, 240-VAC, 800 A and Smaller:  
UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 240 and 600-VAC, 1200 A and Smaller:  
UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 240 and 600-VAC, 200 A and Smaller:  
UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Double Throw, 240 and 600-VAC, 1200 A and Smaller:  
UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
1. Equipment Ground Kit:  
Internally mounted and labeled for copper and aluminum ground conductors.
  2. Neutral Kit:  
Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  3. Class R Fuse Kit:  
Provides rejection of other fuse types when Class R fuses are specified
  4. Lugs:  
Suitable for number, size, and conductor material
  5. Service Rated Switches:  
Labeled for use as service equipment.

**2.2 SHUNT TRIP SWITCHES**

- A. Basis of Design Product:  
Subject to compliance with requirements, provide product indicated on Drawings or/a comparable product by one of the following:

**SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Cooper Bussmann, Inc.
  2. Ferraz Shawmut, Inc.
  3. Littelfuse, Inc.
- B. General Requirements:  
Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class I fuses.
- C. Switches:  
Three pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Control Circuit:  
120-VAC; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.
- E. Accessories:
1. Oil tight key switch for key-to-test function.
  2. Oil tight ON pilot light
  3. Isolated neutral lug
  4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
  5. Form C alarm contacts that change state when switch is tripped.
  6. Three pole, double throw, fire safety and alarm relay; 120-VA or 24-VDC coil voltage.
  7. Three pole, double throw, fire alarm voltage monitoring relay complying with NFPA 72.

## **2.3 MOLDED-CASE CIRCUIT BREAKERS**

- A. Basis of Design Product:  
Subject to compliance with requirements, provide product indicated on Drawings or/a comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit
  2. General Electric Company; GE Consumer & Industrial - Electrical Distribution
  3. Siemens Energy & Automation, Inc.
  4. Square D; a brand of Schneider Electric
- B. General Requirements:  
Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

**SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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C. Thermal-Magnetic Circuit Breakers:

Inverse time-current element for low level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Electronic Trip Circuit Breakers:

Field replaceable rating plug, RMS sensing, with the following field adjustable settings:

1. Instantaneous trip
2. Long and short time pickup levels
3. Long and short time adjustments
4. Ground-fault pickup level, time delay, and  $I^2t$  response

E. Current-Limiting Circuit Breakers:

Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5

F. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs:  
Suitable for number, size, trip ratings, and conductor material
3. Application Listing:  
Appropriate for application; Type SWD for switching fluorescent lighting loads
4. Ground-Fault Protection:  
Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to- test feature, internal memory, and shunt trip unit; and three phase, zero sequence current transformer/sensor.
5. Shunt Trip:  
Trip coil energized from separate circuit, with coil-clearing contact
6. Auxiliary Contacts:  
Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit breaker contacts, "b" contacts operate in reverse of circuit breaker contacts.
7. Alarm Switch:  
One NC contact that operates only when circuit breaker has tripped

## **2.4 ENCLOSURES**

A. Enclosed Switches and Circuit Breakers:

NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations:  
NEMA 250, Type 1

**SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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2. Outdoor Locations:  
NEMA 250, Type 3R
3. Kitchen Wash Down Areas:  
NEMA 250, Type 4X
4. Other Wet or Damp, Indoor Locations:  
NEMA 250, Type 3
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids:  
NEMA 250, Type 12

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install individual wall mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions:  
Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

### **3.2 IDENTIFICATION**

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
  1. Identify field installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved metal or laminated-plastic nameplate.

### **3.3 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
  2. Test continuity of each circuit.
- C. Tests and Inspections:
  1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.



**SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

**END OF SECTION**

# **SECTION 265151 INTERIOR LIGHTING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART 1- GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

### **1.2 SUMMARY**

- A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

### **1.3 DEFINITIONS**

- A. Emergency Lighting Unit:  
A fixture with integral emergency battery powered supply and the means for controlling and charging the battery. It is also known as an emergency light set.
- B. Fixture:  
A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units include ones with and without integral lamp heads.
- C. Average Life:  
The time after which 50 percent fails and 50 percent survives under normal conditions.

### **1.4 SUBMITTALS**

- A. General:  
Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:
  - 1. Outline drawings indicating dimensions and principal features of fixtures.
  - 2. Electrical Ratings and Photometric Data:  
Certified results of independent laboratory tests for fixtures and lamps.
  - 3. Battery and charger data for emergency lighting units.
- C. Maintenance data for fixtures to include in the operation and maintenance manual specified in Division 1.

### **1.5 QUALITY ASSURANCE**

- A. Electrical Component Standard:  
Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
- B. Listing and Labeling:  
Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project. The Terms "Listed" and "Labeled" as defined in the National Electrical Code, Article 100.

## **SECTION 265151 INTERIOR LIGHTING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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1. Listing and Labeling Agency Qualifications:

A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

- C. Coordinate fixtures, mounting hardware, and trim with ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.

### **1.6 WARRANTY**

A. General Warranty:

The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

### **1.7 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Lamps:

10 lamps for every 100 of each type and rating installed. Furnish at least one of each type.

2. Ballasts:

1 for every 100 of each type and rating installed. Furnish at least one of each type.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

A. Products:

Subject to compliance with requirements, provide one of the products specified in each Interior Lighting Fixture Schedule as indicated on the drawings.

### **2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL**

A. Metal Parts:

Free from burrs, sharp comers, and edges.

B. Sheet Metal Components:

Steel, except as indicated. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access:

Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.

D. Reflecting Surfaces:

Minimum reflectance as follows, except as otherwise indicated:

1. White Surfaces:

85 percent

2. Specular Surfaces:

83 percent

## SECTION 265151 INTERIOR LIGHTING

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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3. Diffusing Specular Surfaces:  
75 percent
  4. Laminated Silver Metallized Film:  
90 percent
- E. Lens glasses, Diffusers, Covers, and Globes:  
100 percent virgin acrylic plastic or water white, annealed crystal s, except as otherwise indicated.
1. Lens Thickness:  
0.125 inch (3 mm) minimum; except where greater thickness is indicated.
  2. Plastic:  
High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
- F. Fixture Support Components:  
Comply with Division 26 Section "Basic Electrical Materials and Methods."
1. Single-Stem Hangers:  
1/2-inch (12-mm) steel tubing with swivel ball fitting and ceiling canopy. Finish same as fixture.
  2. Twin-Stem Hangers:  
Two, 1/2-inch (12-mm) steel tubes with single canopy arranged to mount a single fixture. Finish same as fixture.
  3. Rod Hangers:  
3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod
  4. Hook Hanger:  
Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- G. Fluorescent Fixtures:  
Conform to UL 1570.
- H. Fluorescent Ballasts:  
Electronic integrated circuit, solid-state, full-light-output, energy-efficient type compatible with lamps and lamp combinations to which connected.
1. Certification by Electrical Testing Laboratory (ETL).
  2. Labeling by Certified Ballast Manufacturers Association (CBM).
  3. Type:  
Class P, high power factor, except as otherwise indicated
  4. Sound Rating:  
"A" rating, except as otherwise indicated
  5. Voltage:  
Match connected circuits
  6. Lamp Flicker:  
Less than 5 percent.

## **SECTION 265151 INTERIOR LIGHTING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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7. Minimum Power Factor:  
90 percent
8. Total Harmonic Distortion (THD) of Ballast Current:  
Less than 20 percent
9. Conform to FCC Regulations Part 15, Subpart J for electromagnetic interference.
10. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
6. Multi-lamp Ballasts:  
Use 2, 3, or 4 lamp ballasts for multi-lamp fixtures where possible.
7. Lamp-ballast connection method does not reduce normal rated life of lamps.
- I. Exit Signs:  
Conform to UL 924 and the following:
  1. Sign Colors:  
Conform to local code.
  2. Minimum Height of Letters:  
Conform to local code
  3. Arrows:  
Include as indicated
  4. Lamps for AC Operation:  
Light-emitting diodes (LED), 70,000 hours minimum rated life
- J. Emergency Lighting Units:  
Conform to UL 924. Provide self-contained units with the following features:
  1. Battery:  
Sealed, maintenance-free, lead-calcium type with minimum 10-year nominal life and special warranty.
  2. Charger:  
Minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.
  3. Operation:  
Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. Relay disconnects lamps and battery and automatically recharges and floats on trickle charger when normal voltage is restored.

### **2.3 LAMPS**

- A. Comply with ANSI C78 series that is applicable to each type of lamp.
- B. Fluorescent Color Temperature and Minimum Color-Rendering Index (CRI):  
4800 K and 85 CRI, except as otherwise indicated.

## SECTION 265151 INTERIOR LIGHTING

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### C. Not Compact Fluorescent Lamp Life:

Rated average is 20,000 hours at 3 hours per start when used on rapid start circuits.

## 2.4 FINISHES

- A. Manufacturer's standard, except as otherwise indicated, applied over corrosion resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to requirements of Division 26 Section "Basic Electrical Materials and Methods."

### B. Support for Recessed and Semi-recessed Grid Type Fluorescent Fixtures:

Units may be supported from suspended ceiling support system. Install ceiling support system rods or wires at a minimum of 4 rods or wires for each fixture, located not more than 6 inches (150 mm) from fixture comers.

1. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture comer.
2. Fixtures Smaller than Ceiling Grid:  
Install a minimum of 4 rods or wires for each fixture and locate at comer of ceiling grid where fixture is located. Do not support fixtures by ceiling acoustical panels.
3. Fixtures of Sizes Less than Ceiling Grid:  
Center in acoustical panel. Support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

### C. Support for Suspended Fixtures:

Brace pendants and rods over 48 inches (1200 mm) long to limit swinging. Support stem mounted, single unit, suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

### D. Lamping:

Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

### 3.2 CONNECTIONS

#### A Ground lighting units:

Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replaced damaged fixtures and components.
- B. Give advance notice of dates and times for field tests.

## **SECTION 265151 INTERIOR LIGHTING**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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C. Provide instruments to make and record test results.

D. Tests:

Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following information in tests of emergency lighting equipment:

1. Duration of supply.
2. Low battery voltage shutdown.
3. Normal transfer to battery source and retransfer to normal.
4. Low supply voltage transfer.

E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

F. Report results of tests.

G. Replace fixtures that show evidence of corrosion during Project warranty period.

### **3.4 ADJUSTING AND CLEANING**

A. Clean fixtures after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimed fixtures to provide required light intensities.

**END OF SECTION**

## **DIVISION 32 – EXTERIOR IMPROVEMENTS**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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## **PART I - GENERAL**

### **1.1 ORNAMENTAL STEEL SECURITY FENCING AND GATES INCLUDING THE FOLLOWING:**

- A. Swinging Gates.

### **1.2 RELATED SECTIONS**

- A. Section 03 30 00 - Cast-in-Place Concrete.

### **1.3 REFERENCES**

- A. ASTM International (ASTM):

1. ASTM B117: Standard Test Method of Salt Spray (Fog) Testing.
2. ASTM B221: Standard Specification for Aluminum and Aluminum-alloy extruded bars, rods, wire, shapes and tubes.
3. ASTM D2794: Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
4. ASTM D3359: Standard Test Methods for Measuring Adhesion by Tape.
5. ASTM F900: Standard Specification for industrial and commercial swing gates. Installation procedures and instructions describing details for a typical fence and gates.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store products in manufacturer's tagged and unopened packaging until ready for installation.
- B. Handle products in accordance with manufacturers instructions.

#### **1.5 PROJECT CONDITIONS**

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions:
  - 1. Notify local utility marking services before beginning work.
  - 2. Unless otherwise indicated in the general provisions of the contract, notify Architect no less than two days in advance of proposed utility interruptions.
  - 3. Do not proceed with utility interruptions without Owner's Representative's written permission.
- B. Field Measurements: Verify layout information for fences and gates shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

#### **1.6 WARRANTY**

- A. Manufacturer's Warranty: Provide manufacturer's standard ten year limited warranty for finish.

### **PART II -PRODUCTS**

#### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturer: Omega II Fence Systems, which is located at: 1735 St-Elzear West; Laval, QC, Canada H7L 3N6; Toll Free Tel: 800-836-6342; Tel: 450-686-9600; Fax: 450-681-7905; Email:[information@omegatwo.com](mailto:information@omegatwo.com); Web:[www.omegatwo.com](http://www.omegatwo.com)
- B. Requests for substitutions will be considered in accordance with provisions of Division 01.
  - 1. All substitution approval requests shall be accompanied by manufacturing drawings and specifications, and they shall meet all specifications for design, size, gauge of metal parts, and fabrication.

#### **2.2 SWING GATES**

- A. Configuration:
  - 1. Double swing.

**SECTION 323100 – ORNAMENTAL SECURITY FENCING AND GATES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- B. Gate Frames:** Two horizontal ASTM F900 galvanized square steel tubes, 11 gauge, 1-1/2 x 1-1/2 inch (38 mm X 38 mm), two vertical tubes 2 x 2 inch (50 x 50 mm), and 1-1/2 x 1-1/2 inch (38 x 38 mm) supplementary vertical support, welded at intersections to create a rigid frame.
- C. Gate Posts:** Cold rolled 1008 grade steel to meet ASTM 500 and ASTM A787, length as required for installation type:
  - 1. Installation: In ground, post length as required for local frost line requirements.
  - 2. Post Size: 4 x 4 inch (100 x 100 mm).
- D. Gate Hardware: Hinges, Latches, Drop Rods:** Hot-dipped galvanized steel to ASTM F900, sized to assure proper gate operation. Non-moving parts shall be powder-coated.
  - 1. Hinge: Structurally designed by manufacturer to support gates without deformation during opening and closing.
  - 2. Latch: Clamp-on, self-latching, gravity system.
  - 3. Additional Hardware for Double Gates:
    - a. Keeper: Mechanical device with gravity-lock system to fasten each gate leaf in full open position.
    - b. Drop Bar: Secures one gate in closed position using stop pipe to engage the center drop rod.
    - c. Self-Locking Device: Integral to latch, and with padlock eyes.

## **PART III -EXECUTION**

### **3.1 EXAMINATION**

- A.** Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
  - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
  - 2. Provide a verified survey of property lines and legal boundaries.
- B.** Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

**SECTION 323100 – ORNAMENTAL SECURITY FENCING AND GATES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes.
- B. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments marked by registered surveyor and utility companies.

### **3.3 FENCE POST LAYOUT**

- A. Layout fencing on established boundaries inside property line.
- B. Terminal Posts Layout: Locate terminal end, corner, and gate posts at changes in horizontal or vertical alignment.
- C. Post spacing for 2 inch (50 mm) posts:
  - 1. Architectural panel 97-3/4 inch (2483 mm) center to center with an adjustment of plus or minus 1-1/2 in. (38 mm).

### **3.4 IN-GROUND CONCRETE INSTALLATION**

- A. Drill or hand-excavate holes for posts to spacing indicated, in firm, undisturbed or compacted soil.
- B. Dig holes with a diameter 4 times the diameter of the post and 6 inches (150 mm) deeper than the bottom of the post.
  - 1. Minimum 8 inch (200 mm) in diameter and 42 inch (1070 mm) in depth.
- C. Concrete forms are not necessary or recommended. Crown concrete at top to shed water.
- D. Measure, batch, and mix project-site-mixed concrete according to ASTM C 94. Pour concrete and let cure in accordance with ACI 301 and Division 03 Section "Cast-in-Place Concrete".
- E. Exposed Concrete Footings: Extend concrete 2 inches (50 mm) above grade, or as indicated on Drawings, smooth, and shape to shed water.
- F. Post Setting: Set posts in concrete footing. Protect portion of posts above ground from concrete splatter. Place concrete around posts and consolidation. Using mechanical devices to set posts is not permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.

- G. Posts Set into Concrete in Voids: Form or core drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than outside diameter of post. Clean holes of loose material, insert posts, and fill granular space between post and concrete with non-shrink, non-metallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.

### **3.5 PANEL INSTALLATION**

- A. Once the post installation is complete, install the mesh sections with the Universal Bracket kits, flush with horizontal wire of the panel (no gap).
- B. Attach the panels to the posts with eye-U-bracket and tie wire or twist tie. Where two panels meet and no post is set, join them with end-to-end connectors used for panel to panel linkage. Do not exceed manufacturers recommended spacing. Attach panel to corner posts with bands spaced maximum of 24 inches (2610 mm) on center.
- C. Panel Installation: Installed a minimum of 1-1/4 inch (30 mm) and maximum of 2 inches (50 mm) above the ground surface.
  - 1. Install vertical wire extensions pointing up for security.
  - 2. Upon cutting or trimming, a post or a wire mesh section, apply a zinc rich primer to the exposed ends and finish with matching touch-up paint supplied by the manufacturer.
  - 3. Excavation for Supports: Hand-excavate holes for bases, in firm, undisturbed or compacted soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated on Drawings.

### **3.6 GATE INSTALLATION AND ADJUSTMENT**

- A. Install gate posts in accordance with manufacturer's instructions.
- B. Concrete Set Gate Posts:
  - 1. Drill holes in firm, undisturbed or compacted soil.
  - 2. Holes shall have a diameter 4 times greater than outside dimension of post, and depths at least 6 inches (150 mm) deeper than frost level.
  - 3. Set post bottom 36 inches (914 mm) below surface when in firm, undisturbed soil.
  - 4. Excavate and set posts deeper where required for adequate support in soft and loose soils, and for posts with heavy lateral loads.

**SECTION 323100 – ORNAMENTAL SECURITY FENCING AND GATES**  
**GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES**  
**VEHICLE TESTING FACILITY**  
**18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS**

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5. Place concrete around posts in a continuous pour, tamp for consolidation.
  6. Trowel finish around gate posts and slope to direct water away.
  7. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
- C.** Install gates perfectly horizontal and levelled (at junction), plumb, and secure for full opening without interference.
- D.** Attach hardware with nuts inside the property making the assembly tamper-proof to prevent unauthorized removal. Install ground-set items in concrete for anchorage.
- E.** Adjust hardware for smooth operation and lubricate where necessary to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

**END OF SECTION**

## **DIVISION 33 – UTILITIES**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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**SECTION 332722-STORM DRAINAGE STRUCTURES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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The **Specifications** contained this section are intended to cooperate with, to supplement, and to modify **Section 604 Manholes, Inlets, and Catch Basins** and other specifications of the "**Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects**" (FP-14). In case of disagreement with any other section of this contract, the more stringent specification shall govern.

**PART 1- GENERAL**

**1.1 SECTION INCLUDES**

- A. Installing catch basins, manholes, and other drainage structures.

**1.2 REFERENCED SECTIONS**

- A. Section 332724:

Storm Drainage Pipe

**1.3 REFERENCES**

- A. ASTMA48-83:

Gray Iron Castings

- B. ASTM A185-79:

Welded Steel Wire, Fabric, Plain for Concrete Reinforcement

- C. ASTM A615-84:

Deformed and Plain Billet-Steel Bars for Concrete Reinforcement

- D. ASTM A616-84:

Rail-Steel Deformed and Plain Bars for Concrete Reinforcement

- E. ASTMC32-73:

Sewer and Manhole Brick (Made from Clay or Shale)

- F. ASTMC33-85:

Concrete Aggregates

- G. ASTMC94-84:

Ready-Mixed Concrete



**SECTION 332722-STORM DRAINAGE STRUCTURES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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H. ASTM C270-84:

Mortar for Unit Masonry

I. ASTM C478-85:

Precast Reinforced Concrete Manhole Sections

**1.4 SUBMITTALS**

A. Submit Certificates of Compliance for castings, accessories, and other materials furnished under this Section.

**1.5 QUALITY ASSURANCE**

A. Certificates of Compliance are required on materials furnished under this Section.

**PART 2- PRODUCTS**

**2.1 MATERIALS**

A. Class "A" Concrete:

ASTM C94. All concrete shall be Class A unless stated otherwise.

1. Strength: 4000 psi @ 28 days.
2. Cement Content: Type I ASTM C 150, 6.5 sacks/cy (min)
3. W/C Ratio: 0.40 (due to salt conditions) For better workability, add 5.8 fl oz/cy air entrainment or water reducer admixture.
4. Fine Aggregate: ASTM C33
5. Coarse Aggregate: ASTM C33 Size #67

B. Class "B" Concrete:

All concrete for foundations shall be Class B unless otherwise stated.

1. Strength: 3500 psi @ 28 days.
2. Cement Content: Type I ASTM C 150, 6.0 sacks/cy (min)
3. W/C Ratio: 0.40 (due to salt conditions) For better workability, add 5.8 fl oz/cy air entrainment or water reducer admixture.
4. Fine Aggregate: ASTM C33

**SECTION 332722-STORM DRAINAGE STRUCTURES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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5. Coarse Aggregate: ASTM C33 Size #67

C. Reinforcing Steel:

ASTM A615, A616, or A85.

D. Precast Concrete:

ASTM C478 except as specified otherwise.

E. Brick Masonry:

ASTM C32 Grade SS.

F. Mortar:

ASTM C270 Type S.

G. Bedding Material:

Section 02724.

## **2.2 FRAMES, GRATES, AND COVERS**

A. Conform to ASTM A48 Class 30B as modified herein, capable of supporting HS-20 loading.

B. Castings shall be sandblasted and coated with coal tar enamel, applied in a satisfactory manner so as to make a smooth, tough, tenacious coating which is not brittle nor has any tendency to scale off. Damaged coatings shall be repaired by the Contractor at no additional cost to the Owner.

C. Manhole Frames and Covers:

1. Provide a 30-inch diameter clear opening. The cover shall have the letter "D" or the word "DRAIN" cast into the top surface.
2. Contact surfaces of covers and frames shall be machined at the foundry to prevent rocking of covers in any orientation.

D. Catch Basin Frames and Grates:

1. Checkerboard style grill.

## **2.3 STRUCTURE ASSEMBLIES**

A. All structure assemblies, precast or cast-in-place (with or without steel reinforcement), shall be designed to withstand HS-20 loading. All precast sections and bases shall have the date of manufacture and the name or trademark of the manufacturer impressed or indelibly marked on the inside wall.

**SECTION 332722-STORM DRAINAGE STRUCTURES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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B. Base Section:

Monolithic to a plane 6 inches above the crown of the incoming pipe, and shall be pre-cast reinforced concrete or pre-cast non-reinforced concrete.

C. Barrels and Cones:

Precast or cast-in-place, reinforced or non-reinforced concrete. Cone sections shall have an eccentric opening.

D. Top Slab:

When structure depth is less than 6 feet, a reinforced concrete slab cover may be used, which shall have an eccentric entrance opening and be capable of supporting HS-20 loading.

E. Horizontal Joint Sealant:

1. Elastomeric or mastic water-tight sealant such as Kent #2, Ram Nek, EZ, or approved equal.
2. For Sanitary Sewer structures: Polywrap, 18" wide (min.) around all horizontal concrete joints and seal around joint of casting on structure.

F. Pipe to Structure Joints:

Securely mortared with non-shrink grout inside and out so as to provide a sound, watertight seal.

**PART 3- EXECUTION**

**3.1 PREPARATION**

- A. Perform excavation and preparation of subgrade in accordance with Section 02200.
- B. Layout structure locations to accurately match curb lines or other final alignment requirements.
- C. Excavate the pit for structures no wider than the structure diameter plus 4 feet.

**3.2 INSTALLATION**

- A. Base sections shall be placed on a 6-inch layer of Bedding material compacted to 95% maximum dry density as defined in Section 02200.
- B. Place precast sections vertically and in true alignment. Use manufacturer's recommended procedure for sealing horizontal joints.

**SECTION 332722-STORM DRAINAGE STRUCTURES**  
GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES  
VEHICLE TESTING FACILITY  
18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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- C. Inlet and outlet stubs shall be connected and sealed in accordance with the manufacturer's recommended procedure or cast integrally with the base section.
- D. Place and maintain frame and cover or some other means of preventing accidental entry by unauthorized persons, children, or animals until final adjustment to grade.
- E. Backfill in accordance with Section 02200.

**3.3 ADJUSTING**

- A. Structures within AC pavement under construction shall be temporarily set to an elevation below the top of the base course. After installation of the binder course, set structures to final grade. Backfill the excavation necessary for this final adjustment with Class "B" Concrete.
- B. Adjust structures with brick masonry or prefabricated adjustment rings. Set frames concentric with structure openings in a full bed of mortar. All adjustment work shall be sound and watertight.
- C. When the rear edge of a grate set concentric with the structure opening falls more than 4" from the curb line, correct by rotating the eccentric top slab or cone, moving the structure, or replacing with a larger diameter structure as necessary to bring the opening into proper alignment.

**3.4 INVERTS AND SHELVES**

- A. Construct Class "B" Concrete shelf and invert conforming to size of pipes joined. At changes in direction, lay out inverts in curves of longest possible radius tangent to the center line of the pipes.
- B. Construct shelves to the elevation of the highest pipe crown and lope to drain toward the invert.

**END OF SECTION**

## **SECTION 332724-STORM DRAINAGE PIPE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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The Specifications contained this section are intended to cooperate with, to supplement, and to modify Section 602 Culverts and Drains and other specifications of the "Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects" (FP-14). In case of disagreement with any other section of this contract, the more stringent specification shall govern.

### **PART I -GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Installation of high density polyethylene (HDPE) storm drains and fittings.

#### **1.2 REFERENCED SECTIONS**

- A. Section 312200:

Earthwork

#### **1.3 REFERENCES**

- A. FHWA FP-14 Standard Specifications for Construction of Roads and Bridges, 2014 edition.

#### **1.4 SUBMITTALS**

- A. Submit Certificates of Compliance on pipe, joints, and accessories.

#### **1.5 QUALITY ASSURANCE**

- A. The CONTRACTOR shall perform sufficient tests to assure conformance of all material furnished for use under this Section.
- B. Verification testing of material may be performed by an independent testing laboratory paid for by the OWNER.

### **PART II -PRODUCTS**

#### **2.1 PIPE MATERIALS**

- A. High Density Polyethylene (HDPE)

#### **2.2 BEDDING MATERIAL**

- A. Sand Bedding:

Free of frost, muck, peat, soft clay, trash, objectionable organic matter; waste concrete, rocks, or clods larger than 3 inches in greatest dimension, or other deleterious or unstable material; graded as follows:

<u>SIEVE SIZE</u>	<u>WEIGHT PASSING</u>
3"	100
No.4	70-100
No. 200	0-15

## **SECTION 332724-STORM DRAINAGE PIPE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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### **2.3 STORAGE AND HANDLING**

- A. Unload and store pipe according to the manufacturer's recommendations. Avoid compression, damage or deformation to the bell ends of the pipe. Protect the gaskets from excessive exposure to heat, direct sunlight, ozone, oil and grease.
- B. Pipe damaged during transportation, storage and handling will be rejected and replaced with new material meeting the requirements of these specifications.

### **2.4 SOURCE QUALITY CONTROL**

- A. Each length of pipe shall be subject to visual inspection by the ENGINEER prior to installation.

## **PART III -EXECUTION**

### **3.1 PREPARATION**

- A. Excavate trenches in accordance with Section 312300.
- B. All pipe shall be installed by open cut except as provided on the Plans or as authorized by the ENGINEER/PROJECT MANAGER.
- C. Install Bedding material to a depth of at least 6 inches and compact to 95% maximum dry density as defined in Section 312300.

### **3.2 FIELD LAYOUT**

- A. Install offset construction stakes at 50' stations and manholes. Clearly mark offsets on all stakes.
- B. No horizontal or vertical curves in alignment shall be permitted except as authorized by the ENGINEER/PROJECT MANAGER.

### **3.3 INSTALLATION**

- A. Use only the type and size material shown on the Plans.
- B. Pipe laying shall proceed from downstream to upstream with the tongue or spigot ends of pipe pointing in the direction of flow.
- C. Pipe shall be lowered into the trench without disturbing the prepared foundation or trench sides. Do not drop pipe into trenches.
- D. Install pipe and make joints in accordance with the manufacturer's recommendations to prevent damage and provide a watertight seal at each joint.
- E. Should couple joints of pipe vary from true line or grade, they shall be removed and corrected one joint at a time. Lifting or moving coupled pipe to close joints or to correct line and grade will not be permitted.
- F. Verify proper seating of each joint before progressing to the next. Damaged or rejected pipe shall be immediately removed from the site of the work.

## **SECTION 332724-STORM DRAINAGE PIPE**

GOVERNMENT OF THE VIRGIN ISLANDS, BUREAU OF MOTOR VEHICLES

VEHICLE TESTING FACILITY

18-14 FISHFRY DR., ENIGHED CRUZ BAY QUARTER, ST.JOHN, U.S. VIRGIN ISLANDS

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G. Pipe shall be cleaned and maintained free of dirt and debris as installation progresses.

H. Before leaving the work, the open ends of all pipelines shall be securely closed with a tight-fitting plug or closure.

I. Make suitable caps or plugs in all branch stubs before backfilling.

### **3.4 BACKFILL**

A. Corrugated Metal Pipe: Haunching (Bedding material) need extend to only 15% of the external height.

**END OF SECTION**