

# **Burlington Public Works**

## **Fletcher Free Library** **Fire Alarm Upgrades**

**Issued for Bidding – Fletcher Free Library Only**  
**March 21, 2014**

***OWNER:***

Burlington Public Works  
645 Pine Street  
Burlington, VT 05401

***ENGINEER:***

L.N. Consulting, Inc.  
69 Union Street  
Winooski, VT 05404  
Phone (802) 655-1753  
Facsimile (802) 655-7628

SECTION 00010  
TABLE OF CONTENTS

DIVISION 0 – CONTRACT INFORMATION

00001	PROJECT TITLE PAGE
00010	TABLE OF CONTENTS
00300	BID FORM
00500	AGREEMENT FORM
00600	BONDS AND CERTIFICATES
00700	GENERAL CONDITIONS
00800	SUPPLEMENTARY CONDITIONS

DIVISION 1 – GENERAL REQUIREMENTS

01100	SUMMARY
-------	---------

DIVISION 16 – ELECTRICAL

16050	ELECTRICAL GENERAL PROVISIONS
16060	GROUNDING AND BONDING
16071	SEISMIC CONTROLS FOR ELECTRICAL WORK
16075	ELECTRICAL IDENTIFICATION
16080	ELECTRICAL TESTING
16120	CONDUCTORS AND CABLES
16130	RACEWAYS AND BOXES
16851	FIRE ALARM SYSTEM

SECTION 00300 - BID PROPOSAL FORM – ELECTRICAL CONTRACTOR

**Date:** 03/21/2014

**Project Name: Burlington Public Works – Fletcher Free Library Fire Alarm Upgrades Project**  
**Attn: Martha Keenan**

**Bid Description: For Fletcher Free Library Only**

The electrical contractor shall be the prime contractor for the project and shall provide all electrical and fire alarm work required to complete the project within their bid price.

**The ELECTRICAL CONTRACTOR shall provide a performance bond for the entire project value. This cost shall be submitted separately from the project bid price.**

Any fire alarm or electrical system shut downs shall be performed during unoccupied hours or coordinated with CIP Manager and Department head. Any and all work that takes place within occupied areas of the building shall be coordinated with the CIP Manager. The work shall be performed during occupied or unoccupied hours as required to meet the project schedule. Construction at Fletcher Library may begin immediately.

The mechanical contractor shall provide the following with the submitted bid from:

1. A detailed break-out of the submitted bid price.
2. A list of all items included within the bid price.
3. A list of all exclusions within the bid price.
4. Schedule for submittal completion.
5. Schedule for project completion.
6. Unit price to add or remove a magnetic door hold device, 50ft of circuit extension, and fire alarm system tie.

**Schedule of Values:**

The electrical contractor shall provide a schedule of values for the project which shall be submitted with this bid form. This shall provide a break-out of materials and labor for electrical work for the project.

**Walk Through Date:**

An onsite walkthrough will be conducted **Wednesday, March 27, 2014, 3:00 pm**. Please meet at the main entrance. Attendance is recommended.

**Bid Due Date:**

All contract bid proposals must be received by the Public Works Department and LN Consulting, Inc, no later than 1:00PM on **Thursday, April 4, 2014**. Bid documents can be received by email (PDF) or a sealed envelope. Sealed envelopes to be mailed or dropped off to:

**To: Attn: Martha Keenan  
645 Pine Street  
mkeenan@burlingtonvt.gov**

**Attn: Aaron Welch  
LN Consulting, Inc.  
69 Union Street  
Winooski, Vermont 05404  
Email: awelch@lnconsulting.com**

The Undersigned has visited the project site and examined the Bidding and Contract Documents including all Addenda issued before the bid opening for the proposed work. The Undersigned proposes to furnish all materials and supplies and to provide the equipment described above and outlined on the contract documents, for the Bid Lump Sum of:

**Project Lump Sum Bid (less performance bond)**

(words) \_\_\_\_\_

(figures) \_\_\_\_\_

**Cost for obtaining Performance Bond**

(words) \_\_\_\_\_

(figures) \_\_\_\_\_

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

Please attach document indicating all inclusions and exclusions.

The Undersigned attests that the stipulated Bid Lump Sums written above includes their proper share of profit, overhead, insurance, the cost of any appropriate Allowances specified, and any other applicable fees and are not subject to escalator or other hidden charges.

The Undersigned agrees to accept adjustments in the stipulated Bid Lump Sums written above if awarded

the Contract, according to the Owner's choice of Alternates for the Project.

In submitting this proposal, the Undersigned agrees that the Bid will not be withdrawn for a period of 60 consecutive calendar days following the date of Bid Opening; further, that if a Notice to Proceed or if a prepared Agreement provided by the Owner is received at the business address identified below within the above named period, the Undersigned will, within 5 days of such receipt, acknowledge acceptance of the contract award and will execute and deliver the Agreement, the Performance, Labor and Materials Payment Bonds, the Certificates of Insurance and will proceed in accordance with requirements of the Contract Documents for this project.

The Undersigned agrees, if awarded the Contract, to submit shop drawings 60 days or more before the scheduled start of construction after execution of the Contract and only if the schedule of values is accepted by Burlington Public Works Department.

The Undersigned agrees to deliver the equipment on site no later than 40 business days from approval of shop drawings.

Signed, this \_\_\_\_\_ day of \_\_\_\_\_, 2014

Firm: \_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

By: \_\_\_\_\_

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

**END OF SECTION 00300**

SECTION 00500  
AGREEMENT FORM

Refer to Section 00800, Supplemental Conditions, for sample city agreement form.

END OF SECTION 00500

SECTION 00600  
BONDS & CERTIFICATES

Refer to attached performance bond document on next page.

END OF SECTION 00600

**PERFORMANCE BOND**

KNOW ALL PEOPLE BY THESE PRESENTS THAT:

\_\_\_\_\_ (Name of Contractor)

\_\_\_\_\_ (Address of Contractor)

a \_\_\_\_\_, hereinafter called Principal,  
(Corporation, Partnership or Individual)

and \_\_\_\_\_ (Name of Surety)

\_\_\_\_\_ (Address of Surety)

hereinafter called Surety, are held and firmly bound unto

\_\_\_\_\_ City of Burlington \_\_\_\_\_  
(Name of Owner)

\_\_\_\_\_ 645 Pine Street, Burlington, Vermont 05401 \_\_\_\_\_  
(Address of Owner)

hereinafter called OWNER, in the penal sum of \_\_\_\_\_ Dollars  
\$(\_\_\_\_\_) in lawful money of the United States, for the payment of which sum well  
and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these  
presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain  
contract with the OWNER, dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, a copy of  
which is hereto attached and made part hereof for the construction of:

\_\_\_\_\_

NOW, THEREFORE, if the principal shall well, truly and faithfully perform its duties, all the  
undertakings, covenants, terms, conditions and agreements of said contract during the original term  
thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the  
Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred  
under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages  
which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay  
and expense which the OWNER may incur in making good any default, then this obligation shall be void;  
otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contact or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in \_\_\_\_\_ counterparts, each one of which shall be deemed an original, this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

ATTEST:

\_\_\_\_\_  
(Principal Secretary)  
  
(Seal)

\_\_\_\_\_  
Principal  
By: \_\_\_\_\_ (s)  
Address: \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Witness as to Principal  
\_\_\_\_\_  
Address  
\_\_\_\_\_

\_\_\_\_\_  
Surety

ATTEST:

\_\_\_\_\_  
Witness as to Surety  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
Address

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

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Departments most current list (Circular 570) as amended and be authorized to transact business in the State where the PROJECT is located.

SECTION 00700  
GENERAL CONDITIONS OF THE CONTRACT

AIA Document A201 General Conditions of the Contract for Construction, latest approved edition, is not bound within this Project Manual but is a part of the Contract Documents.

END OF SECTION 00700

SECTION 00800  
SUPPLEMENTARY CONDITIONS

**PART 1 - GENERAL**

Information contained in the Supplementary Conditions amends, supplements or clarifies the "General Conditions of the Contract for Construction" AIA Document A201, latest Edition.

In cases of conflict between the General Conditions and this Supplementary Conditions, wording of this Section shall govern.

Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

**BURLINGTON STANDARD CONTRACT CONDITIONS**

Wherever used, abbreviations may be used in place of a word or phrase and definitions may be used to interpret statements for the meaning of words phrases or expressions. The intent and meaning for abbreviations and definitions shall be interpreted as herein set forth:

AASHTO	American Association of State Highway and Transportation Officials
AGC	Associated General Contractors of America
AIA	American Institute of Architects
ANR	Agency of Natural Resources
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
AWS	American Welding Society
AWWA	American Water Works Association
CADD	Computer Aided Drafting and Design
CES	Contractor Engineering Services
CFR	Code of Federal Regulations
DOT	United States Department of Transportation
EEO	Equal Employment Opportunity
EIS	Environmental Impact Statement
EDM	Electronic Data Media
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FHWA	Federal Highway Administration, U.S. Department of Transportation
FRA	Federal Railroad Administration
FSS	Federal Specifications and Standards (General Services Administration)

FTA	Federal Transit Administration
IBC	International Building Code
IPC	International Plumbing Code
NEC	National Electrical Code
NFPA	National Fire Protection Association
SIR	Self Insured Retention
USC	United States Code
USEPA	United States Environmental Protection Agency
VAOT	Vermont Agency of Transportation
VOSHA	Vermont Occupational Safety and Health Act
VSA	Vermont Statutes Annotated
WEF	Water Environment Association

1. **INDEMNIFICATION:**

The CONTRACTOR will act in an independent capacity and not as officers or employees of the CITY. The CONTRACTOR shall indemnify, defend and hold harmless the CITY and its officers and employees from liability and any claims, suits, expenses, losses, judgments, and damages arising as a result of the CONTRACTOR's negligent acts and/or omissions in the performance of this contract.

2. **RELATIONSHIP:**

The parties agree that the CONTRACTOR is an independent CONTRACTOR. To that end, the CONTRACTOR shall determine the method, details, and means of performing the work, but will comply with all legal requirements in doing so. City shall provide the CONTRACTOR with no specific instructions or training in how to provide the required services, except to the extent required by law or regulation. The CONTRACTOR shall provide its own tools, materials or equipment. The parties agree that neither the CONTRACTOR nor its Principal is an employee of City or any of its departments, agencies, or related entities. The parties also agree that neither the CONTRACTOR nor its Principal is entitled to any employee benefits from City. CONTRACTOR understands and agrees that it and its Principal have no right to claim any benefits under the Burlington Employee Retirement System, City's worker's compensation benefits, health insurance, dental insurance, life insurance or any other employee benefit plan offered by City. The CONTRACTOR agrees to execute any certifications or other documents and provide any certificates of insurance required by City and understands that this contract is conditioned on its doing so, if requested.

The CONTRACTOR understands and agrees that it is responsible for the payment of all taxes on the above sums and that City will not withhold or pay for Social Security, Medicare, or other taxes or benefits or be responsible for any unemployment benefits.

3. **INSURANCE:**

Prior to beginning any work the CONTRACTOR shall obtain the following insurance coverage from an

insurance company registered and licensed to do business in the State of Vermont and having an A.M. Best insurance rating of at least A-, financial size category VII or greater (www.ambest.com). The certificate of insurance coverage shall be documented on forms acceptable to the CITY. Evidence of compliance with minimum limits and coverages, evidenced by a certificate of insurance showing policies and carriers that are acceptable to the CITY, must be received prior to the effective date of the Agreement.

The insurance policies shall provide that insurance coverage cannot be canceled or revised without thirty (30) days prior notice to the CITY. In the event that this Contract extends to greater than one year, evidence of continuing coverage must be submitted to the CITY on an annual basis. Certified copies of any insurance policies may be required. Each policy (with the exception of professional liability and workers compensation) shall name the CITY as an additional insured for the possible liabilities resulting from the CONTRACTOR's actions or omissions. It is agreed that the liability insurance furnished by the CONTRACTOR is primary and non-contributory for all the additional insureds.

The CONTRACTOR is responsible to verify and confirm in writing to the CITY that:

- (a) All SUB-CONTRACTORS, agents or workers meet the minimum coverages and limits plus maintain current certificates of coverage for all SUB-CONTRACTORS, agents or workers. SUB-CONTRACTORS must comply with the same insurance requirements as the CONTRACTOR.
- (b) All coverages shall include adequate protection for activities involving hazardous materials.
- (c) All work activities related to the agreement shall meet minimum coverages and limits.

No warranty is made that the coverages and limits listed herein are adequate to cover and protect the interests of the CONTRACTOR for the CONTRACTOR's operations. These are solely minimums that have been developed and must be met to protect the interests of the CITY.

*GENERAL LIABILITY AND PROPERTY DAMAGE:*

With respect to all operations performed by the CONTRACTOR, SUB-CONTRACTORS, agents or workers, it is the CONTRACTOR's responsibility to insure that general liability insurance coverage, on an occurrence form, provides all major divisions of coverage including, but not limited to and with limits not less than:

- 1.Premises Operations
- 2.Independent Contractors' Protective
- 3.Products and Completed Operations
- 4.Personal Injury Liability
- 5.Contractual Liability
- 6.Broad Form Property Damage
- 7.Medical Expenses

8.Collapse, Underground and Explosion Hazards

1. General Aggregate	\$2,000,000
2. Products-Completed/Operations Aggregate	\$2,000,000
3. Personal & Advertising Injury	\$1,000,000
4. Each Occurrence	\$1,000,000
5. Fire Damage (Any one fire)	\$ 250,000
6. Med. Expense (Any one person)	\$ 5,000

*WORKERS' COMPENSATION:* With respect to all operations performed, the CONTRACTOR shall carry workers compensation insurance in accordance with the laws of the State of Vermont and ensure that all SUB-CONTRACTORS and subcontractors carry the same workers' compensation insurance for all work performed by them under this contract. Minimum limits for Employer's Liability:

- (a) Bodily Injury by Accident: \$500,000 each accident
- (b) Bodily Injury by Disease: \$500,000 policy limit, \$500,000 each employee

*PROFESSIONAL LIABILITY INSURANCE:*

(a)General. The CONTRACTOR shall carry architects/engineers/professional liability insurance covering errors and omissions made during their performance of contractile duties with the following minimum limits:

\$3,000,000 - Annual Aggregate  
\$1,000,000 - Per Occurrence

(b)Deductibles. The CONTRACTOR is responsible for any and all deductibles.

(c)Coverage. Prior to performing any work, the CONTRACTOR agrees to provide evidence of E&O insurance coverage defined under this Section. In addition, the CONTRACTOR agrees to attempt to maintain continuous professional liability coverage for the period of the agreement and whenever applicable any construction work related to this agreement, and for a period of five years following substantial completion, if such coverage is reasonably available at commercially affordable premiums.

*AUTOMOBILE LIABILITY:* The CONTRACTOR shall carry commercial automobile liability insurance

covering all motor vehicles, including owned, non-owned and hired, used in connection with the agreement. Each policy shall provide coverage with a limit not less than: \$1,000,000 - Combined Single Limit for each occurrence.

UMBRELLA LIABILITY:  
\$1,000,000 Each Event Limit  
\$1,000,000 General Aggregate Limit

### **COMPLIANCE WITH LAWS**

#### **1. GENERAL COMPLIANCE WITH LAWS**

The CONTRACTOR shall comply with all applicable Federal, State and local laws, including but not limited to the Burlington Livable Wage Ordinance, the Non-Outsourcing Ordinance and the Union-Deterrence Ordinance and shall provide the required certifications attesting to compliance with these ordinances (see attached ordinances and certifications).

Provisions of the Agreement shall be interpreted and implemented in a manner consistent with each other and using procedures that will achieve the intent of both parties. If, for any reason, a provision in the Agreement is unenforceable or invalid, that provision shall be deemed severed from the Agreement, and the remaining provisions shall be carried out with the same force and effect as if the severed provisions had never been a part of the Agreement.

#### **2. ENVIRONMENTAL REGULATIONS:**

Any Contract in excess of one hundred thousand dollars shall comply with all applicable standards, orders or requirements issued under Section 306 of the Clean Air Act (42 U.S.C. § 1857(h)), Section 508 of the Clean Air Act (33 U.S.C. § 1368), Executive Order 11738, and Environmental Protection Agency regulation (40 CFR Part 15), that prohibit the use, under non-exempt Federal Contracts, grants or loans, of facilities included on the EPA list of Violating Facilities. The provisions require reporting of violations to the grantor, CITY and to the USEPA Assistant Administrator for Enforcement (EN-329).

#### **3. CIVIL RIGHTS and EQUAL EMPLOYMENT OPPORTUNITY**

During performance of the Agreement, the CONTRACTOR will not discriminate against any employee or applicant for employment because of race, age, color, religion, sex, sexual orientation, gender identify, national origin, physical disability or veteran status.

The CONTRACTOR shall comply with the applicable provisions of Title VI of the Civil Rights Act of 1964 as amended, Executive Order 11246 as amended by Executive Order 11375 and as supplemented by the Department of Labor regulations (41 CFR Part 60). The CONTRACTOR shall also comply with the rules, regulations and relevant orders of the Secretary of Labor, Nondiscrimination regulations 49 CFR § 21 through Appendix C, and Regulations under 23 CFR§710.405 (b). Accordingly, all subcontracts shall

include reference to the above. The CONTRACTOR shall comply with all the requirements of Title 21, VSA, Chapter 5, Subchapter 6 and 7, relating to fair employment practices to the extent applicable. A similar provision shall be included in any and all subcontracts.

4. **CHILD SUPPORT PAYMENTS**

By signing the Contract the CONTRACTOR certifies, as of the date of signing the Agreement, that they are (a) not under an obligation to pay child support; or (b) is under such an obligation and is in good standing with respect to that obligation; or (c) has agreed to a payment plan with the Vermont Office of Child Support Services and is in full compliance with that plan. If the CONTRACTOR is a sole proprietorship, the CONTRACTOR's statement applies only to the proprietor. If the CONTRACTOR is a partnership, the CONTRACTOR's statement applies to all general partners with a permanent residence in Vermont. If the CONTRACTOR is a corporation, this provision does not apply.

5. **TAX REQUIREMENTS:** By signing the Agreement, the CONTRACTOR certifies, as required by law under 32 VSA, Section 3113, that under the pains and penalties of perjury, he/she is in good standing with respect to payment, or in full compliance with a plan to pay, any and all taxes due the State of Vermont as of the date of signature on the Agreement.

**CONTRACTUAL AGREEMENTS**

1. **REGISTRATION:** The CONTRACTOR agrees to be registered with the Vermont Secretary of State's office as a corporation doing business in the State of Vermont at all times this contract is effective. This registration must be complete prior to contract execution.
2. **PERSONNEL REQUIREMENTS AND CONDITIONS:** A CONTRACTOR shall employ only qualified personnel, for responsible authority to supervise the work. The CITY shall have the right to approve or disapprove key personnel assigned to administer activities related to the Agreement.

Except with the approval of the CITY, during the life of the Agreement, the CONTRACTOR shall not employ:

(a) Personnel on the payroll of the CITY who are directly involved with the awarding, administration, monitoring, or performance of the Agreement or any project(s) that are the subjects of the Agreement.

(b) Any person so involved within one (1) year of termination of employment with the CITY.

The CONTRACTOR warrants that no company or person has been employed or retained, other than a bonafide employee working solely for the CONTRACTOR, to solicit or secure this Agreement, and that no

company or person has been paid or has an agreement with the CONTRACTOR to be paid, other than a bonafide employee working solely for the CONTRACTOR, any fee, commission, percentage, brokerage fee, gift, or any other consideration, contingent upon or resulting from the award or making of the Agreement. For breach or violation of this warranty, the CITY shall have the right to annul the Agreement, without liability to the CITY, and to regain all costs incurred by the CITY in the performance of the Agreement.

The CITY reserves the right to require removal of any person employed by a CONTRACTOR, from work related to the Agreement, for misconduct, incompetence, or negligence, in the opinion of the CITY in the due and proper performance of its duties, or who neglects or refuses to comply with the requirements of the Agreement.

3. **TRANSFERS, SUBLETTING, ETC:** A CONTRACTOR shall not assign, sublet, or transfer any interest in the work, covered by an Agreement, without prior written consent of the CITY and further, if any SUB-CONTRACTOR participates in any work involving additional services, the estimated extent and cost of the contemplated work must receive prior written consent of the CITY. The approval or consent to assign or sublet any portion of the work, shall in no way relieve the CONTRACTOR of responsibility for the performance of that portion of the work so transferred. The form of the SUB-CONTRACTOR's agreement shall be as developed by the CONTRACTOR and approved by the CITY. The CONTRACTOR shall ensure that insurance coverage exists for any operations to be performed by any SUB-CONTRACTOR as specified in the insurance requirements section of this agreement.

The services of the CONTRACTOR, to be performed under the Agreement, are personal and shall not be transferred without written authorization of the CITY. Any authorized subagreements shall contain all of the same provisions for and attached to the original agreement with the CITY.

4. **CONTINUING OBLIGATIONS:** The CONTRACTOR agrees that if, because of death or other occurrences, it becomes impossible to effectively perform its services in compliance with the Agreement, neither the CONTRACTOR nor its surviving members shall be relieved of their obligations to complete the Agreement. However, the CITY may terminate the Agreement if it considers a death or incapacity of any members to be a loss of such magnitude that it would affect the firm's ability to satisfactorily execute the Agreement.
5. **OWNERSHIP OF THE WORK:** The CONTRACTOR agrees that the ownership of all studies, data sheets, survey notes, subsoil information, drawings, tracings, estimates, specifications, proposals, diagrams, calculations, EDM and other material prepared or collected by the Consultants, hereafter referred to as "instruments of professional service", shall become the property of the CITY as they are prepared and/or developed during execution of the Agreement. The CONTRACTOR agrees to allow access to all "instruments of professional service" at any time. The CONTRACTOR shall not copyright any material originating under the Agreement

without prior written approval of the CITY. No publications or publicity of the work, in part or in total, shall be made without the agreement of the CITY, except that Consultants may in general terms use previously developed instruments of professional service to describe its abilities for a project in promotional materials.

6. **PROPRIETARY RIGHTS:** The parties under the Agreement hereby mutually agree that, if patentable discoveries or inventions should result from work performed under the Agreement, all rights accruing from such discoveries or inventions shall be the sole property of the CONTRACTOR. The CONTRACTOR, however, agrees to and does hereby grant to the CITY, the State of Vermont and the United States Government an irrevocable, nonexclusive, non-transferable, and royalty-free license to practice each invention in the manufacture, use, and disposition, according to law, of any article or material or use of method that may be developed, as a part of the work under the Agreement.

7. **Public Records**

The CONTRACTOR understands that any and all records related to and acquired by the City, whether electronic, paper, or otherwise recorded, are subject to the Vermont Public Records Act and that the determination of how those records must be handled is solely within the purview of City.

8. **Records Retention**

The CONTRACTOR agrees to retain, in its files, and to produce to City within the time periods requested, all books, documents, EDM, accounting records, and other evidence related to City, at any time during this Agreement and for a period of at least three (3) years after its termination. The CONTRACTOR further agrees that the CITY shall have access to all the above information for the purpose of reviewing and audit during the Agreement period and anytime within the aforementioned retention period. Copies of all of the above referenced information shall be provided to the CITY if requested. CONTRACTOR, SUB-CONTRACTORS, or any representatives performing work related to the Agreement, are responsible to insure that all data and information created or stored on EDM is secure and can be duplicated if the EDM mechanism is subjected to power outage or damage.

9. **APPEARANCES:**

- (a) Hearings and Conferences. The CONTRACTOR shall provide professional services required by the CITY and necessary for furtherance of any work covered under the Agreement. Professional services shall include appropriate representation at design conferences, public gatherings and hearings, and appearances before any legislative body, commission, board, or court, to justify, explain and defend its contractual services covered under the Agreement.

The CONTRACTOR shall perform any liaison that the CITY deems necessary for the furtherance of the work and participate in conferences with the CITY, at any reasonable time, concerning interpretation and evaluation of all aspects covered under the Agreement.

The CONTRACTOR further agrees to participate in meetings with the CITY and any other interested or affected participant, for the purpose of review or resolution of any conflicts pertaining to the Agreement.

The CONTRACTOR shall be equitably paid for such services and for any reasonable expenses incurred in relation thereto in accordance with the Contract document.

(b) Appearance as Witness. If and when required by the CITY, a CONTRACTOR, or an appropriate representative, shall prepare and appear for any litigation concerning any relevant project or related Agreement, on behalf of the CITY. The CONTRACTOR shall be equitably paid for such services and for any reasonable expenses incurred in relation thereto, in accordance with the Contract document.

10. **CHANGES AND AMENDMENTS:** No changes or amendments of the Agreement shall be effective unless documented in writing and signed by authorized representatives of the CITY and the CONTRACTOR.
11. **APPENDICES:** The CITY may attach, to these specifications, appendices containing various forms and typical sample sheets for guidance and assistance to the CONTRACTOR in the performance of the work. It is understood, however, that such forms and samples may be modified, altered, and augmented from time to time by the CITY as occasions may require. It is the responsibility of the CONTRACTOR to ensure that they have the latest versions applicable to the Agreement.
12. **EXTENSION OF TIME:** The CONTRACTOR agrees to prosecute the work continuously and diligently and no charges or claims for damages shall be made by the CONTRACTOR for delays or hindrances, from any cause whatsoever, during the progress of any portion of services specified in the Agreement. Such delays or hindrances, if any, may be compensated for by an extension of time for such reasonable period as the CITY may decide. Time extensions shall be granted by amendment, only for excusable delays, such as delays beyond the control of the CONTRACTOR and without the fault or negligence of the CONTRACTOR.
13. **SETTLEMENTS OF MISUNDERSTANDINGS:** In order to prevent misunderstandings and litigation, it is mutually agreed by all parties that the City Council shall act as referee on all questions arising under the terms of an Agreement and that the decision of this governing body in such cases shall be binding upon both parties.

In agreements subjecting costs to final audit, an administrative review regarding the audit will be sent to the CONTRACTOR. Any dispute arising from an administrative decision shall be appealed in writing within thirty (30) days of receipt.

14. **FAILURE TO COMPLY WITH TIME SCHEDULE:** It is mutually understood and

agreed to, that neither party hereto shall be held responsible for delay in performing the work encompassed herein, when such delay is due to unforeseeable causes such as acts of God, or a public enemy, fire, strikes, floods, or legal acts of public authorities. In the event that any such causes for delay are of such magnitude as to prevent the complete performance of the Agreement within two (2) years of the originally scheduled completion date, either party may by written notice request to amend or terminate the Agreement.

15. **CITY'S OPTION TO TERMINATE:** The Agreement may be terminated in accordance with the following provisions, which are not exclusive:

(a)Breach of Contract. Administrative remedies - the CITY reserves the right to terminate a Contract for breach of Contract agreements. Termination for breach of Contract will be without further compensation to the CONTRACTOR.

(b)Termination for Cause. The CITY reserves the right, upon written notice to the CONTRACTOR, to terminate the Agreement, as of a date to be specified by the CITY, if the CONTRACTOR fails to complete the designated work to the satisfaction of the CITY, within the time schedule agreed upon. The CONTRACTOR shall be compensated on the basis of the work performed and accepted by the CITY at the date of final acceptance of the Agreement.

(c)Termination for Convenience. In addition to its rights and options to terminate an Agreement as provided herein, the CITY may, at any time prior to completion of services specified under an Agreement, terminate the Agreement by submitting written notice to a CONTRACTOR, within not less than fifteen (15) days prior to the effective date, via certified or registered mail, of its intention to do so. If the termination is for the CITY's convenience, payment to the CONTRACTOR will be made promptly for the amount of any fees earned to the date of the notice of termination, less any payments previously made. However, if a notice of termination is given to a CONTRACTOR prior to completion of twenty (20) percent of the estimated services, as set forth in the approved Work Schedule and Progress Report, the CONTRACTOR will be reimbursed for that portion of any reasonable and necessary expenses incurred to date of the notice of termination, that are in excess of the amount earned under its approved fee to the date of said termination. Such requests for reimbursement shall be supported with factual data and shall be subject to the CITY's approval. The CONTRACTOR shall make no claim for additional compensation against the CITY by reason of such termination.

16. **ACKNOWLEDGEMENTS**

Acknowledgment of the City of Burlington's support must be included in any and all publications, renderings and project publicity, including audio/visual materials developed under this contract.

**OPERATIONAL STANDARDS**

1. **RESPONSIBILITY FOR SUPERVISION:** The CONTRACTOR shall assume primary

responsibility for general supervision of CONTRACTOR employees and his/her or their subcontractors for all work performed under the Contract and shall be solely responsible for all procedures, methods of analysis, interpretation, conclusions and contents of work performed under the Agreement.

2. **INDEPENDENCE:** The CONTRACTOR shall act in an independent capacity and not as officers or employees of the CITY.
3. **UTILITIES:** Whenever a facility or component of a private, public, or cooperatively-owned utility will be affected by any proposed construction, the CONTRACTOR will counsel with the CITY, plus achieve any necessary contacts and discussions with the affected owners, regarding any requirement necessary for revisions of facilities or existing installations, both above and below ground. Any such installations must be completely and accurately exhibited on any detail sheets or plans. The CONTRACTOR shall inform the CITY, in writing, of any such contacts and the results thereof.
4. **PUBLIC RELATIONS:** Whenever it is necessary to perform work in the field, particularly with respect to reconnaissance, the CONTRACTOR will endeavor to maintain good relations with the public and any affected property owners. Personnel employed by or representing the CONTRACTOR shall conduct themselves with propriety. The CONTRACTOR agrees to inform property owners and/or tenants, in a timely manner, if there is need for entering upon private property as an agent of the CITY, in accordance with VSA Title 19 § 35 and §503, in order to accomplish the work under the Agreement. The CONTRACTOR agrees that any work will be done with minimum damage to the land and disturbance to the owner. Upon request of the CONTRACTOR, the CITY shall furnish a letter of introduction to property owners soliciting their cooperation and explaining that the CONTRACTOR is acting as an agent of the CITY.

5. **INSPECTION OF WORK:**

The CITY shall, at all times, have access to the CONTRACTOR's work for the purposes of inspection, accounting, and auditing, and the CONTRACTOR shall provide whatever access is considered necessary to accomplish such inspections. At any time, the CONTRACTOR shall permit the CITY or representative for the CITY the opportunity to inspect any plans, drawings, estimates, specifications, or other materials prepared or undertaken by the CONTRACTOR pursuant to execution of the Agreement.

Conferences, visits to a site, or an inspection of the work, may be held at the request of any involved party or by representatives of the CITY.

6. **RETURN OF MATERIALS.** CONTRACTOR agrees that at the termination of this Agreement, it shall return to City all materials provided to it during its engagement on behalf of City.

**PROJECT DEVELOPMENT AND STANDARDS**

1. **PLANS RECORDS AND AVAILABLE DATA:**

The CITY agrees to make available, at no charge, for the CONTRACTOR's use all available data related to the Agreement including any preliminary plans, maps, drawings, photographs, reports, traffic data, calculations, EDM, valuable papers, topographic survey, utility location plats, or any other pertinent public records.

2. **DESIGN STANDARDS:** Unless otherwise specifically provided for in the Agreement, or directed in writing, CONTRACTOR services, studies or designs, that include or make reference to plans, specifications, special provisions, computations, estimates, or other data necessary for construction of a designed facility, shall be in conformance with applicable portions of the following specifications, manuals, codes or regulations, including supplements to or revisions thereof, adopted and in effect prior to award of the Agreement:

- (a) The National Fire Protection Association.
- (b) Other CITY directives and guidelines current at the time of the Agreement and as may be issued by the CITY during the progress of the design.

In case of any conflict with the guidelines referenced, the CONTRACTOR is responsible to identify and follow any course of direction provided by the CITY.

The CITY shall establish the termini of the project and may substantiate other conditions relative to locations established in the Agreement. When required under the Agreement, the CONTRACTOR will produce an acceptable survey and/or set of plans between such termini and follow any established provisions.

Endorsement of a recommended alignment made, by the CITY, does not relieve the CONTRACTOR of the responsibility for making changes occasioned as a result of an alignment not conforming to standards or good engineering practices when the design is advanced. Nor is the CONTRACTOR relieved of changes developed by normal refinements.

Changes in work or Supplemental Agreements, requested or required of the CONTRACTOR by the CITY, involving extra work or additional services must be properly documented and approved prior to initiating action of any work.

3. **REVIEWS AND ACCEPTANCES:** All preliminary and detailed designs, plans, specifications, estimates or other documents prepared by the CONTRACTOR, shall be subject to review and endorsement by the CITY.

Approval for any inspections or sequences of progress of work shall be documented by letters, memoranda

or other appropriate written means.

A frequency for formal reviews shall be set forth in the Agreement. Informal reviews, conducted by the CITY will be performed as deemed necessary. The CONTRACTOR shall respond to all official comments regardless of their source. The CONTRACTOR shall supply the CITY with written copies of all correspondence relating to formal and informal reviews.

No acceptance shall relieve a CONTRACTOR of their professional obligation to correct any defects or errors in their work at their own expense.

**4. BINDING NATURE AND JURISDICTION**

This agreement shall be binding upon and shall inure to the benefit of the parties hereto, their successors or heirs and representatives, and assigns. This agreement shall be governed by Vermont law, and the CONTRACTOR expressly agrees to submit to the jurisdiction of the courts of the State of Vermont.

**PAYMENT FOR SERVICES RENDERED:**

- PAYMENT PROCEDURES:** The CITY shall pay, or cause to be paid to the CONTRACTOR or the CONTRACTOR's legal representative, payments in accordance with the Agreement. When applicable, for the type of payment specified in the Agreement, the progress report shall summarize actual costs and any earned portion of fixed fee.

All invoices and correspondence shall indicate the applicable project name, project number and the Agreement number. When relevant, the invoice shall further be broken down in detail between projects.

When applicable, for the type of payment specified in the Agreement, expenses for meals and travel shall be limited to the current approved in-state rates, as determined by the State of Vermont's labor contract, and need not be receipted. All other expenses are subject to approval by the CITY and must be accompanied with documentation to substantiate their charges.

No approval given or payment made under an Agreement, shall be conclusive evidence of the performance of said Agreement, either wholly or in part thereof, and no payment shall be construed to be acceptance of defective work or improper materials.

The CITY agrees to pay the CONTRACTOR and the CONTRACTOR agrees to accept, as full compensation, for performance of all services rendered and expenses encompassed in conformance therewith, the type of fee specified in the Agreement.

Upon completion of all services covered under the Agreement and payment of the agreed upon fee, the Agreement with its mutual obligations shall be terminated.

2. **PAYMENT FOR ADDITIONS OR DELETIONS:** The CITY may, upon written notice, and without invalidating the Agreement, require any changes to, additions to, or deletions from, the originally contemplated extent of the work, prior to completion of the Agreement by means of an amendment to the original Agreement. Any adjustments of this nature shall be executed under the appropriate fee established in the Agreement, based on the adjusted quantity of work, except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such addition or deletion.
  
3. **PAYMENT FOR EXTRA WORK, ADDITIONAL SERVICES OR CHANGES:** The CITY may, upon written notice, and without invalidating the Agreement, require changes resulting from revision or abandonment of work already performed by the CONTRACTOR or changes in the scope of work.

The value of such changes, to the extent not reflected in other payments to the CONTRACTOR, shall be incorporated in an amendment and be determined by mutual agreement, by one or more of the following:

- (a) Fixed Price. By a price that is not subject to any adjustment on the basis of the CONTRACTOR's expenses experienced in performing the work. The CONTRACTOR is fully responsible for all costs and resulting profit or loss.
  
- (b) Rate Schedule. By unit prices designated in the Agreement, or by unit prices covered under any subsequent Agreements.
  
- (c) Actual Cost. By amounts determined on the basis of actual costs incurred, as distinguished from forecasted expenditures.

No changes, for which additional fee payment is claimed, shall be made unless pursuant to a written order from the CITY, and no claim shall be valid unless so ordered.

The CONTRACTOR agrees to maintain complete and accurate records, in a form satisfactory to the CITY for all time devoted directly to same by CONTRACTOR employees. The CITY reserves the right to audit the records of the CONTRACTOR related to any extra work or additional services. Any such services rendered shall be subject, in all other respects, to the terms of the Agreement. When changes are so ordered, no additional work shall be performed by the CONTRACTOR until an Agreement amendment has been fully executed, unless written notice to proceed is issued by the CITY. Any claim for extension of time, which may be necessitated as a result of extra work or additional services and changes, shall be given consideration and evaluated insofar as it directly relates to the change.

### **LIVABLE WAGE ORDINANCE**

ARTICLE VI. LIVABLE WAGES – See attached Document at end of this section.

## **OUTSOURCING ORDINANCE**

### ARTICLE VII. OUTSOURCING

#### 21-90 Policy.

It is the policy of the City of Burlington to let service contracts to contractors, subcontractors and vendors who perform work in the United States.

(Ord. of 11-21-05/12-21-05)

#### 21-91 Definitions.

- (a) Contractor or vendor. A person or entity that has a contract with the City of Burlington primarily for the furnishing of services (as opposed to the purchasing of goods), including any subcontractors of such contractor or vendor.
- (b) Government funded project. Any contract for services which involves any city funds and the total amount of the contract is fifty thousand dollars (\$50,000.00) or more. Burlington School Department contracts shall not be considered government funded projects under this article.
- (c) Outsourcing. The assigning or reassigning, directly, or indirectly through subcontracting, of services under a government funded project to workers performing the work outside of the United States.

(Ord. of 11-21-05/12-21-05)

#### 21-92 Implementation.

- (a) No contract for a government funded project shall be let to any contractor, subcontractor, or vendor who is outsourcing, or causing the work to be performed outside of the United States or Canada.
- (b) Prior to the commencement of work on a government funded project a contractor, subcontractor or vendor shall provide written certification that the services provided under the contract will be performed in the United States or Canada.

(Ord. of 11-21-05/12-21-05)

#### 21-93 Exemption.

An exemption from requirements of this article may be authorized by the chief administrative officer based upon a determination that the services to be performed for the government funded project are not available in the United States or Canada at a reasonable cost. Any such exemption decision by the chief administrative officer shall be reported to the board of finance in writing within five (5) days. The board of finance may, if it should vote to do so, override the exemption decision if such vote occurs within fourteen (14) days of the date of the chief administrative officer's communication to such board.

(Ord. of 11-21-05/12-21-05)

21-94 Enforcement.

- (a) Any contractor, subcontractor or vendor who files false or materially misleading information in connection with an application, certification or request for information pursuant to the provisions of this article or outsources work on a government funded project shall be deemed to be in violation of this article.
- (b) A violation of this article shall be a civil offense subject to a civil penalty of from one hundred dollars (\$100.00) to five hundred (\$500.00). All law enforcement officers and any other duly authorized municipal officials are authorized to issue a municipal complaint for a violation of this article. Each day any violation of any provision of this article shall continue shall constitute a separate violation.
- (c) The City of Burlington shall have the right to modify, terminate and or seek specific performance of any contract for a government funded project if the contractor, subcontractor or vendor has not complied with this article.

(Ord. of 11-21-05/12-21-05)

21-95—21-99 Reserved.

**COMPLIANCE WITH LIVABLE WAGE & NON-OUTSOURCING ORDINANCES:** The Contractor shall comply with the Burlington Livable Wage Ordinance and the Non-outsourcing Ordinance and shall provide the required certifications attesting to compliance with these ordinances (see attached ordinances and certifications).

Certification of Compliance with the City of Burlington's Livable Wage Ordinance

I, \_\_\_\_\_, on behalf of \_\_\_\_\_ (Contractor) and in connection with \_\_\_\_\_ (City contract/project/grant), hereby certify under oath that (1) Contractor shall comply with the City of Burlington's Livable Wage Ordinance; (2) as a condition of entering into this contract or grant, Contractor confirms that all covered employees, as defined by Burlington's Livable Wage Ordinance, shall be paid a livable wage for the term of the contract as determined and adjusted annually by the City of Burlington's Chief Administrative Officer, (3) a notice regarding the applicability of the Livable Wage Ordinance shall be posted in the workplace or other location where covered employees work, and (4) payroll records or other documentation, as deemed necessary by the Chief Administrative Officer, shall be provided within ten (10) business days from receipt of the City's request.

Dated at \_\_\_\_\_, Vermont this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

By: \_\_\_\_\_  
Duly Authorized Agent

Subscribed and sworn to before me: \_\_\_\_\_  
Notary

Certification of Compliance with the City of Burlington's Outsourcing Ordinance

I, \_\_\_\_\_, on behalf of \_\_\_\_\_ (Contractor) and in connection with \_\_\_\_\_ (City contract/project/grant), hereby certify under oath that (1) Contractor shall comply with the City of Burlington's Outsourcing Ordinance (Ordinance §§ 21-90 – 21-93); (2) as a condition of entering into this contract or grant, Contractor confirms that the services provided under the above-referenced contract will be performed in the United States or Canada. Dated at \_\_\_\_\_, Vermont this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

By: \_\_\_\_\_  
Duly Authorized Agent

Subscribed and sworn to before me: \_\_\_\_\_  
Notary

## **UNION DETERRENCE ORDINANCE**

### ARTICLE VIII. UNION DETERRENCE

#### 21-100 Policy.

It is the policy of the City of Burlington to limit letting contracts to organizations that provide union deterrence services to other companies.

(Ord. of 3-27-06/4-26-06)

#### 21-101 Definitions.

(a) Contractor or vendor. A person or entity that has a contract with the City of Burlington primarily for the furnishing of services (as opposed to the purchasing of goods), including any subcontractors of such contractor or vendor.

(b) Government funded project. Any contract for services which involves any City funds and the total amount of the contract is fifteen thousand dollars (\$15,000.00) or more. Burlington School Department contracts shall not be considered government funded projects under this article.

(c) Union deterrence services. Services provided by a contractor, subcontractor or vendor that are not restricted to advice concerning what activities by an employer are prohibited and permitted by applicable laws and regulations, but extend beyond such legal advice to encouraging an employer to do any of the following:

- 1) Hold captive audience, (i.e., mandatory) meetings with employees encouraging employees to vote against the union;
- 2) Have supervisors force workers to meet individually with them to discuss the union;
- 3) Imply to employees, whether through written or oral communication, that their employer may have to shut down or lay people off if the union wins the election;
- 4) Discipline or fire workers for union activity;
- 5) Train managers on how to dissuade employees from supporting the union.

(d) Substantial portion of income. For the purposes of this article, substantial portion of income shall mean greater than ten (10) percent of annual gross revenues or one hundred thousand dollars (\$100,000.00), whichever is less.

(Ord. of 3-27-06/4-26-06)

#### 21-102 Implementation.

(a) No contract for a government funded project shall be let to any contractor, subcontractor, or vendor who

- 1) Advises or has advised an employer to conduct any illegal activity in its dealings with a union.
- 2) Advertises union deterrence services as specialty services;

3) Earns a substantial portion of its income by providing union deterrence services to other companies in order to defeat union organizing efforts.

(b) Prior to the commencement of work on a government funded project a contractor, subcontractor or vendor shall provide written certification that it has not advised the conduct of any illegal activity, it does not currently, nor will it over the life of the contract provide union deterrence services in violation of this article.

(Ord. of 3-27-06/4-26-06)

21-103 Enforcement.

(a) Any contractor, subcontractor or vendor who files false or materially misleading information in connection with an application, certification or request for information pursuant to the provisions of this article or provided union deterrence services during the life of a contract for a government funded project shall be deemed to be in violation of this article.

(b) The City of Burlington shall have the right to modify, terminate and or seek specific performance of any contract for a government funded project if the contractor, subcontractor or vendor has not complied with this article.

(Ord. of 3-27-06/4-26-06)

21-104—21-110 Reserved.

Certification of Compliance with the City of Burlington's Union Deterrence Ordinance

I, \_\_\_\_\_, on behalf of \_\_\_\_\_ (Contractor) and in connection with \_\_\_\_\_ (City contract/project/grant), hereby certify under oath that \_\_\_\_\_ (Contractor) has not advised an employer to conduct any illegal activity in its dealings with a union, and it does not currently, nor will it over the life of the contract advertise or provide union deterrence services in violation of the City's union deterrence ordinance.

Dated at \_\_\_\_\_, Vermont this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

By: \_\_\_\_\_  
Duly Authorized Agent

Subscribed and sworn to before me: \_\_\_\_\_  
Notary

**SAMPLE AGREEMENT**

AGREEMENT FOR CONSTRUCTION SERVICES  
BY AND BETWEEN THE  
CITY OF BURLINGTON, VERMONT  
AND  
XXX.

THIS AGREEMENT is made this \_\_\_\_\_ day of \_\_\_\_\_, 2013, by and between the City of Burlington, Vermont, acting herein by and through its Department of Public Works, hereinafter called the "City," and XXX with offices at XXX, hereinafter called the "Contractor."

WHEREAS, the City intends to make improvements to XXX; and

WHEREAS, Contractor has demonstrated experience installing XXX; and

WHEREAS, Contractor has submitted a scope of work for Contractor services to be performed for a not-to-exceed fee inclusive of reimbursable expenses; and

WHEREAS, the City desires to contract with Contractor for these services;

NOW, THEREFORE, in consideration of the promises and covenants hereinafter contained, the engagement of Contractor by City, and other good and valuable consideration, the receipt of which is hereby acknowledged, Contractor and City agree and covenant as follows:

1. Services and Scope of Work. City agrees to engage Contractor for the services set forth in the scope of work set forth below, and Contractor accepts and agrees to such engagement.

Scope of work. Contractor shall include, but not be limited to, the following:

- XXX

Contractor further accepts and agrees to perform such work in compliance with the provisions in the following attachments, all of which are incorporated herein and made a part of this Agreement:

- a. Attachment A ("Standard Contract Provisions")
- b. Attachment B (Livable Wage Ordinance)
- c. Attachment C (Outsourcing Ordinance)
- d. Attachment D (Union Deterrence Ordinance).

Contractor shall be responsible for providing professional services, assistance in the construction bid process, and construction review and project closeout as further set forth in the scope of work below as an

independent contractor and professional Contractor in its relationship with the City and in accordance with the terms and conditions of this contract.

2.Payment. City shall pay Contractor for services and expenses a not to exceed fee of \$XXX, payable as follows:

- Services will be invoiced on or about the first of each month;
- Payment will be made within 30 days;
- The hourly rate for services shall be included in the invoice;
- Reimbursable expenses will be billed at cost. Reimbursable expenses include large format printing, photocopying, and mileage;

3.Term. The term of Contractor's engagement under this Agreement shall commence upon execution of this agreement and shall continue until \_\_\_\_\_ unless sooner terminated by:

- a. written agreement of the parties;
- b. the death or inability to perform due to disability of Contractor; or

c.either party for cause, consisting of incompetence, misconduct, illegal conduct, or breach of this Agreement.

4. Direction. For purposes of this engagement, Steve Roy, Burlington Public Works engineer, shall be the point of contact and City's representative with Contractor. The parties agree that City does not have the right to control how Contractor performs the services under this Agreement.

5. Subcontractors:

- a) The Parties agree that the following sub-contractors will perform services under this AGREEMENT: XXX. Additional sub-consultants may be added in accordance with the terms of this agreement.
- b) The subcontractor's compensated involvement in THE PROJECT shall be restricted by the hours listed for each task in Attachment \_\_\_\_: Cost Proposal.
- c) Any changes to the extent and cost of subcontractors involvement must receive prior written consent of the CITY.
- d) All subcontractors,, including the ones listed above, are subject to all applicable contract provisions (and are specifically subject to the City's Livable Wage , Outsourcing, Union Deterrence ordinances).

6.Entire Agreement and Amendments. The parties acknowledge that this Agreement is the entire

agreement between the parties and that there are no representations, inducements, arrangements, promises, or agreements outstanding between them, either oral or in writing, other than those. No provision of this Agreement shall be changed or modified except by a written instrument executed by both parties hereto.

7.Waiver. No waiver by City of any breach of this Agreement by Contractor shall constitute a waiver of any subsequent breach by Contractor, and no delay in enforcement of any breach shall be deemed a waiver of that breach.

8.Severability. If any provision of this Agreement is rendered invalid or unenforceable by the decision of any court of competent jurisdiction, that provision shall be severed, and all other provisions of this Agreement shall remain in full force and effect.

9.Binding Nature and Jurisdiction. This agreement shall be binding upon and shall inure to the benefit of the parties hereto, their successors or heirs and representatives, and assigns. This agreement shall be governed by Vermont law, and Contractor expressly agrees to submit to the jurisdiction of the courts of the State of Vermont.

IN WITNESS WHEREOF, in Burlington, VT this \_\_\_\_\_ day of \_\_\_\_\_, 2013.

CITY OF BURLINGTON  
By

XXX  
By

Chapin Spencer  
Director of Public Works

XXX  
Title

END OF SECTION 00800

# CITY OF BURLINGTON

10.

revised version

In the Year Two Thousand Thirteen

ORDINANCE  
Sponsor: Councilors Mason,  
Bushor, Paul: Ordinance Com.  
Public Hearing Dates \_\_\_\_\_

First reading: 09/23/13  
Referred to: Ordinance Committee  
Rules suspended and placed in all  
stages of passage: \_\_\_\_\_  
Second reading: 10/21/13  
Action: adopted  
Date: 10/21/13  
Signed by Mayor: 10/30/13  
Published: 11/06/13  
Effective: 11/27/13

## An Ordinance in Relation to

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages

**It is hereby Ordained** by the City Council of the City of Burlington, as follows:

That Chapter 21, Offenses and Miscellaneous Provisions, of the Code of Ordinances of the City of Burlington be and hereby is amended by amending Sections 21-80 through 21-87 thereof and adding new Sections 21-88 and 21-89 thereto to read as follows:

### **Sec. 21-80. - Findings and purpose.**

In enacting this article, the city council states the following findings and purposes:

- (a) Income from full-time work should be sufficient to meet an individual's basic needs;
- (b) The City of Burlington is committed to ensuring that its ~~year-round~~ employees (~~full and part time~~) have an opportunity for a decent quality of life and are compensated, and such that they are not dependent on public assistance, to meet their basic needs;
- (c) ~~The city~~ City of Burlington is committed, through its contracts with vendors and provision of financial assistance, to encourage the private sector to pay its employees a livable wage and contribute to employee health care benefits;
- (d) The creation of jobs that pay livable wages promotes the prosperity and general welfare of the ~~city~~ City of Burlington and its residents, increases consumer spending with local businesses, improves the economic welfare and security of affected employees and reduces expenditures for public assistance;
- (e) It is the intention of the city council in passing this article to provide a minimum level of compensation for ~~city~~ employees of the City of Burlington and employees of entities that enter into service contracts or receive financial assistance from the City of Burlington.

**Sec. 21-81. - Definitions.**

As used in this article, the following terms shall be defined as follows:

a) Contractor or vendor is a person or entity that has a service contract with the City of Burlington primarily for the furnishing of services (as opposed to the purchasing of goods) ~~where Burlington where~~ the total amount of the service contract or service contracts exceeds fifteen thousand dollars (\$15,000.00) for any twelve-month period, including any subcontractors of such contractor or vendor. ~~A person or entity that has a contract with the City of Burlington for the use of property under the jurisdiction of the board of airport commissioners, or any person or entity that has a sublease or other agreement to perform services on such property, shall also be considered a contractor under this article.~~

(b) Grantee is a person or entity that is the recipient of financial assistance from the City of Burlington in the form of grants ~~administered by the city~~, including any contractors or ~~subcontractor~~ grantees of the grantee, that exceeds fifteen thousand dollars (\$15,000.00) for any twelve-month period.

(c) Covered employer means the City of Burlington ~~(except that the Burlington School Department shall not be considered a covered employer)~~, a contractor or vendor or a grantee as defined above. The primary contractor, vendor, or grantee shall be responsible for the compliance of each of its subcontractors (or of each subgrantee) that is a covered employer.

(d) Covered employee means an "employee" as defined below, who is employed by a "covered employer," subject to the following:

(1) An employee who is employed by a contractor or vendor is a "covered employee" during the period of time he or she expends on furnishing services under a service contract with the City of Burlington funded by the city, notwithstanding that the employee may be a temporary or seasonal employee;

(2) An employee who is employed by a grantee who expends at least half of his or her time on activities funded by the ~~city~~ City of Burlington is a "covered employee."

(e) Designated accountability monitor shall mean a nonprofit corporation which has established and maintains valid nonprofit status under Section 501(c)(3) of the United States Internal Revenue Code of 1986, as amended, and that is independent of the parties it is monitoring.

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages

(ef) Employee means a person who is employed on a full-time or part-time regular basis ~~(i.e., nonseasonal)~~. In addition, commencing with the next fiscal year, a seasonal or temporary employee of the City of Burlington who works ten (10) or more hours per week and has been employed by the City of Burlington for a period of four years shall be considered a covered employee commencing in the fifth year of employment. "Employee" shall not refer to volunteers working without pay or for a nominal stipend, persons working in an approved apprenticeship program, persons who are hired for a prescribed period of six months or less to fulfill the requirements to obtain a professional license as an attorney, persons who are hired through youth employment programs or student workers or interns participating in established educational internship programs.

(fg) Employer-assisted health care means health care benefits provided by employers for employees (or employees and their dependents) at the employer's cost or at an employer contribution towards the purchase of such health care benefits, provided that the employer cost or contribution consists of at least one dollar and twenty cents (\$1.20) per hour. (Said amount shall be adjusted every two (2) years for inflation, by the chief administrative officer of the city.)

(gh) Livable wage has the meaning set forth in section 21-82.

(i) Retaliation shall mean the denial of any right guaranteed under this article, and any threat, discipline, discharge, demotion, suspension, reduction of hours, or any other adverse action against an employee for exercising any right guaranteed under this article. Retaliation shall also include coercion, intimidation, threat, harassment, or interference in any manner with any investigation, proceeding, or hearing under this article.

(j) Service contract means a contract primarily for the furnishing of services to the City of Burlington (as opposed to the purchasing or leasing of goods or property) A contract involving the furnishing of financial products, insurance products, ~~and or~~ software, even if that contract also includes some support or other services related to the provision of the products, shall not be considered a service contract.

**Sec. 21-82. - Livable wages required.**

(a) Every covered employer shall pay each and every covered employee at least a livable wage ("Livable Wage") ~~as established under this article no less than:~~

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages

(1) For a covered employer that provides employer assisted health care, the livable wage shall be at least ~~nine dollars and ninety cents~~ thirteen dollars and ninety four cents (~~\$13.949.90~~) per hour on the effective date of the amendments to this article [Dec. 19, 2001].

(2) For a covered employer that does not provide employer assisted health care, the livable wage shall be at least ~~eleven dollars and sixty eight cents~~ fifteen dollars and eighty three cents (~~\$15.8344.68~~) per hour on the effective date of the amendments to this article [Dec. 19, 2001].

(3) ~~Tipped covered employees and other ee~~ Covered employees whose wage compensation consists of more or other than hourly wages, including, but not limited to, tips, commissions, flat fees or bonuses, shall be paid so that the total of all wage an hourly wage which, when combined with the other compensation, will at least equal the Livable wWage as established under this article.

(b) The amount of the Livable wWage established in this section shall be adjusted by the chief administrative officer of the city, as of July 1st~~first~~ of each year based upon a report of the Joint Fiscal Office of the State of Vermont that describes the basic needs budget for a single person but utilizes a model of two (2) adults residing in a two-bedroom living unit in an urban area with the moderate cost food plan. Should there be no such report from the joint fiscal office, the chief administrative officer shall obtain and utilize a basic needs budget that applies a similar methodology. The livable wage rates derived from utilizing a model of two (2) adults residing in a two-bedroom living unit in an urban area with a moderate cost food plan shall not become effective until rates meet or exceed the 2010 posted livable wage rates. Prior to the first day of May preceding any such adjustment and prior to the first day of May of each calendar year thereafter, the chief administrative officer will provide public notice of this adjustment by publishing a notice in a newspaper of general circulation, by posting a written notice in a prominent place in City Hall, by sending written notice to the city council and, in the case of covered employers that have requested individual notice and provided contact information an address of record to the chief administrative officer, by notice written letter to each such covered employer. However, once a Livable Wage is applied to an individual employee, no reduction in that employee's pay rate is permissible due to this annual adjustment.

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages

(c) Covered employers shall provide at least twelve (12) compensated days off per year for full-time covered employees, and a proportionate amount for part-time covered employees, for sick leave, vacation, ~~or personal, or combined time off~~ leave.

**Sec. 21-83. - Applicability.**

(a) This article shall apply to any service contract or grant, as provided by this article that is awarded or entered into after the effective date of the article ~~[Dec. 19, 2001]~~. After the effective date of the article, entering into any agreement or an extension, renewal or amendment of any contract or grant as defined herein shall be subject to compliance with this article.

(b) The requirements of this article shall apply during the term of any service contract subject to the article. Covered employers who receive grants shall comply with this article during the period of time the city's funds awarded by the City of Burlington are being expended by the covered employer.

**Sec. 21-84. - Enforcement.**

(a) ~~The City of Burlington shall require, as a condition of any~~ Each service contract or grant covered by this article section, shall contain provisions requiring that the affected covered employer or grantee submit a written certification, under oath, during each year during the term of the service contract or grant, that the covered employer or grantee (including all of its subcontractors and subgrantees, if any) is in compliance with this article. The failure of a contract to contain such provisions does not excuse a covered employer from its obligations under this ordinance. ~~confirming payment of a livable wage as a condition of entering into said contract or grant.~~ The affected covered employer shall agree to post a notice regarding the applicability of this section in any workplace or other location where employees or other persons contracted for employment are working. The affected covered employer shall agree to provide payroll records or other documentation for itself and any subcontractors or subgrantees, as deemed necessary by the chief administrative officer of the City of Burlington within ten (10) business days from receipt of the City of Burlington ~~city's~~ request.

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages

(b) The chief administrative officer of the City of Burlington may require that a covered employer submit proof of compliance with this article at any time, including but not limited to

(1) verification of an individual employee's compensation.

(2) production of payroll, health insurance enrollment records, or other relevant documentation, or

(3) evidence of proper posting of notice.

If a covered employer is not able to provide that information within ten (10) business days of the request, the chief administrative officer may turn the matter over to the city attorney's office for further enforcement proceedings.

(c) The City of Burlington shall appoint a designated accountability monitor that shall have the authority:

(i) To inform and educate employees of all applicable provisions of this article and other applicable laws, codes, and regulations;

(ii) To create a telephonic and electronic accountability system under this article that shall be available at all times to receive complaints under this article;

(iii) To establish and implement a system for processing employees' complaints under this article, including a system for investigating complaints and determining their legitimacy; and

(iv) To refer credible complaints to the City Attorney's office for potential enforcement action under this article.

The designated accountability monitor shall forward to the City of Burlington all credible complaints of violations within ten (10) days of their receipt.

(ed) Any covered employee who believes his or her covered employer is not complying with this article may file a complaint in writing with the City Attorney's office within one (1) year after the alleged violation. The City Attorney's office shall conduct an investigation of the complaint, during which it may require from the covered employer evidence such as may be required to determine whether the covered employer has been compliant, and shall make a finding of compliance or noncompliance within a reasonable time after receiving the complaint. Prior to ordering any penalty provided in subsections (e), (f), or (g) below, the City Attorney's office shall give notice to the covered employer. The covered employer may request a hearing within thirty (30) days of receipt of such notice. The hearing shall be conducted by a hearing

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages

officer appointed by the City Attorney's office, who shall affirm or reverse the finding or the penalty based upon evidence presented by the City Attorney's office and the covered employer.

(eeb) The City of Burlington shall have the right to modify, terminate and/or seek specific performance of any contract or grant with an affected covered employer from any court of competent jurisdiction, if the affected covered employer has not complied with this article.

(fde) Any covered employer who violates this article may be barred from receiving a contract or grant from the city for a period up to two (2) years from the date of the finding of violation.

(edg) A violation of this article shall be a civil offense subject to a civil penalty of from two hundred dollars (\$200.00) to five hundred dollars (\$500.00). All law enforcement officers and any other duly authorized municipal officials are authorized to issue a municipal complaint for a violation of this article. Each day any covered employee is not compensated as required by this article shall constitute a separate violation.

(h) If a complaint is received that implicates any City of Burlington employee in a possible violation of this ordinance, that complaint will be handled through the City's personnel procedures, not through the process outlined in this ordinance.

(fi-) Any covered employee aggrieved by a violation of this article may bring a civil action in a court of competent jurisdiction against the covered employer within two (2) years after discovery of the alleged violation. The court may award any covered employee who files suit pursuant to this section, as to the relevant period of time, the following:

- (i) The difference between the livable wage required under this article and the amount actually paid to the covered employee;
- (ii) Equitable payment for any compensated days off that were unlawfully denied or were not properly compensated;
- (iii) Liquidated damages in an amount equal to the amount of back wages and/or compensated days off unlawfully withheld or of \$50 for each employee or person whose rights under this article were violated for each day that the violation occurred or continued, whichever is greater;
- (iv) Reinstatement in employment and/or injunctive relief; and
- (v) Reasonable attorneys' fees and costs.

(gj) It shall be unlawful for an employer or any other person to interfere with, restrain, or deny the exercise of, or the attempt to exercise, any right protected under this article. No person

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages

shall engage in retaliation against an employee or threaten to do so because such employee has exercised rights or is planning to exercise rights protected under this article or has cooperated in any investigation conducted pursuant to this article.

**Sec. 21-85. - Other provisions.**

(a) No ~~affected~~ covered employer shall reduce the compensation, wages, fringe benefits or leave available to any covered employee in order to pay the livable wage required by this article. Any action in violation of this paragraph shall be deemed a violation of this article subject to the remedies of section 21-84.

(b) No covered employer with a current contract, as of the effective date of this provision, with the City of Burlington for the use of property located at the Burlington International Airport may reduce, during the term of that contract, the wages of a covered employee below the Livable Wage as a result of amendments to this ordinance.

(~~b~~c) Where pursuant to a contract for services with the city, the contractor or subcontractor incurs a contractual obligation to pay its employees certain wage rates, in no case except as stated in subsection 21-85(~~e~~d), shall the wage rates paid pursuant to that contract be less than the minimum livable wage paid pursuant to this article.

(~~e~~d) Notwithstanding subsection 21-85(~~b~~c), where employees are represented by a bargaining unit or labor union pursuant to rights conferred by state or federal law and a collective bargaining labor agreement is in effect governing the terms and conditions of employment of those employees, this chapter shall not apply to those employees, and the collective bargaining labor agreement shall control.

(~~e~~e) Covered employers shall inform employees making less than twelve dollars (\$12.00) per hour of their possible right to the Earned Income Tax Credit under federal and state law.

(~~e~~f) The chief administrative officer of the city shall have the authority to promulgate rules as necessary to administer the provisions of this article, which shall become effective upon approval by the city council.

OFFENSES AND MISCELLANEOUS PROVISIONS--  
ARTICLE VI - Livable Wages**Sec. 21-86. - Exemptions.**

An partial or complete exemption from the any requirement of this article may be requested for a period not to exceed two (2) years:

- (a) By a covered employer where payment of the livable wage authorized based upon a determination that compliance with the livable wage requirement would cause substantial economic hardship; and
- (b) By the City of Burlington - where application of this article to a particular contract or grant is found to violate specific state or federal statutory, regulatory or constitutional provision or provisions or where granting the exemption would be in the best interests of the City.

A covered employer or grantee granted an exemption under this Section 21-86 may reapply for an exemption upon the expiration of the exemption.

Requests for exemption may be granted by majority vote of the City Council. All requests for exemption shall be submitted to the chief administrative officer. The finance committee board of the city City of Burlington shall first consider such request and make a recommendation to the City Council. The decision of the City Council shall be final. shall consider the request for exemption with prior notice provided to the city council. A unanimous decision by the finance board shall be final. A split decision by the finance board is reviewable by the city council not later than the next meeting of the city council which occurs after the date of the finance board decision.

**Sec. 21-87. - Severability.**

If any part or parts or application of any part of this article is held invalid, such holding shall not affect the validity of the remaining parts of this article.

**Section 21-88. Annual Reporting.**

On or before April 15<sup>th</sup> of each year, the City Attorney's office shall submit a report to the City Council that provides the following information:

An Ordinance in Relation to

(a) a list of all covered employers broken down by department;

(b) a list of all covered employers whose service contract did not contain the language required by this article; and

(c) all complaints filed and investigated by the City Attorney's office and the results of such investigation.

**Sec. 21-89. Effective Date.**

The amendments to this ordinance shall take effect on January 1, 2014, and shall not be retroactively applied.

\* Material stricken out deleted.

\*\* Material underlined added.

ORIGINAL

# AN ORDINANCE

IN RELATION TO

OFFENSES AND MISCELLANEOUS PROVISIONS -- ARTICLE  
VI - Livable Wages

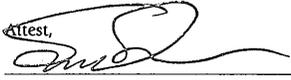
Introduced by

Councilor s Mason, Bushor, Paul: Ordinance  
Committee

Read in City Council first time

September 23, 20 13

Attest,

 , Clerk.

Rules suspended, and ordinance placed in all stages of passage.

\_\_\_\_\_, 20 \_\_\_\_\_

Attest,

\_\_\_\_\_, Clerk.

Read in City Council second time

October 21, 20 13

Attest,

 , Clerk.

Passed in City Council at meeting held

October 21, 20 13

Attest,

 , Clerk.

Approved October 30, 20 13

 , Mayor.

I, ACAO Schrader, City Clerk of the City of Burlington and Clerk of the City Council of said City, do hereby certify that the within written Ordinance has been duly published according to Law and the Charter of the City, and in compliance with said Charter this certificate is hereto attached.

And the within Ordinance was ordered published for Wednesday day, namely the 6th day of November, 20 13.

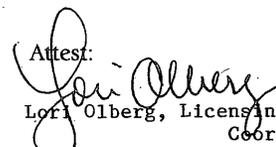
Adopted 10/21/13 Published 11/06/13 Effective 11/27/13  
 A CAO // City Clerk

\* \* \* \* \*

### Distribution

I hereby certify that this Ordinance has been sent to the following department(s) on

ALL DEPTS

Attest:  
  
Lori Olberg, Licensing, Voting & Records Coordinator

\* \* \* \* \*



SECTION 01100  
SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Work covered by the Contract Documents.
  - 2. Type of the Contract.
  - 3. Work phases.
  - 4. Work under other contracts.
  - 5. Products ordered in advance.
  - 6. Owner-furnished products.
  - 7. Use of premises.
  - 8. Owner's occupancy requirements.
  - 9. Work restrictions.
  - 10. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Fire Alarm System Replacement Project
  - 1. Project Locations:
    - a. Memorial Auditorium, Burlington, Vermont
    - b. Fletcher Free Library, Burlington, Vermont
- B. Owner: City of Burlington, Vermont
  - 1. Owner's Representative: Martha Keenan
- C. Engineer: LN Consulting, Inc; c/o John Askew, P.E.
- D. The Work consists of the following:
  - 1. Replacement of the existing fire alarm systems in both locations with a new Mircom FX2000 system, latest version.
  - 2. Electrical system work associated with fire alarm upgrades, including but not limited to the addition of shunt trip and contactor devices on 120/208 volt, three phase, four wire systems.
  - 3. Removal of all existing fire alarm equipment, including all miscellaneous cutting and patching.

4. Work is to occur during summer vacation from June 15<sup>th</sup> to August 20<sup>th</sup>. The building will only be occupied by construction crews during this time.

#### 1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

#### 1.5 OWNER-FURNISHED PRODUCTS

- A. None

#### 1.6 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
  2. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.
- D. Contractors shall follow all state laws regarding non-smoking rules.
- E. Contractors shall use proper decorum while working at the project site. Use of objectionable language, clothing, perishables (i.e., alcohol), etc, shall result in Contractor being asked to leave school grounds immediately. Any work that must be completed in order to resume school functions shall be performed by others at the Contractors expense. It is expected the Contractors shall dress appropriately, with no obscene graphics, baggy pants, etc, that may be offensive to others.

#### 1.7 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will not be occupying building during entire construction period. However, cooperate with Owner during construction operations to minimize conflicts

and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations outside the building. Maintain existing exits, unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than **72** hours' notice to Owner of activities that will affect Owner's operations.

#### 1.8 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 7:00 a.m to 7:00 p.m., Monday through Friday, except otherwise indicated.
1. Weekend Hours: As approved by Owner
  2. Early Morning Hours: As approved by Owner
  3. Hours for Utility Shutdowns: As approved by Owner
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Do not proceed with utility interruptions without Owner's written permission.

#### 1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

## SECTION 16050 - ELECTRICAL GENERAL PROVISIONS

### 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

This Section includes the following:

1. Supporting devices for electrical components.
2. Electrical demolition.
3. Cutting and patching for electrical construction.
4. Touchup painting.

#### 1.3 DEFINITIONS

- A. The use of the word "Provide": Whenever the word "Provide" is used in the specifications and/or on the drawings, it shall mean "furnish and install", "connect", "apply", "erect", "construct", or similar terms, unless otherwise indicated.
- B. The use of the word "Piping": "Piping" shall include but not be limited to, in addition to piping or mains, all fittings, flanges, unions, valves, strainers, drains, traps, insulation, vents, hangers and other accessories relative to such piping.
- C. The use of the word "Material": Whenever the word material is used in the specifications and/or on the drawings, it shall mean any "product", "equipment", "device", "assembly", or "item" required under the contract, as indicated by trade or brand name, manufacturer's name, standard specification reference or other description.
- D. The term "Electrical Contractor" or "Contractor" refer to the Sub Contractor or his Sub Contractors responsible for the furnishing and installation of all work indicated on the Electrical drawings and in the Electrical Specifications.
- E. The term "Accessible" indicates ease of access with or without the use of ladders and without requiring extensive removal of other equipment, such as ductwork, piping, conduit, etc to gain access. "accessible ceiling" indicates acoustical tile type hung ceilings. Concealed spline or sheetrock ceilings with access panes shall not be considered accessible ceilings.

#### 1.4 CODES, STANDARDS, REFERENCES, AND PERMITS

- A. All material and workmanship shall comply with all the latest editions of all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations.
- B. In case of differences between the Building Codes, State Law, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the contractor shall promptly notify the Engineer in writing of any such difference.
- C. In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern for budgetary and bid purposes. However, no work will proceed until the Engineer determines the correct method of installation.
- D. Should the contractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations, the contractor shall bear all costs arising in correcting the deficiencies, as approved by the Engineer.

#### 1.5 SUBMITTALS

- A. Shop Drawings: Dimensioned plans and sections or elevation layouts of electrical equipment and devices. All clearance requirements for electrical equipment shall be included.
- B. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Provide factory representation for supervision of equipment installation and commissioning (start-up) where requested by drawings and/or specifications. The factory representative shall provide approval of adequate installation completion.
- C. Provide documentation that structural supports for stacking transformers is adequate to accommodate weights.

#### 1.6 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.
- C. Comply with NFPA 72 and NFPA 101.

#### 1.7 SYSTEM DESCRIPTION

- A. Furnish and install all materials in order to provide functioning systems, upon completion, in compliance with all applicable codes, authorities having jurisdiction, manufacturer's requirements, performance requirements specified, and any modifications resulting from reviewed shop drawings and the field coordination drawings.

## 1.8 SCOPE OF WORK

- A. The contractor is responsible for furnishing and installing all the devices and equipment shown indicated the Electrical Drawings including materials and equipment required to create fully operational systems.
- B. The contractor shall be responsible for reviewing the plans. In addition to all devices indicated on the Electrical Plans, the contractor is responsible for electrical installation of all the equipment and devices shown on other plans associated with this project.
- C. The contractor shall be responsible for reviewing the plans. Prior to bid, the contractor shall notify the Engineer of any discrepancies between the plans regarding equipment locations, equipment quantities, conduit routing, device locations, chase locations, etc. otherwise it will be assumed the contractor is responsible for the electrical installation of all the equipment and devices shown on plans associated with this project regardless of whether they are indicated on the Electrical Plans.

## 1.9 DRAWING INTERPRETATION

- A. The project drawings are schematic in nature and indicate general arrangement of equipment. It is not the intent of the drawings to substitute for shop drawings. In many instances, equipment and devices are sized on one manufacturer's product. In the event of a field verification or coordination issue, report issue to Owners construction supervisor.
- B. Install work as closely as possible to layouts shown on drawings. Modify work as necessary to meet job conditions and to clear other equipment. Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines, to avoid existing field conditions as well as to maintain clearances to equipment whether or not indicated on the drawings. The contractor shall provide all pull boxes and accessories as required for his work to effect these offsets, transitions and changes in direction. Consult Design Professional before making changes that affect the function or appearance of systems.
- C. Do not install equipment, devices or conduit in a non-code compliant fashion due to drawing interpretation. Provide modification of illustrated work in order to accommodate job conditions at no cost to Owner.

## 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver conduit with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored conduit and equipment from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.
- C. Protect electrical specialties from moisture and dirt.
- D. Store plastic conduit protected from direct sunlight. Support to prevent sagging and bending.

### 1.11 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
  - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
  - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
  - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
- D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.
- F. Coordinate all Division 16 work with all other divisions.
- G. Coordinate supporting electrical equipment and devices with all other divisions.
- H. Coordinate mounting heights of all devices with architectural details and shop drawings.

### 1.12 SEQUENCING AND SCHEDULING

- A. Coordinate electrical equipment installation with other building components.
- B. Arrange for conduit spaces, chases, slots, and openings in building structure during progress of construction to allow for electrical installations.
- C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.
- D. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- E. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

- F. Coordinate requirements for access panels and doors if electrical items requiring access are concealed behind finished surfaces.
- G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

#### 1.13 “AS-BUILT” RECORD DRAWINGS

- A. Record daily progress on one set of construction documents. Utilize a permanent black or blue marking media. All progress of record drawings shall be provided in a neat and accurate fashion.
- B. As-built drawing reviews will be completed on a monthly basis by the engineer of record. Release of requisitions will be based on the regular progress of As-built drawings. The latest As-built drawings shall be submitted for review with each requisition for payment.
- C. Formal As-built drawings shall be submitted for review at the completion of each phase of the work. The as-built drawings shall be ¼” scale and created in electronic format utilizing AUTOCAD 2012. At the completion of each phase of work, the electrical contractor shall submit to the Engineer the original field progress as-built drawings, the electronic files of the formal as-built drawings, and four sets of final as-built drawings plotted on 24” x 36” ‘D’ sized sheets. Final payment for the phase of work and the start of the next phase shall be dependant of approval of the as-built drawings.

#### 1.14 GUARANTEE

- A. Provide written guarantee of all completed/installed work. Materials, equipment and workmanship shall be guaranteed for a minimum period of one year after Owners acceptance of work. Any failure due to defective material, equipment or workmanship shall be corrected at no additional cost to owner. This shall include damage completed to other areas of construction or facility resulting from this failure. Provide correction of any failure within an acceptable/reasonable time period.
- B. Provide all equipment and material manufacturer’s guarantees and/or warranties to owner after acceptance of installation.

#### 1.15 OPERATING AND MAINTENANCE MANUALS

- A. Provide operating and maintenance information for all equipment, devices, systems, and materials. This shall include all maintenance and operations procedures, recommendations, and service requirements. All submitted data must include minimum equipment/device operations and maintenance requirements to fulfill manufacturers warranties.
- B. Submit all engineering selection and specification documentation with operating and maintenance information for all equipment, devices, systems, and materials.

- C. Submit all data media in a detailed, organized, and complete manner. Provide a minimum of three copies to Owners construction supervisor for engineer/architect review. Submit in 3 ring bound enclosure.

## PART 2 - PRODUCTS

### 2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
  - 1. Channel Thickness: Selected to suit structural loading.
  - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least one surface.
  - 1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
  - 2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
- F. 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.
- G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored 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.
- I. Expansion Anchors: Carbon-steel wedge or sleeve type.
- J. Toggle Bolts: All-steel springhead type.
- K. Powder-Driven Threaded Studs: Heat-treated steel.

## 2.2 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

## PART 3 - EXECUTION

### 3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.
- E. Provide ¾" exterior grade, group 3, fire resistive plywood for surface mounted equipment installation. Paint plywood with battleship grey finish which meets fire resistive building requirements. Provide where indicated on drawings or where equipment is to be mounted on masonry or concrete walls.
- F. Mounting heights indicated on drawings are to be measured from the center of the device to the finished floor elevation. Submit a request for unidentified mounting heights of equipment to Owners construction supervisor.
- G. Coordinate all device mounting heights with Architectural documents and ADA requirements. If discrepancy is detected, contact design professional so as to limit delay to construction.
- H. The mounting heights indicated on architectural details and shop drawings take precedence over mounting heights indicated on drawings. In the event of a mounting issue, consult Owners construction supervisor.
- I. Signaling devices shall not be located where the audible or visual signal is obstructed, including but not limited to locating visual devices behind conduits.

### 3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Galvanized Steel materials.

- C. Selection of Supports: Comply with manufacturer's written instructions.
- D. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

### 3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 3/8"-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- K. Install metal channel racks or equipment backboards for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.
  - a. Field Welding: Comply with AWS D1.1.
6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

### 3.4 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality at no cost to Owner.
- B. Coordinate all electrical shutdowns with facility and local utility for demolition and revision to existing electrical circuits, panel feeds, and high voltage rework. The emergency power system shall be kept online during all shutdowns and switchovers.
- C. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety. Remove electrical conduit and conductor back to source (ie, circuit breaker, panelboard) for equipment or devices indicated to be demolished or removed.
- D. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- E. Remove demolished material from Project site and dispose of in a legal manner.
- F. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

### 3.5 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

### 3.6 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
  - 1. Raceways.
  - 2. Building wire and connectors.
  - 3. Supporting devices for electrical components.
  - 4. Electrical demolition.
  - 5. Cutting and patching for electrical construction.
  - 6. Touchup painting.

### 3.7 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint.
  - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
  - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
  - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

### 3.8 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 16050

## SECTION 16060 - GROUNDING AND BONDING

### 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 grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

#### 1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.
- B. 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.
  - 1. Comply with UL 467.
- C. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.
- D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

### PART 2 - PRODUCTS

#### 2.1 GROUNDING CONDUCTORS

- A. For insulated conductors, comply with Division 16 Section "Conductors and Cables."
- B. Equipment Grounding Conductors: Insulated with green-colored type THHN insulation.

- C. Isolated Ground Conductors: Insulated with green-colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.
- D. Grounding Electrode Conductors: Stranded cable.
- E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.
- F. Bare Copper Conductors: Comply with the following:
  - 1. Solid Conductors: ASTM B 3 (Do not use at vibrating equipment).
  - 2. Assembly of Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
- G. Copper Bonding Conductors: As follows:
  - 1. Bonding Cable: No. 12 AWG copper conductor.
  - 2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
  - 3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  - 4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.

## 2.2 CONNECTOR PRODUCTS

- A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.
- B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.
- C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone, and similar materials.
- B. In raceways, use insulated equipment grounding conductors.
- C. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells.
- D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

### 3.2 EQUIPMENT GROUNDING CONDUCTORS

- A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.
- B. Install equipment grounding conductors in all feeders and circuits.
- C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by NEC:
  - 1. All circuits.
- D. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding 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. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service 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 grounding bus.
  - 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- F. Panelboard bonding: Provide bond conductor between ground bus of normal power panels and emergency power panels that support the same patient care area. The bond conductor shall be

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

### 3.4 CONNECTIONS

- A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
  2. Make connections with clean, bare metal at points of contact.
  3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.
- E. Tighten screws and bolts for grounding and bonding 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.
- F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.
- G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

### 3.5 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

END OF SECTION 16060

## SECTION 16071 - SEISMIC CONTROLS FOR ELECTRICAL WORK

### 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 seismic restraints and other earthquake-damage-reduction measures for electrical components. It complements optional seismic construction requirements in the various electrical component Sections.

#### 1.3 DEFINITIONS

- A. IBC: International Building Code.
- B. SBC: Standard Building Code.
- C. UBC: Uniform Building Code.
- D. Seismic Restraint: A fixed device (a seismic brace, an anchor bolt or stud, or a fastening assembly) used to prevent vertical or horizontal movement, or both vertical and horizontal movement, of an electrical system component during an earthquake.
- E. Mobile Structural Element: A part of the building structure such as a slab, floor structure, roof structure, or wall that may move independent of other mobile structural elements during an earthquake.

#### 1.4 SUBMITTALS

- A. Product Data: Illustrate and indicate types, styles, materials, strength, fastening provisions, and finish for each type and size of seismic restraint component used.
  - 1. Anchor Bolts and Studs: Tabulate types and sizes, complete with report numbers and rated strength in tension and shear as evaluated by an agency approved by authorities having jurisdiction.
- B. Shop Drawings: For anchorage and bracing not defined by details and charts on Drawings. Indicate materials, and show designs and calculations signed and sealed by a professional engineer.

1. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
  2. Details: Detail fabrication and arrangement. Detail attachment of restraints to both structural and restrained items. Show attachment locations, methods, and spacings, identifying components and listing their strengths. Indicate direction and value of forces transmitted to the structure during seismic events.
  3. Preapproval and Evaluation Documentation: By an agency approved by authorities having jurisdiction, showing maximum ratings of restraints and the basis for approval (tests or calculations).
- C. Coordination Drawings: Plans and sections drawn to scale and coordinating seismic bracing for electrical components with other systems and equipment, including other seismic restraints, in the vicinity.
- D. Product Certificates: Signed by manufacturers of seismic restraints certifying that products furnished comply with requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
- F. Material Test Reports: From a qualified testing agency indicating and interpreting test results of seismic control devices for compliance with requirements indicated.

#### 1.5 QUALITY ASSURANCE

- A. Comply with seismic restraint requirements in BOCA, unless requirements in this Section are more stringent.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing seismic engineering services, including the design of seismic restraints, that are similar to those indicated for this Project.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, with the experience and capability to conduct the testing indicated.

#### 1.6 PROJECT CONDITIONS

- A. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: Site Class D
  2. Importance Factor: 1.25
  3. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.
  4. Design Spectral Response Acceleration at Short Periods (0.2 Second): 37.00%G.
  5. Design Spectral Response Acceleration at 1-Second Period: 9.60%G.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of seismic bracing with building structural system and architectural features, and with mechanical, fire-protection, electrical, and other building features in the vicinity.
- B. Coordinate concrete bases with building structural system.

## PART 2 - 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. B-Line Systems, Inc.
  - 2. Erico, Inc.
  - 3. Mason Industries, Inc.
  - 4. Unistrut Corporation.

### 2.2 MATERIALS

- A. Use the following materials for restraints:
  - 1. Indoor Dry Locations: Galvanized steel.
  - 2. Outdoors and Damp Locations: Galvanized steel.
  - 3. Corrosive Locations: Stainless steel.

### 2.3 ANCHORAGE AND STRUCTURAL ATTACHMENT COMPONENTS

- A. Strength: Defined in reports by ICBO Evaluation Service or another agency acceptable to authorities having jurisdiction.
  - 1. Structural Safety Factor: Strength in tension and shear of components used shall be at least two times the maximum seismic forces to which they will be subjected.
- B. Concrete and Masonry Anchor Bolts and Studs: Steel-expansion wedge type.
- C. Concrete Inserts: Steel-channel type.
- D. Through Bolts: Structural type, hex head, high strength. Comply with ASTM A 325.
- E. Welding Lugs: Comply with MSS SP-69, Type 57.
- F. Beam Clamps for Steel Beams and Joists: Double sided. Single-sided type is not acceptable.

- G. Bushings for Floor-Mounted Equipment Anchors: Neoprene units designed for seismically rated rigid equipment mountings, and matched to the type and size of anchor bolts and studs used.
- H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for seismically rated rigid equipment mountings, and matched to the type and size of attachment devices used.

## 2.4 SEISMIC BRACING COMPONENTS

- A. Slotted Steel Channel: 1-5/8-by-1-5/8-inch cross section, formed from 0.1046-inch-thick steel, with 9/16-by-7/8-inch slots at a maximum of 2 inches o.c. in webs, and flange edges turned toward web.
  - 1. Materials for Channel: ASTM A 570, GR 33.
  - 2. Materials for Fittings and Accessories: ASTM A 575, ASTM A 576, or ASTM A 36.
  - 3. Fittings and Accessories: Products of the same manufacturer as channels and designed for use with that product.
  - 4. Finish: Baked, rust-inhibiting, acrylic-enamel paint applied after cleaning and phosphate treatment, unless otherwise indicated.
- B. Channel-Type Bracing Assemblies: Slotted steel channel, with adjustable hinged steel brackets and bolts.
- C. Cable-Type Bracing Assemblies: Zinc-coated, high-strength steel wire rope cable attached to steel thimbles, brackets, and bolts designed for cable service.
  - 1. Arrange units for attachment to the braced component at one end and to the structure at the other end.
  - 2. Wire Rope Cable: Comply with ASTM 603. Use 49- or 133-strand cable with a minimum strength of 2 times the calculated maximum seismic force to be resisted.
- D. Hanger Rod Stiffeners: Slotted steel channels with internally bolted connections to hanger rod.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install seismic restraints according to applicable codes and regulations and as approved by authorities having jurisdiction, unless more stringent requirements are indicated.

### 3.2 STRUCTURAL ATTACHMENTS

- A. Use bolted connections with steel brackets, slotted channel, and slotted-channel fittings to spread structural loads and reduce stresses.

- B. Attachments to New Concrete: Bolt to channel-type concrete inserts or use expansion anchors.
- C. Attachments to Existing Concrete: Use expansion anchors.
- D. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars.
- E. Attachments to Solid Concrete Masonry Unit Walls: Use expansion anchors.
- F. Attachments to Hollow Walls: Bolt to slotted steel channels fastened to wall with expansion anchors.
- G. Attachments to Wood Structural Members: Install bolts through members.
- H. Attachments to Steel: Bolt to clamps on flanges of beams or on upper truss chords of bar joists.

### 3.3 ELECTRICAL EQUIPMENT ANCHORAGE

- A. Anchor rigidly to a single mobile structural element or to a concrete base that is structurally tied to a single mobile structural element.
- B. Anchor panelboards, and electronic signal processing, control, and distribution units as follows:
  - 1. Anchor Bolt Bushing Assemblies for Wall-Mounted Equipment: Install to allow for resilient media where equipment or equipment-mounting channels are attached to wall.
  - 2. Torque bolts and nuts on studs to values recommended by equipment manufacturer.

### 3.4 SEISMIC BRACING INSTALLATION

- A. Install bracing according to spacings and strengths indicated by approved analysis.
- B. Expansion and Contraction: Install to allow for thermal movement of braced components.
- C. Cable Braces: Install with maximum cable slack recommended by manufacturer.
- D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to the structure at flanges of beams, upper truss chords of bar joists, or at concrete members.

### 3.5 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Make flexible connections in raceways, cables, wireways, cable trays, and busways where they cross expansion and seismic control joints, where adjacent sections or branches are supported by different structural elements, and where they terminate at electrical equipment anchored to a different mobile structural element from the one supporting them.

### 3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform the following field quality-control testing:
1. Provide necessary test equipment required for reliable testing.
  2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
  3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
  4. Obtain Architect's approval before transmitting test loads to the structure. Provide temporary load-spreading members.
  5. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
  6. Test to 90 percent of rated proof load of device.
  7. If a device fails the test, modify all installations of same type and retest until satisfactory results are achieved.
  8. Record test results.

END OF SECTION 16071

## SECTION 16075 - ELECTRICAL IDENTIFICATION

### 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 electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

#### 1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

#### 1.4 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

### PART 2 - PRODUCTS

#### 2.1 RACEWAY AND CABLE LABELS

- A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
  - 1. Color: Black letters on orange field.
  - 2. Legend: Indicates voltage and service.

- B. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.
- C. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.
- D. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- E. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
  - 1. Not less than 6 inches wide by 4 mils thick.
  - 2. Compounded for permanent direct-burial service.
  - 3. Embedded continuous metallic strip or core.
  - 4. Printed legend indicating type of underground line.
- F. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- G. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch-thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- H. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, unless otherwise indicated, with eyelet for fastener.
- I. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.
- J. Brass or Aluminum Tags: 2 by 2 by 0.05-inch metal tags with stamped legend, punched for fastener.

## 2.2 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
  - 1. Engraved legend with black letters on white face.
  - 2. Punched or drilled for mechanical fasteners.
- C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

- D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.
- E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

### 2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
  - 1. Minimum Width: 3/16 inch.
  - 2. Tensile Strength: 50 lb minimum.
  - 3. Temperature Range: Minus 40 to plus 185 deg F.
  - 4. Color: According to color-coding.
- B. Paint: Formulated for the type of surface and intended use.
  - 1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
  - 2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
  - 3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
  - 4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.
- C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before applying.
- E. Install painted identification according to manufacturer's written instructions and as follows:
  - 1. Clean surfaces of dust, loose material, and oily films before painting.
  - 2. Prime surfaces using type of primer specified for surface.
  - 3. Apply one intermediate and one finish coat of enamel.
- F. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
  2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
  3. Apply the following colors to the systems listed below:
    - a. Fire Alarm System: Red.
    - b. Fire-Suppression Supervisory and Control System: Red and yellow.
    - c. Mechanical and Electrical Supervisory System: Green and blue.
    - d. Telecommunication System: Green and yellow.
- G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.
- H. Circuit Identification Labels on Boxes: Install labels externally.
1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
  2. Concealed Boxes: Plasticized card-stock tags.
  3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- I. Color-Coding of Secondary Phase Conductors: Use the following colors for branch-circuit phase conductors:
1. 208/120-V Conductors:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  2. 480/277-V Conductors:
    - a. Phase A: Yellow.
    - b. Phase B: Brown.
    - c. Phase C: Orange.
  3. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:
    - a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
    - b. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3

inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

- J. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
  - 1. Legend: 1/4-inch- steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
  - 2. Tag Fasteners: Nylon cable ties.
  - 3. Band Fasteners: Integral ears.
  
- K. Apply identification to conductors as follows:
  - 1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
  - 2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
  - 3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.
  
- L. Apply warning, caution, and instruction signs as follows:
  - 1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
  - 2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.
  
- M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
  - 1. Panelboards, electrical cabinets, and enclosures.
  - 2. Access doors and panels for concealed electrical items.
  - 3. Emergency system boxes and enclosures.
  - 4. Disconnect switches.
  - 5. Power transfer equipment.
  - 6. Contactors.
  - 7. Dimmers.
  - 8. Control devices.
  - 9. Transformers.
  - 10. Power-generating units.

11. Telephone switching equipment.
12. Fire alarm master station or control panel.

END OF SECTION 16075

## SECTION 16080 - ELECTRICAL TESTING

### 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 general requirements for electrical field testing and inspecting. Detailed requirements are specified in each Section containing components that require testing. General requirements include the following:
  - 1. Qualifications of testing agencies and their personnel.
  - 2. Suitability of test equipment.
  - 3. Calibration of test instruments.
  - 4. Coordination requirements for testing and inspecting.
  - 5. Reporting requirements for testing and inspecting.
- B. Allowances: Electrical tests and inspections specified in various Division 16 Sections are covered by a testing and inspecting allowance specified in Division 1 Section "Allowances." See Division 1 Section "Allowances" for what is included in allowance amount, the amount of the allowance, payment procedures for allowances, changes to allowance amounts, and disposition of unused portions of allowance.

#### 1.3 QUALITY ASSURANCE

- A. Testing Agency Qualifications: As specified in each Section containing electrical testing requirements and in subparagraph and associated subparagraph below.
  - 1. Independent Testing Agencies: Independent of manufacturers, suppliers, and installers of components to be tested or inspected.
    - a. Testing Agency's Field Supervisor for Power Component Testing: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Division 16 power component Sections.
- B. Test Equipment Suitability: Comply with NETA ATS, Section 5.2.
- C. Test Equipment Calibration: Comply with NETA ATS, Section 5.3.

### PART 2 - NOT USED

## PART 3 - EXECUTION

### 3.1 GENERAL TESTS AND INSPECTIONS

- A. If a group of tests are specified to be performed by an independent testing agency, prepare systems, equipment, and components for tests and inspections, and perform preliminary tests to ensure that systems, equipment, and components are ready for independent agency testing. Include the following minimum preparations as appropriate:
1. Perform insulation-resistance tests.
  2. Perform continuity tests.
  3. Perform rotation test (for motors to be tested).
  4. Provide a stable source of single-phase, 208/120-V electrical power for test instrumentation at each test location.
- B. Test and Inspection Reports: In addition to requirements specified elsewhere, report the following:
1. Manufacturer's written testing and inspecting instructions.
  2. Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
  3. Tabulation of expected measurement results made before measurements.
  4. Tabulation of "as-found" and "as-left" measurement and observation results.

END OF SECTION 16080

## SECTION 16120 - CONDUCTORS AND CABLES

### 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 building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

#### 1.3 SUBMITTALS

- A. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

#### 1.4 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
  - 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.
- B. Comply with NFPA 70.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wires and cables according to NEMA WC 26.

#### 1.6 COORDINATION

- A. Coordinate layout and installation of cables with other installations.
- B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

### PART 2 - PRODUCTS

## 2.1 BUILDING WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Wire and Insulation Applications" Article.
- B. Insulation: Color impregnated for size #10 AWG and smaller.
- C. Rubber Insulation Material: Comply with NEMA WC 3.
- D. Thermoplastic Insulation Material: Comply with NEMA WC 5.
- E. Cross-Linked Polyethylene Insulation Material: Comply with NEMA WC 7.
- F. Ethylene Propylene Rubber Insulation Material: Comply with NEMA WC 8.
- G. Conductor Material: Copper.
- H. Stranding: Stranded conductor for No. 8 AWG and larger.
- I. All conductor shall be rated for 600V class at minimum.
- J. 208 Volt System Conductor Color Coding:
  - 1. Phase A: Black
  - 2. Phase B: Red
  - 3. Phase C: Blue
  - 4. Neutral: White
- K. 480 Volt-System Conductor Color Coding
  - 1. Phase A: Yellow.
  - 2. Phase B: Brown.
  - 3. Phase C: Orange.
  - 4. Neutral: White with Stripe (coordinate color with Authority Having Jurisdiction).

## 2.2 CONNECTORS AND SPLICES

- A. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated. Comply with Project's installation requirements and as specified in Part 3 "Wire and Insulation Applications" Article.
- B. Splices #10 and smaller: Solderless connections, spring type or crimp type.
- C. Splices and terminals #8 and larger: Compression connectors, or bolted pressure connectors, copper construction.
- D. Electrical Tape: 3M Scotch Brand model 88.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 WIRE AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN/THWN, in raceway.
- B. Feeders: Type THHN/THWN, in raceway.
- C. Branch Circuits: Type THHN/THWN, in raceway.
- D. Fire Alarm Circuits: As per manufacturer requirements.
- E. Class 1 Control Circuits: Type THHN/THWN, in raceway.
- F. Class 2 Control Circuits: Type THHN/THWN, in raceway.

### 3.3 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and NECA's "Standard of Installation."
- B. Remove existing wires from raceway before pulling in new wires and cables.
- C. Pull Conductors: 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.
- D. Do not use pulling compound or lubricant for Isolated Power branch circuits.
- E. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- F. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- G. Identify wires and cables according to Division 16 Section "Electrical Identification."

### 3.4 CONNECTIONS

- A. Conductor Splices: Keep to minimum.
- B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

- C. Use splice and tap connectors compatible with conductor material.
- D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.
- E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.
- 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.

### 3.5 FIELD QUALITY CONTROL

- A. Testing: On installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 16120

## SECTION 16130 - RACEWAYS AND BOXES

### 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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
  - 2. Division 16 Section "Electrical General Provisions" for supports, and anchors.
  - 3. Division 16 Section "Seismic Controls for Electrical Work" for seismic restraints and bracing of raceways, boxes, enclosures, and cabinets.
  - 4. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

#### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. LFNC: Liquidtight flexible nonmetallic conduit.
- F. RNC: Rigid nonmetallic conduit.
- G. RMC: Rigid metal conduit.

#### 1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer.
  - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
  - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- E. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

## 1.5 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.

## 1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2.2 METAL CONDUIT AND TUBING

- A. Available Manufacturers:
1. AFC Cable Systems, Inc.
  2. Electri-Flex Co.
  3. Manhattan/CDT/Cole-Flex.
  4. O-Z Gedney; Unit of General Signal.
  5. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- D. Plastic-Coated IMC and Fittings: NEMA RN 1.
- E. EMT and Fittings: ANSI C80.3.
1. Fittings: Set-screw, concrete tight type – 2-1/2” and larger, Compression, concrete tight type – 2” and smaller.
- F. FMC: Zinc-coated steel, Fed. Spec. WW-C-566.
- G. LFMC: Shall consist of flexible galvanized steel tubing over which is extruded a liquid-tight jacket of polyvinyl chloride. Provide with a continuous copper bonding conductor wound spirally between the convolutions.
- H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

### 2.3 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers:
1. American International.
  2. Electri-Flex Co.
  3. Manhattan/CDT/Cole-Flex.
  4. RACO; Division of Hubbell, Inc.

5. Spiralduct, Inc./AFC Cable Systems, Inc.
6. Thomas & Betts Corporation.

- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

#### 2.4 METAL WIREWAYS

- A. Available Manufacturers:
  1. Hoffman.
  2. Square D.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 3R.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Hinged type.
- F. Finish: Manufacturer's standard enamel finish.

#### 2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers:
  1. Hoffman.
  2. Appleton
  3. Hubbell, Inc.; Killark Electric Manufacturing Co.
  4. O-Z/Gedney; Unit of General Signal.
  5. RACO; Division of Hubbell, Inc.
  6. Steel City
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Non gangable, galvanized steel, 2-1/8" deep. Galvanized steel covers.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover, 2-1/8" deep.

- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1. Galvanized steel, 2-1/8" deep.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover, 2-1/8" deep.
- H. Ceiling Boxes: 4" octagonal, unless specified otherwise on drawings. Provide a 3/8" fixture stud for attachment of light fixture, where required.
- I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

## 2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.
- B. All parts and hardware shall be zinc coated or have equivalent corrosion protection.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors:
  - 1. Exposed: RMC.
  - 2. Concealed: RMC.
  - 3. Underground, Single Run: PVC Externally Coated RMC or Sched. 80 PVC where indicated.
  - 4. Underground, Grouped: PVC Externally Coated RMC or Sched. 80 PVC where indicated.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 6. Boxes and Enclosures: NEMA 250, Type 4X Stainless Steel.
- B. Indoors:

1. Exposed: EMT, except RMC where subject to physical damage.
  2. Concealed: EMT.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  4. Damp or Wet Locations: EMT, except RMC where subject to physical damage.
  5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4X Stainless Steel.
- C. Minimum Raceway Size: 1/2-inch trade size, except as noted otherwise in contract documents.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.

### 3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Do not install horizontal raceway runs above or below water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Install raceways a maximum of 10'0" above finished floor, unless indicated otherwise or to meet seismic installation requirements. Any raceway above 10'0" above finished floor shall be approved by owner and engineer.
- D. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- E. Install temporary closures to prevent foreign matter from entering raceways.
- F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- H. Prefabricated bends are only permitted for RMC and IMC conduits 3" and above.
- I. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
  1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- J. Raceways 1¼" and smaller, penetrating concrete slabs, shall be installed with a bituminous coating. The bituminous coating shall be applied around the entire perimeter of the raceway and along the full depth of the slab.
- K. Raceways 1½" and larger, penetrating concrete slabs, shall be installed within a Schedule 40 PVC sleeve.

- L. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit or rigid steel conduit before rising above the floor.
- M. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.
  - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- N. Individual construe hangers shall be designed for the purpose, and have pre-assembled closure bolts and nuts, and provisions for receiving hanger rod.
- O. Multiple conduit trapeze hangers shall not be less than 1-1/2" by 1-1/2", 12 gage steel, cold formed, lipped channels. Hanger rods shall be not less than 3/8" diameter steel.
- P. Join raceways with fittings designed and approved for that purpose and make joints tight.
  - 1. Use insulating bushings to protect conductors.
- Q. Tighten set screws of threadless fittings with suitable tools.
- R. Terminations:
  - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- T. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- U. Install raceway sealing fittings at suitable, approved, and 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:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where otherwise required by NFPA 70.
- V. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor, where approved by engineer. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- W. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures. Lighting fixtures shall not be "daisy chained." For equipment subject to vibration, noise transmission, or movement; and for all motors use LFMC. Install separate ground conductor across flexible connections.
- X. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals. Where noted for wall mounted raceway, provide junction boxes or stubs through wall to delete need for surface raceway from floor or ceiling.
- Y. Set floor boxes level and flush with finished floor surface.
- Z. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- AA. Anchors shall be self drilling expansion shields, or machine bolt expansion hangers.
- BB. Solid Masonry and Concrete Anchors: Fed. Spec. FF-S-325
- CC. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- DD. Wall Outlets in Stud Walls: Boxes shall be 4" square with plaster ring, with number of gangs as required.
- EE. Surface Exposed Wall or Ceiling Outlets: 4" square or multi-gang boxes with matching raised covers. Boxes in finished areas and where indicated shall be cast FS type with covers similar to those specified for finished plates.

### 3.3 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.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

## SECTION 16130 - RACEWAYS AND BOXES

### 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 raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 7 Section "Through-Penetration Firestop Systems" for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
  - 2. Division 16 Section "Electrical General Provisions" for supports, and anchors.
  - 3. Division 16 Section "Seismic Controls for Electrical Work" for seismic restraints and bracing of raceways, boxes, enclosures, and cabinets.
  - 4. Division 16 Section "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

#### 1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. LFNC: Liquidtight flexible nonmetallic conduit.
- F. RNC: Rigid nonmetallic conduit.
- G. RMC: Rigid metal conduit.

#### 1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer.
  - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
  - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- E. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

## 1.5 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.

## 1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2.2 METAL CONDUIT AND TUBING

- A. Available Manufacturers:
1. AFC Cable Systems, Inc.
  2. Electri-Flex Co.
  3. Manhattan/CDT/Cole-Flex.
  4. O-Z Gedney; Unit of General Signal.
  5. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- D. Plastic-Coated IMC and Fittings: NEMA RN 1.
- E. EMT and Fittings: ANSI C80.3.
1. Fittings: Set-screw, concrete tight type – 2-1/2” and larger, Compression, concrete tight type – 2” and smaller.
- F. FMC: Zinc-coated steel, Fed. Spec. WW-C-566.
- G. LFMC: Shall consist of flexible galvanized steel tubing over which is extruded a liquid-tight jacket of polyvinyl chloride. Provide with a continuous copper bonding conductor wound spirally between the convolutions.
- H. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

### 2.3 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers:
1. American International.
  2. Electri-Flex Co.
  3. Manhattan/CDT/Cole-Flex.
  4. RACO; Division of Hubbell, Inc.

5. Spiralduct, Inc./AFC Cable Systems, Inc.
  6. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

#### 2.4 METAL WIREWAYS

- A. Available Manufacturers:
1. Hoffman.
  2. Square D.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 3R.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Hinged type.
- F. Finish: Manufacturer's standard enamel finish.

#### 2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers:
1. Hoffman.
  2. Appleton
  3. Hubbell, Inc.; Killark Electric Manufacturing Co.
  4. O-Z/Gedney; Unit of General Signal.
  5. RACO; Division of Hubbell, Inc.
  6. Steel City
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1. Non gangable, galvanized steel, 2-1/8" deep. Galvanized steel covers.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover, 2-1/8" deep.

- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1. Galvanized steel, 2-1/8" deep.
- G. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover, 2-1/8" deep.
- H. Ceiling Boxes: 4" octagonal, unless specified otherwise on drawings. Provide a 3/8" fixture stud for attachment of light fixture, where required.
- I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

## 2.6 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.
- B. All parts and hardware shall be zinc coated or have equivalent corrosion protection.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors:
  - 1. Exposed: RMC.
  - 2. Concealed: RMC.
  - 3. Underground, Single Run: PVC Externally Coated RMC or Sched. 80 PVC where indicated.
  - 4. Underground, Grouped: PVC Externally Coated RMC or Sched. 80 PVC where indicated.
  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 6. Boxes and Enclosures: NEMA 250, Type 4X Stainless Steel.
- B. Indoors:

1. Exposed: EMT, except RMC where subject to physical damage.
  2. Concealed: EMT.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  4. Damp or Wet Locations: EMT, except RMC where subject to physical damage.
  5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a. Damp or Wet Locations: NEMA 250, Type 4X Stainless Steel.
- C. Minimum Raceway Size: 1/2-inch trade size, except as noted otherwise in contract documents.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.

### 3.2 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Do not install horizontal raceway runs above or below water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Install raceways a maximum of 10'0" above finished floor, unless indicated otherwise or to meet seismic installation requirements. Any raceway above 10'0" above finished floor shall be approved by owner and engineer.
- D. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- E. Install temporary closures to prevent foreign matter from entering raceways.
- F. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- H. Prefabricated bends are only permitted for RMC and IMC conduits 3" and above.
- I. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
  1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- J. Raceways 1¼" and smaller, penetrating concrete slabs, shall be installed with a bituminous coating. The bituminous coating shall be applied around the entire perimeter of the raceway and along the full depth of the slab.
- K. Raceways 1½" and larger, penetrating concrete slabs, shall be installed within a Schedule 40 PVC sleeve.

- L. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - 3. Run conduit larger than 1-inch trade size parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit or rigid steel conduit before rising above the floor.
- M. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.
  - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- N. Individual construe hangers shall be designed for the purpose, and have pre-assembled closure bolts and nuts, and provisions for receiving hanger rod.
- O. Multiple conduit trapeze hangers shall not be less than 1-1/2" by 1-1/2", 12 gage steel, cold formed, lipped channels. Hanger rods shall be not less than 3/8" diameter steel.
- P. Join raceways with fittings designed and approved for that purpose and make joints tight.
  - 1. Use insulating bushings to protect conductors.
- Q. Tighten set screws of threadless fittings with suitable tools.
- R. Terminations:
  - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- S. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- T. Telephone and Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- U. Install raceway sealing fittings at suitable, approved, and 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:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  2. Where otherwise required by NFPA 70.
- V. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor, where approved by engineer. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- W. Flexible Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures. Lighting fixtures shall not be "daisy chained." For equipment subject to vibration, noise transmission, or movement; and for all motors use LFMC. Install separate ground conductor across flexible connections.
- X. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals. Where noted for wall mounted raceway, provide junction boxes or stubs through wall to delete need for surface raceway from floor or ceiling.
- Y. Set floor boxes level and flush with finished floor surface.
- Z. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- AA. Anchors shall be self drilling expansion shields, or machine bolt expansion hangers.
- BB. Solid Masonry and Concrete Anchors: Fed. Spec. FF-S-325
- CC. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- DD. Wall Outlets in Stud Walls: Boxes shall be 4" square with plaster ring, with number of gangs as required.
- EE. Surface Exposed Wall or Ceiling Outlets: 4" square or multi-gang boxes with matching raised covers. Boxes in finished areas and where indicated shall be cast FS type with covers similar to those specified for finished plates.

### 3.3 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.
  2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.4 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 16130

## SECTION 16410 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### 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 individually mounted enclosed switches and circuit breakers used for the following:
  - 1. Service disconnecting means.
  - 2. Feeder and branch-circuit protection.
  - 3. Motor and equipment disconnecting means.
- B. Related Sections include the following:
  - 1. Division 16 Section "Wiring Devices" for attachment plugs, receptacles, and toggle switches used for disconnecting means.
  - 2. Division 16 Section "Fuses" for fusible devices.

#### 1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
  - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

- a. Enclosure types and details for types other than NEMA 250, Type 1.
  - b. Current and voltage ratings.
  - c. Short-circuit current rating.
  - d. UL listing for series rating of installed devices.
  - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 16 Section "Seismic Controls for Electrical Work." Include the following:
1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
- E. Field Test Reports: Submit written test reports and include the following:
1. Test procedures used.
  2. Test results that comply with requirements.
  3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- F. Manufacturer's field service report.
- G. Maintenance Data: For enclosed switches and circuit breakers and for components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Closeout Procedures," include the following:
1. Routine maintenance requirements for components.
  2. Manufacturer's written instructions for testing and adjusting switches and circuit breakers.
  3. Time-current curves, including selectable ranges for each type of circuit breaker.

## 1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. 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.
- C. Comply with NEMA AB 1 and NEMA KS 1.
- D. Comply with NFPA 70.
- E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

### PART 2 - 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. Fusible Switches:
    - a. Siemens
    - b. Square D Co.
    - c. GE
    - d. Eaton

2. Molded-Case Circuit Breakers:
  - a. Siemens.
  - b. Square D Co.
  - c. GE
  - d. Eaton
  
3. Combination Circuit Breaker and Ground-Fault Trip:
  - a. Siemens.
  - b. Square D Co.
  - c. GE
  - d. Eaton

## 2.2 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

## 2.3 ENCLOSED CIRCUIT BREAKERS

- A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.
  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. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
  3. Molded-Case Switch: Molded-case circuit breaker without trip units.
- B. Molded-Case Circuit-Breaker Features and Accessories, as selected on drawings: Standard frame sizes, trip ratings, and number of poles.
  1. Lugs: Mechanical style suitable for number, size, trip ratings, and material of conductors.
  2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
  3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  4. Communication Capability: Integral communication module with functions and features compatible with power monitoring and control system.
  5. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
  6. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.

7. Auxiliary Switch: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
8. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
9. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

## 2.4 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.
  1. Outdoor Locations: NEMA 250, Type 3R.
  2. Kitchen Areas: NEMA 250, Type 3R.
  3. Other Wet or Damp Indoor Locations: NEMA 250, Type 3R.
  4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

## 2.5 FACTORY FINISHES

- A. Finish: Manufacturer's standard gray paint applied to factory-assembled and -tested enclosures before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
  1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with mounting and anchoring requirements specified in Division 16 Section "Seismic Controls for Electrical Work."
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

### 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

### 3.4 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. 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.

### 3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
  - 1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
  - 2. Test continuity of each line- and load-side circuit.
- B. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. 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.
- C. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Open or remove doors or panels so connections are accessible to portable scanner.
  - 1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each unit 11 months after date of Substantial Completion.
  - 2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
  - 3. Record of Infrared Scanning: Prepare a certified report that identifies switches and circuit breakers checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

### 3.6 ADJUSTING

- A. Set field-adjustable switches and circuit-breaker trip ranges per Engineer.

### 3.7 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 16410

## SECTION 16851 - FIRE ALARM SYSTEM

### 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 fire alarm systems with manual stations, signal equipment, controls, and devices.

#### 1.3 DEFINITIONS

- A. FACP: Fire alarm control panel.
- B. LED: Light-emitting diode.
- C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

#### 1.4 SYSTEM DESCRIPTION

- A. The specifications may be general in nature. The intent is to provide Mircom FX2000, latest generation, fire alarm system being used at other Burlington School District schools where recent fire alarm system upgrades have occurred.

#### 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show details of graphic annunciator.
  - 1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
  - 2. Battery: Sizing calculations.
  - 3. Floor Plans: Indicate final outlet locations and routings of raceway connections.
  - 4. Device Address List: Coordinate with final system programming.
  - 5. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

6. Manufacturers original catalog data and descriptive information shall be supplied for all major components of the equipment to be supplied, including but not limited to all drawings and manufacturer's specification sheets as well as NAC Charts, narratives and any other documentation included in the Submittal.
  7. Supplier's qualifications shall indicate years in business, service policies, warranty definitions, and a list of similar installations. Contractor qualifications shall indicate prior experience with installations that include the type of equipment that is to be supplied. All pertinent information shall be furnished regarding the reliability and operation of the equipment to be supplied. Sufficient information shall be furnished so that the exact function of each installed device is known.
  8. Other than Specified Equipment: If equipment other than that specified is supplied, it shall be the contractor's obligation to furnish appropriate documentation and submit the following in writing to the engineer ten (10) days before the bid date:
    - a. Complete lists, descriptions and drawings of materials to be used.
    - b. A complete list of current drain requirements during normal supervisory condition, trouble, and alarm conditions.
    - c. Battery standby calculations showing total standby power needed to meet the system requirements as specified.
- C. Coordination Drawings: Plans, sections, and elevations drawn to scale and coordinating installation of smoke detectors in ducts and access to them. Show the following near each duct smoke provision of detector installation:
1. Size and location of ducts, including lining.
  2. Size and location of piping.
  3. Size and arrangement of structural elements.
  4. Size and location of duct smoke detector, including air-sampling elements.
- D. Operating Instructions: For mounting at the FACP.
- E. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.
- F. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.
- G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.
- H. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.
- I. Submissions to Authorities Having Jurisdiction: Make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

- J. Documentation: Shop drawings shall contain a one-line, color-coded “Riser” diagram that is to reflect the equipment and their proposed location within the installation. Included on this Riser shall be a “per circuit” NAC current draw chart and a listing of the types and sizes of wire to be used on the various circuits. Also included with the Riser will be an all-inclusive “Block” diagram of all components in the system including all FACP components and associated field devices. This shall include detailed termination information.
- K. The bound Submittal booklet shall list all equipment and devices on the job clearly highlighted in yellow on the submittal’s original specification sheets. Included in this submittal shall be Wiring Charts, which include voltage drop calculations. A system Narrative explaining the sequence of operation for the specified equipment shall be included. This Submittal booklet shall also include a partial list of installations that can be used as reference.
- L. Certificate of Completion: Comply with NFPA 72.
- M. As-built Drawings: Record daily progress on one set of construction documents. Utilize a permanent black or blue marking media. All progress of record drawings shall be provided in a neat and accurate fashion. Contractor invoice processing shall be subject to progress “as-built” acceptance by the Owner and Engineer. At the completion of each phase of work, the contractor shall submit “as-built” drawings detailing all work performed on the fire alarm system during that phase of the project. The drawings shall show all new devices locations, device address numbers, conduit runs, junction box locations, junction box labeling, fire alarm control panel location, and fire command center location. Each completed phases’ “as-built” drawings shall be submitted both electronically, in AUTCAD Release 2012 format, and on a standard 36” x 24” sheet. The AUTOCAD drawings shall be completed utilizing a layering system acceptable to Owner and Engineer. At the completion of all phases of the project, the contractor shall submit a comprehensive “as-built” drawings coordinating all work performed during each phase of construction. The comprehensive “as-built” drawings shall be submitted both electronically, in AUTCAD Release 2012 format, and on a standard 36” x 24” sheet.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is an authorized representative of the FACP manufacturer for both installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.
- C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.
- D. Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.
- E. The fire alarm system shall comply with the applicable provisions of the following current National Fire Protection Association (NFPA) standards:
  - 1. NFPA 13 Installation of Sprinkler Systems
  - 2. NFPA 72, National Fire Alarm Code:

- a. Central Station Fire Alarm Systems
  - b. Local Fire Alarm Systems
  - c. Auxiliary Fire Alarm Systems
  - d. Remote Station Fire Alarm Systems
  - e. Proprietary Fire Alarm Systems
  3. NFPA 90A, Installation of Air Conditioning and Ventilating Systems
  4. NFPA 101, Life Safety Code - Safety to Life from Fire in Buildings and Structures
- F. The system shall comply with the applicable provisions of the following U.L. Standards and Classifications:
1. UL STD 864, Control Units, Fire Protective Signaling Systems
  2. UOJZ, Control Units, System
  3. UOXX, Control Unit Accessories, System
- G. Where there are contradictory requirements indicated with this specification section, the Contractor shall be responsible for providing the system that would not result in a cost adder should the contrary specified items are required to a complete, approved system.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Keys and Tools: One extra set for access to locked and tamperproofed components.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Mircom FX-2000, latest generation.

### 2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. Control of System: By the FACP.
- B. System Configuration: All fire alarm system wiring shall be installed in a Class A Preferred loop with voice evac.
- C. The system shall be of microprocessor design to allow maximum flexibility of capabilities and operation. This includes the integration of both Conventional Zones and Analog/Addressable Loops in the same cabinet/system. The system shall be capable of storing and displaying 2000 events. These events shall be categorized into 1000 Alarm events and 1000 non-alarm events.

## 2.3 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new, addressable, automatic fire detection and alarm system.
  - 1. Provide all components necessary, regardless of whether shown in the contract documents or not.
  - 2. Protected Premises: Entire building shown on drawings.
  - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed.
    - a. ADA Standards for Accessible Design.
    - b. The requirements of NFPA and the Vermont Fire Code.
    - c. The requirements of the local authority having jurisdiction.
    - d. Applicable local codes.
    - e. The contract documents (drawings and specifications).
    - f. NFPA 101
    - g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
  - 4. Two-Way Telephone: Provide two-way telephone service at main panel for the use of the fire service and others.
  - 5. Combined Systems: Do not combine fire alarm system with other non-fire systems.
- B. Supervising Stations and Fire Department Connections:
  - 1. Public Fire Department Notification: By remote supervising station.
  - 2. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
- C. Circuits:
  - 1. Initiating Device Circuits (IDC): Class A, Style D.
  - 2. Signaling Line Circuits (SLC) Within Single Building: Class A, Style 5.
  - 3. Notification Appliance Circuits (NAC): Class A, Style Z.
- D. Spare Capacity.
  - 1. Initiating Device Circuits: Minimum 25 percent spare capacity.
  - 2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
  - 3. Master Control Unit: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.
- E. Power Sources:
  - 1. Primary: Dedicated branch circuits of the facility power distribution system.
  - 2. Secondary: Storage batteries.
  - 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

## 2.4 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new. Except for locations where the intent is to reuse existing conduits, do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.

- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

## 2.5 CITY CONNECTION

1. The fire alarm system shall be connected to a new local energy city master box via a Municipal Circuit Module. The city master box shall be coded and timed in accordance with the requirements of the fire department. The box shall be (surface/flush) mounted and located as specified by the building engineer and the fire department.
2. The contractor shall coordinate with the local fire marshal to determine equipment being supplied by Contractor and local fire department.
3. Provide new Radio Master Box and antenna. Refer to drawings.

## 2.6 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
  1. Sprinkler water control valves.
  2. Dry-pipe sprinkler system pressure.
  3. Dry-pipe sprinkler valve room low temperature.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
  1. Sprinkler water flow
  2. Duct smoke detectors.
  3. As required by local authority having jurisdiction.
- C. HVAC:
  1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.
- D. Doors:
  1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.
  2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from.

## 2.7 COMPONENTS

- A. General:
  1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable per approval by Architect.
  2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
  3. Provide control relays/modules as needed to accommodate door holders, door controllers, interconnections to security systems and all other equipment requiring control or status of fire alarm system.

- B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: addressable type; listed by Underwriters Laboratories as suitable for the purpose intended.
- C. Initiating Devices:
  - 1. Manual Pull Stations: Double-action.
  - 2. Key Operated Pull Stations:.
  - 3. Smoke Detectors: Photoelectric.
  - 4. Duct Smoke Detectors:.
  - 5. Heat Detectors: \_\_\_\_\_.
  - 6. Carbon Monoxide Detectors:
  - 7. Addressable Interface Devices: \_\_\_\_\_.
- D. Notification Appliances:
  - 1. Speakers: \_\_\_\_\_.
  - 2. Horns:
  - 3. Strobes: \_\_\_\_\_.
- E. Magnetic Door Holders:
  - 1. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate.
    - a. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
    - b. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
    - c. Rating: 24-V ac or dc.
  - 2. Material and Finish: Match door hardware.
- F. Emergency Power Supply
  - 1. Verify capacity of existing batteries and increase as require. Perform battery load calculations per NFPA 72.
  - 2. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.
- G. Control Relays:
  - 1. Description: Control relays shall be fully addressable. Control relays shall provide addressable control functions of auxiliary devices. The control relay shall have a resistive rating of 2A at 28 VDC, or ½A at 120 VAC, and an inductive rating of 1A at 28 VDC, or ½A at 120 VAC. Control relays shall be provided with auxiliary dry contacts for connection to other monitor systems such as the building automation system.
- H. Circuit Conductors: Copper; provide 200 feet extra; color code and label.
- I. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
  - 1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
  - 2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.

3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.
- J. Locks and Keys: Deliver keys to Owner.
  1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type
- K. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
  1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
  2. Provide one for each control unit where operations are to be performed.
  3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
  4. Provide extra copy with operation and maintenance data submittal.
- L. Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
  1. Padlock eye and hasp for lock furnished by Owner.
  2. Locate as directed by Owner.

## 2.8 REMOTE ANNUNCIATOR

- A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, reset, and test.
  1. Mounting: Semi-Recessed cabinet, NEMA 250, Class 1.
- B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP. Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. The FCC display shall be programmed to correspond with room names and numbers for alarm initiating or supervisory devices. The FCC display shall correspond to the contractor submitted "as built" drawings. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.
- C. Provide microphone at remote annunciator location where voice evacuation speakers provided for fire department use.

## PART 3 - EXECUTION

### 3.1 EQUIPMENT INSTALLATION

- A. Connect the FACP with a disconnect switch with lockable handle or cover.

- B. Locate all devices as required by NFPA 72 and manufacturer's recommendations.
- C. Manual Pull Stations: Mount semi-flush in recessed back boxes.
- D. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.
- E. Audible Alarm-Indicating Devices: Where mounted on walls, install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.
- F. Smoke Detectors:
  - 1. Locate such that no point on a wall is further than 15' from the detector.
  - 2. Locate greater than 36" from any air supply diffuser or return grill.
  - 3. Locate such that detectors are no more than 30' spacing between smoke detectors.
- G. Heat Detectors:
  - 1. Locate such that no point on a wall is further than 15' from the detector.
  - 2. Locate greater than 36" from any air supply diffuser or return grill.
  - 3. Locate such that detectors are spaced as indicated in manufacturer's recommendations.
- H. Visible Alarm-Indicating Devices: Install per NFPA-72 wall mount or ceiling mount requirements in chapter 7.
  - 1. Locate such that strobe light is within 15' of end of corridors.
  - 2. Locate such that lights are spaced as indicated in manufacturer's recommendations.
  - 3. Fire alarm system supplier shall verify candela levels required for each location.
- I. FACP: Surface mount with tops of cabinets not more than 72 inches above the finished floor.
- J. Annunciator: Install with the top of the panel not more than 72 inches above the finished floor.

### 3.2 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated. Class "A" preferred system.
- B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Cable Taps: Not permitted.

- D. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.
- E. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

### 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to Division 16 Section "Electrical Identification."
- B. Install instructions frame in a location visible from the FACP.
- C. Paint power-supply disconnect switch red and label "FIRE ALARM."

### 3.4 GROUNDING

- A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, and other impairments.
- B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.
- C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 16 Section "Grounding."
- D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

### 3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.
- B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

- C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.
- D. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:
  - 1. Verify the absence of unwanted voltages between circuit conductors and ground.
  - 2. Test all conductors for short circuits using an insulation-testing device.
  - 3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
  - 4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
  - 5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
  - 6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
  - 7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.
  - 8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.
- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.
- G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.
- H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

### 3.6 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

### 3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
  - 1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training.
  - 2. Train Owner's maintenance personnel to program system, per manufacturer's or manufacturer's representatives training program.
  - 3. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
  - 4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

### 3.8 ON-SITE ASSISTANCE

- A. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

END OF SECTION 16851