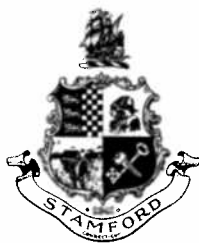


**MAYOR
DAVID R. MARTIN**



**PURCHASING AGENT
BEVERLY A. AVENI
Phone: (203) 977-4107
FAX: (203) 977-5253
Email: baveni@stamfordct.gov**

**CITY OF STAMFORD
OFFICE OF ADMINISTRATION
888 WASHINGTON BOULEVARD
STAMFORD, CT 06901-2152**

**REQUEST FOR PROPOSALS No. 706
MATERIALS TESTING AND SPECIAL INSPECTION SERVICES
FOR
NEW POLICE HEADQUARTERS**

PROPOSALS DUE:

OCTOBER 13, 2016 @ 4:00 P.M.

SUBMIT TO:

**CITY OF STAMFORD
888 WASHINGTON BOULEVARD
STAMFORD, CT 06904-2152**

ATTENTION:

**BEVERLY A. AVENI
AT (203) 977-4107 OR
baveni@stamfordct.gov**

NUMBER OF COPIES REQUIRED:

**ONE ORIGINAL AND SIX (6)
COPIES, PLUS TWO (2)
ELECTRONIC VERSIONS
(EITHER CD ROM OR USB
DRIVE)**

**NOTE 1: RFP SPECIFICATIONS, DOCUMENTS AND DRAWINGS CAN BE PICKED UP FROM COUNTY REPRODUCTIONS
39 BELDEN STREET, STAMFORD, CT 06902. TELE: (203) 348-3758; FAX: (203) 348-2654. A NON-REFUNDABLE FEE WILL
BE CHARGED FOR THESE DOCUMENTS.**

**Date Issued: (9/13/16)
(REV: 6-1-16)**



CITY OF STAMFORD, CONNECTICUT

NOTE

EFFECTIVE JANUARY 2, 2009 THE PURCHASING DEPARTMENT IS REQUESTING THAT YOU IDENTIFY CLEARLY, WITH A 'TAB/STICKER', YOUR FEE PROPOSAL SHEET(S), AS WELL AS YOUR BID BOND PAGES, (IF APPLICABLE).

Effective: 1/2/09



CITY OF STAMFORD, CONNECTICUT

IMPORTANT

Caution : The competitive bid/proposal process requires that the City of Stamford provide all competitors with equal and timely access to information. To enhance our capabilities, the Purchasing Department is providing bid information over the Internet. You may use this application provided you agree with the following understandings:

1. The City cannot guarantee that the equipment involved in this technology will be available to provide information or receive transmittals. IT IS YOUR RESPONSIBILITY TO ENSURE THAT YOU HAVE CURRENT INFORMATION AND THAT QUOTATIONS ARE RECEIVED AT THE DESIGNATED LOCATION, COMPLETE AND ON TIME.
2. The City is not responsible for the confidentiality of information transmitted over the Internet.
3. The City makes no guarantee as to the completeness or accuracy of downloaded "Request for Bid", "Request for Proposal" or "Request for Qualification".
4. Bids/Proposals must be received in hard copy in the Purchasing Department by the due date and time in order to be considered. Please be advised that the Purchasing Department does not accept bids or proposals by email or fax. More Information: (203) 977-4108, (203) 977-4107 or (203) 977-4994.
5. Please note modifications made to the City's Standard form of Contract with the addition of Dispute Resolution on page 8 of the General Conditions and page 4 of the Sample Contract. Also, added is the Article IV- Labor Standards and Responsibilities after the General Conditions.
6. PLEASE NOTE THE ADDITION OF THE "CONTRACTOR'S STATEMENT" ON THE NEXT PAGE.

Contractor's Statement

Pursuant to Section 103.1 of the Stamford Code of Ordinances, I hereby provide the following:

If a joint venture, trustee, partnership, limited liability company or partnership, the names and addresses of all joint venturers, beneficiaries, partners or members:

If a corporation, the names and addresses of all officers and the names and addresses of all parties owning over 10% of its common stock or over 10% of its preferred stock. If any of said stockholders is a holding corporation, the names and addresses of all persons owning a beneficial interest in over 10% of the common or preferred stock of said holding company.

The names and positions of all persons listed hereinabove who are elected or appointed officers or employees of the City of Stamford.

Name of
Bidder/Proposer: _____

Signature of Bidder/Proposer _____

Title: _____

Company Name: _____

Address: _____

Non-Collusion Certification – RFP/RFQ

By submission of this Proposal, each Proposer or person signing on behalf of the Proposer, certifies that to the best of his/her knowledge and belief:

1. The prices in this Proposal have been arrived at independently without collusion, consultation, communication, or agreement with any other Proposer or with a competitor for the purpose of restricting competition.
2. Unless otherwise required by law, the prices, which have been quoted in this Proposal, have not been knowingly disclosed by the Proposer and will not knowingly be disclosed by the Proposer prior to opening, directly or indirectly, to any other Proposer or to any competitor.
3. No attempt has been made or will be made by the Proposer to induce any other person, partnership or corporation to submit or not to submit a Proposal for the purpose of restricting competition.

Non-Collusion Affidavit

The undersigned, having been duly sworn, affirms and says that to the best of his/her knowledge and belief:

1. The prices in this Proposal have been arrived at independently without collusion, consultation, communication, or agreement with any other Proposer or with any competitor for the purpose of restricting competition.
2. Unless otherwise required by law, the prices, which have been quoted in this Proposal, have not been knowingly disclosed by the Proposer and will not knowingly be disclosed by the Proposer prior to opening, directly or indirectly, to any other Proposer or to any competitor.
3. No attempt has been made or will be made by the Proposer to induce any other person, partnership or corporation to submit or not to submit a Proposal for the purpose of restricting competition.

Name of Proposer: _____

By: _____

Print Name: _____

Title: _____

ACKNOWLEDGMENT

STATE OF _____ :
COUNTY OF _____ : S.S.: Date: _____

Personally appeared _____, as _____
of the above named firm, and attested that the foregoing statements are true and
accurate to the best of his/her knowledge and belief.

Notary Public
My Commission Expires: _____

EFFECTIVE: 2/24/09
(Construction Only)

**MAYOR
DAVID R. MARTIN**



**CITY OF STAMFORD
OFFICE OF POLICY & MANAGEMENT
888 WASHINGTON BOULEVARD
P.O. BOX 10152
STAMFORD, CONNECTICUT 06904-2152
(Rev. 12/2/13)**

**PURCHASING AGENT
BEVERLY A. AVENI
Phone: (203) 977-4107
FAX: (203) 977-5253
Email: baveni@ci.stamford.ct.us**

EQUAL EMPLOYMENT OPPORTUNITY

1. Notification to Bidders

The contract awarded is subject to contract compliance requirements mandated by Sections 4a-60 and 4a-60a of the Connecticut General Statutes.

The City of Stamford aggressively solicits the participation of legitimate minority business enterprises as bidders, contractors, subcontractors and suppliers of materials. "Minority business enterprise" is defined in Section 4a-60 of the Connecticut General Statutes as a business wherein fifty-one percent or more of the capital stock, or assets belong to a person or persons: (1) Who are active in daily affairs of the enterprise; (2) who have the power to direct the management and policies of the enterprise; and (3) who are members of a minority, as such term is defined in subsection (a) of Section 32-9n." "Minority" groups are defined in Section 32-9n of the Connecticut General Statutes as "(1) Black Americans; (2) Hispanic Americans; (3) persons who have origins in the Iberian Peninsula; (4) Women; (5) Asian Pacific Americans and Pacific Islanders; and (6) American Indians. An individual with a disability is also a minority business enterprise as provided by Section 4a-60g of the Connecticut General Statutes. The City will consider the following factors when reviewing the Bidder's/Proposer's qualifications:

- (a) success in implementing an affirmative action plan;
- (b) where applicable, success in developing an apprenticeship program complying with Sections 46a-68-1 to 46a-68-17 of the Administrative Regulations of Connecticut State Agencies, inclusive;
- (c) a promise to develop and implement a successful affirmative action plan;
- (d) submission of employment statistics contained in the Connecticut Commission on Human Rights and Opportunities ("CCHRO") "Employment Information Form", indicating that the composition of its workforce is at or near parity when compared to the racial and sexual composition of the workforce in the relevant labor market area; and

- (e) a promise to set aside a portion of the contract for legitimate minority business enterprises.

2. Non-Discrimination

(a) The contractor agrees and warrants that in the performance of the contract, it will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, sexual orientation, mental retardation or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut. If the contract is for a public works project, the contractor agrees and warrants that it will make good faith efforts to employ minority business enterprises as subcontractors and supplies of materials on such project. The contractor further agrees to take affirmative action to ensure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, sexual orientation, mental retardation, or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved;

(b) the contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the contractor, to state that it is an "Affirmative Action-Equal Opportunity Employer" in accordance with regulations adopted by the CCHRO;

(c) the contractor agrees to provide each labor union or representative of workers with which such contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such contractor has a contract or understanding, a copy of these provisions, advising the labor union or worker's representative of the contractor's commitments under these provisions and to post copies of the notice in conspicuous places available to employees and applicants for employment;

(d) the contractor agrees to comply with each provision of this section and Conn. Gen. Stat. Sections 4a-62, 32-9e, 46a-56 and 46a-68b to 46a-68k, inclusive, and with each regulation or relevant order issued by said CCHRO;

(e) the contractor agrees to provide the City with such information requested by the City, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the contractor.

3. Subcontractors

The contractor shall include the provisions of subsection (2) in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the City and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the CCHRO. The contractor shall take such action with respect to any such subcontract or purchase order as the City may direct as a means of enforcing such provisions.

The contractor agrees to comply with the CCHRO's requirements as they exist on the date of this contract and as they may be adopted or amended from time to time during the term of this contract and any amendments thereto.

**MAYOR
DAVID R. MARTIN**



**CITY OF STAMFORD
OFFICE OF POLICY & MANAGEMENT
888 WASHINGTON BOULEVARD
P.O. BOX 10152
STAMFORD, CONNECTICUT 06904-2152
(Rev. 12/2/13)**

**PURCHASING AGENT
BEVERLY A. AVENI
Phone: (203) 877-4107
FAX: (203) 877-5253
Email: baveni@ci.stamford.ct.us**

GIFTS: During the term of this contract, including any extensions, the Contractor shall refrain from making gifts of money, goods, real or personal property or services to any appointed or elected official or employee of the City of Stamford or the Stamford Board of Education or any appointed or elected official or employee of their Boards, Commissions, Departments, Agencies or Authorities. All references to the Contractor shall include its officers, directors, employees, and owners of more than 5% equity in the contractor. Violation of this provision shall constitute a material breach of this Agreement, for which this Agreement may be summarily terminated.

PLEASE NOTE: THIS AGREEMENT IS PROVIDED AS AN EXAMPLE ONLY. THE ACTUAL CONTRACT SUBMITTED FOR YOUR FIRM'S SIGNATURE WILL VARY BASED UPON THE PARTICULARS OF THE SPECIFIC RFP/RFQ PACKAGE.

A G R E E M E N T

THIS AGREEMENT dated the day of , 2014, by and between the **CITY OF STAMFORD**, a municipal corporation in the State of Connecticut, hereinafter referred to as the "City", 888 Washington Boulevard, Stamford, Connecticut 06904, acting herein by David R. Martin, its Mayor, hereunto duly authorized, and

hereinafter referred to as the "Contractor", acting herein by ,
duly authorized.

W I T N E S S E T H

WHEREAS, the City of Stamford solicited Request for Proposals # for ; and,

WHEREAS, the Contractor has responded to the City by submitting a Response to the Request for Proposal; and,

WHEREAS, the City has accepted the Contractor's Proposal for said work, pursuant to the terms hereinafter set forth.

NOW THEREFORE, THE PARTIES AGREE AS FOLLOWS:

1. SCOPE OF SERVICES. The scope of services shall consist of those duties, functions, obligations, responsibilities, and tasks set forth in: (a) the City's Request for Proposal # , attached hereto as Exhibit A and made a part hereof; and (b) the Contractor's Proposal, Exhibit B attached hereto and incorporated herein.

2. COMPENSATION. The City shall pay as compensation to the Contractor a fee of

3. TIME OF COMMENCEMENT AND COMPLETION OF WORK. The Contractor shall commence the work hereunder upon the execution of this Agreement by both parties and shall complete said work in a timely, efficient, and diligent manner. It is agreed and understood that time is of the essence, and that if the Contractor fails to perform the work within the period allowed, the City shall have the right to terminate this Agreement and/or pursue appropriate legal recourse for the Contractor's breach of this Agreement.

4. REVIEW OF WORK. The Contractor will permit the City, its officers, agents, and employees, to review, at any time, all work performed under the terms of this Agreement at any stage of the work.

5. INDEMNIFICATION. The Contractor shall indemnify and hold harmless the City, its officers, agents and employees, from and, if requested, shall defend them against any loss, cost, damage, injury, liability, and claim for injury to or death of a person, including employees of the Contractor or loss of or damage to property, resulting directly or indirectly from the Contractor's performance of this Agreement, or by any omission to perform some duty imposed by law or agreement upon the Contractor, its officers, agents and employees. The foregoing indemnity shall include, without limitation, reasonable fees of attorneys, Contractors and experts, and related costs and the City's cost of investigating any claims against it.

In addition to the Contractor's obligation to indemnify the City, the Contractor specifically acknowledges and agrees that it has an immediate and independent obligation to defend the City from any claim which actually or potentially falls within this indemnification provision, even if the allegations are or may be groundless, false or fraudulent, which obligation arises at the time such claim is tendered to the Contractor by the City and continues at all times thereafter.

The Contractor shall indemnify and hold the City, its officers, agents and employees, harmless from all loss and liability, including attorneys' fees, court costs and all other litigation expenses arising out of the Contractor's performance of this Agreement.

6. ASSIGNMENT. The Contractor shall not assign, sub-contract, or transfer any portion of the work set forth herein without the prior written approval of the City.

7. BOOKS AND RECORDS. The Contractor shall maintain or cause to be maintained all records, books, or other documents relative to charges, costs, expenses, fees, alleged breaches of Agreement, settlement of claims, or any other matter pertaining to the Contractor's demand for compensation by the City for a period of not less than three (3) years from the date of the final payment for work performed under this Agreement.

8. INSURANCE. The Contractor shall provide and pay for such insurance as is set forth in Exhibit A - Insurance Requirements of the City of Stamford, attached hereto as Exhibit A and made a part hereof.

9. REPRESENTATION. The Contractor represents that it is an expert in relation to the work to be performed under this Agreement. The Contractor further represents that it has the requisite skill, expertise, and knowledge necessary to perform the scope of services required under the terms of this Agreement, including any supplementary work and the City relies upon said representation in executing this Agreement.

10. INTERPRETATION. The parties agree that in the event of any ambiguity between the terms of this Agreement, the City's Request for Proposal (Exhibit A), and the Contractor's Proposal (Exhibit B), the City in its sole discretion shall determine the terms and/or the documents which shall prevail and take precedence.

11. NON-APPROPRIATION. Contractor acknowledges that the City is a municipal corporation and that the City's obligation to make payments under this Agreement is contingent upon the appropriation by the City's Board of Representatives of funds sufficient for such purposes, for each budget year in which this Agreement is in effect. If sufficient funds to provide for the payment(s) hereunder are not appropriated, the City may terminate this Agreement upon notice in writing to the Contractor.

12. SUBCONTRACTING. The Contractor is prohibited from subcontracting this Agreement or any part of it unless the City first approves such subcontracting in writing and approves, in writing, the specific subcontractors proposed to be used by the Contractor. An agreement made in

violation of this provision shall confer no rights on any party and shall be null and void.

In addition to the foregoing, pursuant to Section 103.4 of the Code, the Contractor agrees to supply the City with the names and addresses of all subcontractors to be used for any subcontract which shall be in an amount in excess of Ten Thousand Dollars (\$10,000.00). Said information shall be supplied at the time such contracts are executed.

13. CONTRACT EXTRAS. Pursuant to Section 23-18.4C of the Code, it is specifically understood and agreed by the Contractor that all contract extras regarding this contract shall be governed by the City Charter and/or the Code. The City shall not be liable for payment of any additional costs unless the provisions of the City Charter and/or the Code are fully complied with. The provisions of the City Code can be found at www.municode.com

14. COMPLIANCE WITH CITY CODE PROVISIONS. The Contractor shall fully comply with the requirements of Sections 103-1 through 103-7 of the Code. Failure to so comply shall constitute a material breach of the terms of this Agreement, for which the City may unilaterally terminate the Agreement upon written notice to the Contractor. The provisions of the City Code can be found at www.municode.com

15. TERMINATION. A. TERMINATION FOR CAUSE. If, through any cause, the Contractor shall fail to fulfill, in a timely and proper manner, its obligations under this Agreement, or if the Contractor shall violate any of the covenants, agreements, or stipulations of this Agreement, the City shall thereupon have the right to terminate this Agreement for cause by giving written notice to the Contractor of such termination and specifying the effective date thereof, at least five (5) days before the effective date of such termination. In that event, all finished or unfinished reports, documents, data, studies, surveys, drawings, maps, models, photographs, and reports or other material prepared by the Contractor and/or its subcontractors under this Agreement shall, at the option of the City, become its property, and the Contractor shall be entitled to receive just and equitable compensation for any satisfactory work completed on such documents and other materials to the effective date of termination.

The term "cause" includes, without limitation the following:

- 1) If the Contractor furnished any statement, representation, warranty or certification in connection with this Agreement, which is materially false, deceptive, incorrect, or incomplete.
- 2) If the Contractor fails to perform to the City's satisfaction any material requirement of the Agreement, or is in violation of any specific provision thereof.
- 3) If the City reasonably determines satisfactory performance of the Agreement is substantially endangered or can reasonably anticipate such an occurrence or default.

Notwithstanding the above, the Contractor shall not be relieved of liability to the City for any damages sustained by the City by virtue of any breach of the Agreement by the Contractor, and the City may withhold any payment to the Contractor for the purposes of setoff until such time as the exact amount of damages due the City from the Contractor is determined.

B. TERMINATION FOR CONVENIENCE. The City may terminate this Agreement at any time the City determines that the purposes of the distribution of monies under the Agreement would no longer be served by completion of the Work/Project. The City shall effect such termination by giving written notice of termination to the Contractor and specifying the effective date thereof, at least twenty (20) days before the effective date of such termination. In that event, all finished or unfinished documents and other materials as described Subsection A shall, at the option of the City, become its property. If the Agreement is terminated by the City as provided herein, the Contractor shall be paid an amount which bears the same ratio to the total compensation as the services actually and satisfactorily performed to the effective date of termination bear to the total services of the Contractor pursuant to the terms of the Agreement, less payments of compensation previously made, and subject to the City's right of set off for any damages pursuant to the terms of the Agreement.

16. GOVERNING LAWS. This Agreement shall be governed by the laws of the State of Connecticut.

17. GIFTS: During the term of this contract, including any extensions, the Contractor shall refrain from making gifts of money, goods, real or personal property or services to any appointed or elected official or employee of the City of Stamford or the Stamford Board of Education or any appointed or elected official or employee of their Boards, Commissions, Departments, Agencies or Authorities. All references to the Contractor shall include its officers, directors, employees, and owners of more than 5% equity in the contractor. Violation of this provision shall constitute a material breach of this Agreement, for which this Agreement may be summarily terminated.

THIS PAGE LEFT INTENTIONALLY BLANK

SIGNATURE PAGE FOLLOWS

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

Signed, sealed and delivered
in the presence of:

CITY OF STAMFORD

Beverly A. Aveni
Purchasing Agent

Date: _____

By _____
David R. Martin
Mayor

Date: _____

THE CONTRACTOR

Witness

By _____
Date: _____

Approved as to Form:

Approved as to Insurance:

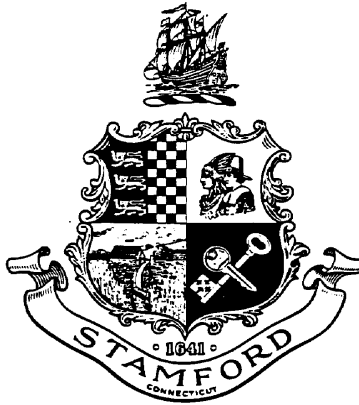
B. Rosenberg
Asst. Corp. Counsel

Date: _____

A. M. Mones
Risk Manager

Date: _____

REVISED: 12/2/13



REQUEST FOR PROPOSALS

MATERIALS TESTING & SPECIAL INSPECTION SERVICES

For

NEW POLICE HEADQUARTERS

1.0 GENERAL INFORMATION

2.0 PROJECT SCOPE

3.0 PROPOSAL INSTRUCTIONS

4.0 PROPOSAL EVALUATION

Appendix A – Drawings & Specifications

Appendix B – Fee Proposal

Appendix C – Statement of Special Inspections

Appendix D – Insurance Requirements

Appendix E – Sample Agreement

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

This Request For Proposals (RFP) was prepared to solicit proposals from qualified responsible firms to provide various types of testing and special inspection services, including but not limited, to soil compaction, bearing capacity, sieve tests, rebar, concrete and form inspection, concrete cylinders and break tests, masonry, structural steel inspections (bolt and weld) for the New Police Headquarters, 725 Bedford Street, Stamford, CT 06902.

Each proposal shall be accompanied by a completely filled in and properly executed copy of Qualification questionnaire, Ordinance Compliance form and Non-Collusion Affidavit.

All work shall be done in accordance with the applicable State of Connecticut Statutes.

All Testing and Inspections Agencies wishing to submit a proposal for this **Must Be NVLAP Accredited** and shall be required to provide documentation with your proposal to confirm same.

If it is your intention to use a sub-consultant to perform testing and/or inspections that are not normally performed by your company, then you must clearly state which items are to be tested by others and the name and address of the sub-testing/inspection agency.

The words "consultant" and "proposer" are used interchangeably in this "Request for Proposals".

1.2 ISSUING OFFICE

This RFP is being issued by the Purchasing Department of the City of Stamford on behalf of the Office of Operations, Engineering Bureau. The issuing officer is the Purchasing Agent or her designee.

1.3 INQUIRIES

All inquiries regarding this RFP must be in writing and must be either emailed or faxed prior to September 22, 2016, and be addressed to:

Jeffrey Pardo, Construction Manager
Engineering Bureau, Office of Operations
City of Stamford
888 Washington Boulevard
Stamford, Connecticut 06901
jpardo@stamfordct.gov
203-977-4137 FAX

The City's Engineering Bureau will respond in writing to all written inquiries through the Purchasing Department in the form of Addenda.

1.4 INCURRING COST

The City of Stamford will not be held responsible for any costs incurred by the proposer for work performed in preparation and production of a proposal or for any work performed prior to the issuance of a contract.

1.5 RESPONSE MATERIAL OWNERSHIP

All material submitted regarding this RFP becomes the property of the City of Stamford.

1.6 ACCEPTANCE/REJECTION OF PROPOSALS

The City of Stamford reserves the right to accept or reject any and/or all proposals to best serve its interest, or to hold the proposals for one hundred twenty (120) days before rendering a decision. Acceptance of any firm's response does not place the City of Stamford under any obligation to accept the lowest-priced response. The City of Stamford reserves the right to cancel this RFP at any time without penalty.

1.7 ADDENDA TO RFP

Amendments to this RFP may be necessary prior to the closing date and will be furnished via the City of Stamford Purchasing Department's E-Bid System to all prospective proposers. Failure to acknowledge receipt of amendments in accordance with the instructions contained in the amendment may result in the proposal not being considered.

1.8 PERTINENT DATES

Each proposer must submit one (1) original and six (6) copies, along with two (2) electronic versions (either CD ROM or USB Drive) of the proposal in a sealed envelope bearing on the outside the name of the firm, full address, name of the project for which the proposal is submitted and the date and time the proposal is due to:

Beverly Aveni
Purchasing Agent
City of Stamford
Purchasing Department
888 Washington Boulevard
Stamford, CT 06901
Attn: Materials Testing & Special Inspection
Services for New Police Headquarters

These proposals must be received by the City no later than **Thursday, October 13, 2016, at 4:00 p.m.** Proposals received after the date and time prescribed shall not be considered for contract award and shall be returned to the proposer. Neither faxed nor emailed RFP responses will be accepted as qualified RFP submission.

1.9 PROPRIETARY INFORMATION

All material submitted in response to this RFP will become public record and will be subject to inspection after Intent to Award notice is issued. Any material requested to be treated as proprietary or confidential *must be clearly identified* and easily separable from the rest of the proposal. Such request must include justification for the request. The request will be reviewed and either approved or denied by the City of Stamford. If denied, the Proposer will have the opportunity to withdraw its entire proposal, or to remove the proprietary restrictions. **NEITHER COST, PRICING INFORMATION OR TOTAL PROPOSAL WILL BE CONSIDERED PROPRIETARY.** The City of Stamford will not disclose any portion of the proposals except to members of the proposal evaluation team prior to contract award. The City of Stamford retains the right to disclose the name of the successful proposer, the financial considerations, and any other information in the proposal that is pertinent to the selection of the proposer.

1.10 INDEPENDENT PROJECT COST DETERMINATION AND GRATUITIES

By submission of a proposal, the proposer certifies, that in connection with its procurement:

The financial data in this offer has been arrived at independently, without consultation, communication, or agreement, for the purposes of restricting competition, as to any matter relating to such prices with any other proposer or competitor.

The financial data quoted in this offer will not change for a period of one hundred twenty (120) days after the receipt date at the City of Stamford of this offer.

Unless otherwise required by law, the financial data that has been quoted in this offer have not been knowingly disclosed by proposer and will not knowingly be disclosed by the proposer prior to award, directly or indirectly to any other proposer or to any competitor.

No attempt has been made or will be made by the proposer to induce any other person or firm to submit or not to submit an offer for the purpose of restricting competition.

No elected official or appointed official or employee of the City of Stamford shall benefit financially or materially from this contract.

1.11 PRIME PROPOSER RESPONSIBILITY

Proposers submitting responses to this RFP may utilize the services of sub-contractors or partners. If sub-contractors or partners are planned to be used, this should be clearly explained in the proposal. The prime proposer will be responsible for the entire contract performance whether or not a sub-contractor or partner is to perform. All corporate information required in this RFP must be included for each proposed sub-contractor or partner. The proposal must also include copies of any agreements to be executed between the prime proposer and any sub-contractors or partners in the event of contract award. Under this RFP, the City of Stamford retains the right to approve all sub-contractors or partners. If a proposer is owned or controlled by a parent company, the name, main office address, and parent company's tax identification number shall be provided in the proposal.

1.12 KEY PERSONNEL

The personnel and commitments identified on any proposer's proposal will be considered essential to the work to be performed under this RFP. Prior to diverting any of the specified individuals to other programs or changing the level of effort of the specified individuals, the proposer must notify the Office of Operations fourteen (14) days in advance and will be required to submit justification, including proposed substitutions, in sufficient detail, to permit evaluation of the impact on the project. The proposer will make no deviation without the prior written consent of the Office of Operations. Replacement of personnel will be with personnel of equal ability and qualifications.

Any employee of the proposer, who in the sole opinion of the Office of Operations is unacceptable, shall be removed from the project pursuant to the request of the Office of Operations. The proposer will have fourteen (14) calendar days to fill the vacancy with another employee of acceptable technical experience and skills subject to the written approval of the Office of Operations.

The City shall have the right to reject or terminate any of the staff provided by the proposer with 24-hour notice, and the proposer shall be able to provide immediate, temporary replacement and within 30 days, provide permanent replacement.

1.13 AVAILABILITY OF FUNDS

The contract award under this RFP is contingent upon the availability of funds to the Office of Operations for this project. In the event that funds are not available, any contract resulting from this RFP will become void and of no force and effect.

1.14 PAYMENT

The proposer will bill the Office of Operations based on the submission of monthly invoices in a format to be approved by the City.

1.15 TERMINATION FOR DEFAULT OR FOR THE CONVENIENCE OF THE CONTRACTING AGENCY

Performance under any contract resulting from this RFP may be terminated by the City of Stamford whenever:

The proposer, in the sole opinion of the City, is in default in the performance of the contract and shall fail to correct such default within the period specified by the contracting officer in a notice specifying default; or, the contracting office shall determine that termination is in the best interest of the Office of Operations and/or of the City of Stamford.

Termination will be effected by delivery to the proposer of a notice to terminate, stating the date upon which the termination becomes effective. Upon receipt of the notice to terminate, the proposer shall:

- stop all work;
- assign to the Office of Operations all rights, title and interest in the work being developed;
- deliver forthwith to the Office of Operations all completed work and work in progress;
- preserve and protect, until delivery to the Office of Operations, all material, plans, and documents related to this contract, which, if the contract had been completed, would have been furnished to the Office of Operations or necessary to the completion of the work.

1.16 AMBIGUITY IN THE REQUEST FOR PROPOSALS (RFP)

Prior to submitting the proposal, the proposer is responsible to bring to the City's attention any ambiguity in this RFP. Not to do so, shall result in the proposer forfeiting any claim for adjustment based on such ambiguity as should have been noted by a prudent proposer.

1.17 OWNERSHIP INFORMATION

The City of Stamford shall have unlimited rights to use, disclose, or duplicate, for any purpose whatsoever, all information developed, derived, documented or furnished by the proposer under any contract resulting from this RFP.

In the event of contract award, all data collected and other documentation produced as part of the contract will become the exclusive property of the City of Stamford and may not be copied or removed by any employee of the proposer without written permission of the City of Stamford.

1.18 NEGOTIATED CHANGES

In the event negotiated changes occur after the awarding of the contract, any policies called for in the original contract will remain in effect.

1.19 CONTRACT AGREEMENT

The selected proposer will be required to agree to and sign a formal written contract agreement between the City of Stamford and the proposer, prepared by the Law Department of the City of Stamford (Appendix "E").

1.20 INSURANCE REQUIREMENTS

The selected proposer, upon the signing of the formal contract, will be required to deliver an insurance certificate in amounts, companies, and terms acceptable to the Risk Manager of the City of Stamford. See attached insurance requirements (Appendix "D").

1.21 COMPETITION INTENDED

It is the City's intention that this RFP permit competition. It shall be the proposer's responsibility to advise the City in writing if any language, requirement, scope, specification, etc., or any combination thereof, inadvertently restricts or limits the requirements in this RFP to a single source. Such notification must be received by the City not later than seven (7) days prior to the date set for acceptance of proposals.

1.22 TAX EXEMPT

The City of Stamford is exempt from the payment of taxes imposed by the Federal Government and/or State of Connecticut. Such taxes must not be included in the bid price.

2.0 PROJECT STATEMENT

The City of Stamford is seeking a consultant licensed to practice in the State of Connecticut to provide materials testing and special inspection services for the New Police Headquarters.

2.1(a) Site Location

Police Headquarters
725 Bedford Street
Stamford, CT 06902

2.2 PROJECT BACKGROUND

The project under this RFP consists of, but may not be limited to, the testing and special inspections for the construction of the New Police Headquarters. The existing Police Station located at 805 Bedford Street is both undersized and its existing design does not suite a modern day Police Facility in the 21st Century. In addition, the

building contains a significant amount of hazardous materials, making a renovation and addition project infeasible. Therefore, a new Police Headquarters is warranted.

2.2 PROJECT SCOPE

The scope of work shall consist of all items described in the Statement of Special Inspections dated 4/11/16. Inspectors and testing agents shall report to the City of Stamford Construction Manager or Clerk of the Works each day they visit and inspect the site. Inspectors and testing agents shall update and sign "The Blue Book" after each inspection.

Required inspections based on drawings and specifications prepared by Jacunski Humes Architects dated August 15, 2016.

The City anticipates breaking ground late November 2016 with a July 2018 occupancy.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE Structural Engineer – a licensed SE or PE specializing in the design of building structures

PE/GE Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations

EIT Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT Concrete Field Testing Technician – Grade 1

ACI-CCI Concrete Construction Inspector

ACI-LTT Laboratory Testing Technician – Grade 1&2

ACI-STT Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI Certified Welding Inspector

AWS/AISC-SSI Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI Structural Masonry Special Inspector

ICC-SWSI Structural Steel and Welding Special Inspector

ICC-SFSI Spray-Applied Fireproofing Special Inspector

ICC-PCSI Prestressed Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT Concrete Technician – Levels I, II, III & IV

NICET-ST Soils Technician - Levels I, II, III & IV

NICET-GET Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS EIFS Third Party Inspector

Each day the inspector is on site, the inspector will check-in with the City's Clerk of the Works prior to performing any tests or inspections, and check out with the Clerk of the Works prior to leaving the site. Consultant's fee will be based upon hours worked as indicated by the Clerk of the Works daily reports. Any discrepancies in the work inspected are to be reported to the Clerk of the Works immediately.

Inspectors on site and testing technicians must meet the minimum qualifications as described in the Statement of Special Inspections.

One copy of all testing and inspection reports will be issued to the following:

Jeff Pardo
Engineering Bureau
City of Stamford
888 Washington Boulevard
Stamford, CT 06901
jpardo@stamfordct.gov

Robert DeMarco
Building Department
City of Stamford
888 Washington Boulevard
Stamford, CT 06901
rdemarco@stamfordct.gov

Mark Allen
Jacunski Humes Architects, LLC
15 Massirio Drive, Suite 101
Berlin, CT 06037
mallen@jharchitects.net

John C. Beaoregard
BVH Integrated Services, P.C.
50 Griffin Road South
Bloomfield, CT 06002
johnb@bvh.com

General Contractor
To Be Determined

2.3 DELIVERABLES

All documents are to be prepared and provided to all parties listed via e-mail and regular mail.

2.4 FEE

The project shall be proposed under a not to exceed lump sum fee (see Appendix "B"). Consultant shall propose fixed fees for hourly testing, inspections, and preparing a final report. Each invoice submitted must list what inspections or testing are being billed for.

Reimbursable expenses shall be broken out of the total fee and set at a not to exceed amount. This shall include customary costs for out-of-office use or distribution and expenses directly related to this project. They shall not include gas surcharge, travel, meals or taxes. Back up shall be provided with all invoices.

Additional services, if necessary and agreed to, will be negotiated based upon average hourly rates. The consultant shall not perform any additional services without first informing the Engineering Bureau that additional costs may be associated with the services.

3.0 PROPOSAL INSTRUCTIONS

The contractor shall follow the guidelines given below to allow for the efficient evaluation and selection process.

3.1 CONTENT AND FORMAT

Proposal is to be submitted in three (3) parts:

1. Letter of Transmittal.
2. Proposal response which includes qualifications and work plan.
3. Financial supplement containing the proposed fee.

Seven (7) copies of the three parts (along with two electronic versions) described above are to be submitted to the office contact specified in Section 1.8. Faxed copies of the response will not be accepted.

The proposals must be bound in such a manner that any updates can be incorporated into the original proposal without much difficulty. The name of the contractor must appear on the outside front cover of each copy of the proposal.

Each page of the proposal must be numbered consecutively from the beginning of the proposal through all appended material.

In case there is a need for updating the proposal of the selected firm, the firm will accomplish the need by insertion of the updated pages submitted for all copies. All new or corrected pages must show the date of revision and indicate the portion of the page that has been changed. This later requirement is to be met by drawing vertical lines down both margins of all affected pages.

The City of Stamford reserves the right to reject any unsolicited modifications or additions received between the date of submission and proposal selection, including the substitution of subcontractors or of staff.

3.2 LETTERS OF TRANSMITTAL

The cover letter must specify the following:

The corporation's name and address of the prime contractor.

Name, title and telephone number of the individual within the corporation who is authorized to commit the company to this contract.

The name, title and telephone number of the individual whom the City of Stamford should contact regarding questions, and clarifications.

The corporation name and address of all proposed subcontractors, consultants or partners.

The time for validity of the offer must be one hundred twenty (120) days from the due date of the proposal.

Proposer shall also provide a statement specifying the following qualifications:

- Experience as a testing and special inspections firm, providing professional services for a minimum of ten (10) years.
- Availability of professional staff to be able to work from an office within the area that would allow the assigned professionals to be available on a full time basis.

3.3 PROPOSAL RESPONSE FORMAT

SUMMARY

The summary should include significant features of the proposal including the proposer's experience, and project team. It must include all background information related to the proposer's understanding of the requirements and procedures adopted by the City for successful completion of this project.

PROJECT SCOPE

The proposer shall address all items detailed in Section 2.0 through Section 2.2.

PROJECT MANAGEMENT PLAN

The project management plan shall include sufficiently detailed information to identify the proposer's organization, responsibilities and internal reporting requirements. Where subcontractors are to be used, their names, qualifications, specific tasks and control elements must be specified, as well as the firm's control elements on subcontractor's performance.

Finally, the project management plan must show the relationship between this project and other corporate commitments, the provision for backup personnel and the total corporate resources potentially available to this project.

PROJECT STAFF

A detailed resume must be included for each individual to whom the proposer plans to assign or commit to the project. Where individual resumes for backup or non-assigned personnel are included, they must be clearly marked as "SECONDARY RESOURCES".

For each individual whom the proposer plans to assign to the project, the proposer must designate the individual's status such as full time regular employee, part time regular employee, consultant, etc., and must specify the number of years that the individual has been employed by the proposer.

The proposer should include a separate list of sub-contractors that may be used, along with related costs, to prepare all documents related to the testing and special inspection services requested, if it is determined that the project so requires. The cost for sub-contractors should not be included in the percentage of report costs submitted but submitted separately as a potential cost.

EXPERIENCE AND CAPABILITIES

This section should include detailed information regarding previous projects successfully completed by the proposer and general information related to offering organization to allow the City of Stamford to assess overall capabilities. The contractor must provide information regarding the following items related to past performance:

- History of contract performance.
- History of labor relations.
- Reliability of services.
- Public interaction.

The total number of full time employees and total number of professional employees in the offering organization should be specified. Do not include part time employees or consultants. In the event that subcontractors or partners are proposed, this information should be included for each.

CORPORATE FINANCIAL CAPABILITIES

The proposer should include an annual report for the previous year and banking references. In addition, if proposer plans to have the revenues from this contract assigned to any bank or other institution, the reason for such assignment must be specified and the assignee designated.

REFERENCES

Include at least three (3) references from other organizations or agencies for which the contractor has provided similar services.

APPENDICES

The proposer may provide any additional information that is deemed to be useful to the City of Stamford in evaluating the proposal in Appendices. Generally, this may include examples of prior work products and methods.

3.4 FINANCIAL SUPPLEMENT FORMAT

The proposer must submit a financial supplement, as part of the submission. It must contain the proposer's detailed cost of implementing the project. The estimated costs must be available to show clearly the resources that would be committed to each phase of the project. The estimated costs and fees included in the price proposal must also include a certification confirming that the estimated costs and fees will remain firm throughout the project. The selected proposer may be required to provide detailed information used to determine the overall fee as a condition of award. Appendix "B" should be submitted as a summary of fee proposal and breakout of costs.

4.0 PROPOSAL EVALUATION

4.1 EVALUATION METHODOLOGY

Proposals submitted in response to this RFP will be evaluated by a Selection Committee. This Committee will be comprised of technically qualified personnel from the City of Stamford. Selection will be based on the following criteria:

1. Corporate and Project Experience
2. Corporate Capacity
3. Project Management Plan and Organization
4. Understanding of Work to be Performed
5. Fee

Vendors may be asked to present their proposals to the Selection Committee and/or to respond to questions. Based on the information provided in the proposal and any additional information provided, a final selection will be made.

The City of Stamford reserves the right to reject any and/or all proposals submitted, to request information from any vendors and to negotiate with any of the vendors regarding the terms of the engagement. The City of Stamford intends to select the vendor that, in its sole option, best meets the City's needs, not necessarily the vendor that proposes the lowest fees.

APPENDIX “B”

For the testing and special inspections for the New Police Headquarters, located at 725 Bedford Street. The estimated construction cost for the main building and the garage is \$47,351,683.00 Fee will be a not to exceed lump sum proposal based upon the inspections and requirements of the Statement of Special Inspections.

PROPOSED FEE:

NOT TO EXCEED LUMP SUM

\$ _____

Sieve Analysis Per Sample \$ _____

Proctor test Per test \$ _____

Concrete Cylinders (to include both 7 day and 28 day tests).

Per Cylinder \$ _____

Mortar/Grout Cubes Per Sample \$ _____

PE/SE Half Day \$ _____ Full Day \$ _____

PE/GE Half Day \$ _____ Full Day \$ _____

ACI-CCI Half Day \$ _____ Full Day \$ _____

ICC-RCSI Half Day \$ _____ Full Day \$ _____

ICC-PCSI Half Day \$ _____ Full Day \$ _____

AWS-CWI/ANST Half Day \$ _____ Full Day \$ _____

ACI-CFTT/ACI-STT Half Day \$ _____ Full Day \$ _____

ICC-SMSI Half Day \$ _____ Full Day \$ _____

AWS/AISC-SSI Half Day \$ _____ Full Day \$ _____

ICC-SWSI Half Day \$ _____ Full Day \$ _____

Combined Inspections Half Day \$ _____ Full Day \$ _____

Special Inspection Report Each \$ _____

Final Report \$ _____

Reimbursables (Not to Exceed) \$ _____

Authorized Signature: _____ Date: _____

Name: _____ Phone: _____

Title: _____ Email: _____

Company Name: _____

Address: _____

Federal Tax ID No. _____

Statement of Special Inspections

Project: *Police Headquarters*
Location: *Stamford, Connecticut*
Owner: *City of Stamford*

Design Professional in Responsible Charge: *Karl F. Frey, PE*

This *Statement of Special Inspections* is submitted as a condition for permit issuance in accordance with the Special Inspection and Structural Testing requirements of the Building Code. It includes a schedule of Special Inspection services applicable to this project as well as the name of the Special Inspection Coordinator and the identity of other approved agencies to be retained for conducting these inspections and tests. This *Statement of Special Inspections* encompass the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

The Special Inspection Coordinator shall keep records of all inspections and shall furnish inspection reports to the Building Official and the Registered Design Professional in Responsible Charge. Discovered discrepancies shall be brought to the immediate attention of the Contractor for correction. If such discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge. The Special Inspection program does not relieve the Contractor of his or her responsibilities.

Interim reports shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge.

A *Final Report of Special Inspections* documenting completion of all required Special Inspections, testing and correction of any discrepancies noted in the inspections shall be submitted prior to issuance of a Certificate of Use and Occupancy.

Job site safety and means and methods of construction are solely the responsibility of the Contractor.

Interim Report Frequency: *Monthly* or ☐ per attached schedule.

Prepared by:

Karl F. Frey, PE
(type or print name)

Signature *04/11/2016*
Date



Owner's Authorization:

Building Official's Acceptance:

Signature Date

Signature Date

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Soils and Foundations | <input type="checkbox"/> Spray Fire Resistant Material |
| <input checked="" type="checkbox"/> Cast-in-Place Concrete | <input type="checkbox"/> Wood Construction |
| <input checked="" type="checkbox"/> Precast Concrete | <input type="checkbox"/> Exterior Insulation and Finish System |
| <input checked="" type="checkbox"/> Masonry | <input type="checkbox"/> Mechanical & Electrical Systems |
| <input checked="" type="checkbox"/> Structural Steel | <input type="checkbox"/> Architectural Systems |
| <input checked="" type="checkbox"/> Cold-Formed Steel Framing | <input type="checkbox"/> Small Diameter Grouted Piles (Micropiles) |

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. Special Inspection Coordinator	To be determined or BVH Integrated Services, P.C.	50 Griffin Road South Bloomfield, CT 06002 (860) 286-9171 karlf@bvhis.com
2. Inspection and Testing Agency	To be determined	
3. Inspection and Testing Agency		
4. Inspection and Testing Agency		
5. Inspection and Testing Agency		
6. Geotechnical Engineer	Dr. Clarence Welti, PE, PC	227 Williams Street Glastonbury, CT 06033-0397 860-633-4623 cwelti@weltiassoc.com

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

PE/SE	Structural Engineer – a licensed SE or PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.
------	---

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector
----------	----------------------------

Other

Soils and Foundations		
Item	Agency # (Qualif.)	Scope
1. Shallow Foundations	6/2 PE/GE	Inspect soil at bottom of footing elevations and verify suitability and consistency of bearing stratum with geotechnical report prior to concrete placement. Ensure that excavation is to proper depth. Verify extent of over-excavation where applicable. Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill.
2. Controlled Structural Fill	6/2 PE/GE	Perform sieve tests (ASTM D422 & D1140) and modified Proctor tests (ASTM D1557) of each source of fill material. Inspect placement, lift thickness, and compaction of controlled fill. Test density of each lift of fill by nuclear methods (ASTM D2922) Verify extent and slope of fill placement.
3. Geotextile Separation Fabric and Slab Subbase	6/2 PE/GE	Inspect installation of geotextile fabric and slab crushed stone subbase.
4. Vapor Retarder	2 ACI-CCI	Inspect installation of under slab vapor retarder to confirm that installation and taping are in accordance with the manufacturer's written instructions. Verify all penetrations and blockouts through the vapor retarder are sealed per the manufacturer's published details.
5. Pile Foundations	2/6 PE/GE	
6. Load Testing	2/6 PE/GE	
7. Pile Splices	2 AWS-CWI ASNT	
7. Underpinning and Excavation Support Systems	6 PE/GE	
8. Other Reports	1 and 6 PE	Review contractor's field quality control procedures. Monitor testing lab and field inspection results to ensure conformance with construction documents. Notify Engineer of Record immediately of all discrepancies.

Cast-In-Place Concrete		
Item	Agency # (Qualif.)	Scope
1. Mix Design	2 ACI-CCI ICC-RCSI	Review concrete batch tickets and verify compliance with approved mix design.
2. Material Certification	1 PE	Review certificates of compliance for concrete materials.
3. Reinforcement Installation	2 ACI-CCI ICC-RCSI	Inspect size, spacing, cover, positioning and grade of all reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters.
4. Batching Plant	1/2 ACI-CCI	Review plant quality control procedures and batching and mixing methods.
5. Welding of Reinforcing	2 AWS-CWI	Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.
6. Anchor Rods	2 ACI-CCI ICC-RCSI	Inspect size, positioning and embedment of all anchor rods prior to and during concrete placement. Inspect concrete placement and consolidation around anchors.
7. Formwork Geometry	2 ACI-CCI ICC-RCSI	Review for general conformance with contract documents.
8. Concrete Placement	2 ACI-CCI ICC-RCSI	Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated. Verify use of required design mix.

Cast-In-Place Concrete		
Item	Agency # (Qualif.)	Scope
9. Sampling and Testing of Concrete	2 ACI-CFTT ACI-STT	<p>Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064).</p> <p>Slump: ASTM C 143; one test at point of discharge for each set of compression strength cylinders and additional tests when concrete consistency seems to have changed.</p> <p>Compression Test Cylinders: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed.</p> <p>Compressive-Strength Tests: ASTM C 39; one set for each day's pour, plus additional sets for each 50 cubic yards of each concrete class placed in any one day.</p> <p>Provide one set of field cured cylinders for each concrete type for any days that are less than or expected to be less than 40 deg F within 24 hours after concrete placement.</p>
10. Curing and Protection	2 ACI-CCI ICC-RCSI	Inspect curing, cold weather protection and hot weather protection procedures. Inspect for maintenance of specified concrete curing temperature and techniques.
11. Non-shrink grout for column base plates and beam bearing plates.	2 ACI-CFTT ACI-STT	Cast cubes and perform strength tests in conformance with ASTM C-109. Review curing and extreme weather precautions per Manufacturer's requirements.
12. Expansion and Adhesive Anchoring	2 ACI-CCI ICC-RCSI	Witness installation of 25 percent for conformance with Manufacturer's requirements. Verify that materials are suitable for job conditions.
13. Other Reports	1 PE	Review contractor's field quality control procedures. Monitor testing lab and field inspection results to ensure conformance with construction documents. Notify Engineer of Record immediately of all discrepancies.

Precast Concrete		
Item	Agency # (Qualif.)	Scope
1. Plant Certification / Quality Control Procedures	ACI-CCI ICC-RCSI	Review plant operations and quality control procedures.
2. Mix Design	2 ACI-CCI ICC-RCSI	Inspect concrete batching operations and verify compliance with approved mix design.
3. Material Certification	2 ACI-CCI ICC-RCSI	Review for conformance with Contract Documents and approved shop drawings.
4. Reinforcement Installation	2 ACI-CCI ICC-RCSI	Inspect size, spacing, position and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials.
5. Prestress Operations	2 ICC-PCSI	Inspect placement, stressing, grouting and protection of prestressing tendons.
6. Connections / Embedded Items	2 ACI-CCI ICC-RCSI	Review for conformance with approved shop drawings.
7. Formwork Geometry	2 ACI-CCI ICC-RCSI	Review for conformance with contract drawings and approved shop drawings.
8. Concrete Placement	2 ACI-CCI ICC-RCSI	Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.
9. Sampling and Testing of Concrete	2 ACI-CFTT ACI-STT	Periodic review of sampling and testing procedures of Precaster for compliance with Contract Documents and ASTM procedures. Review batch plant compression tests reports.
10. Curing and Protection	2 ACI-CCI ICC-RCSI	Inspect curing, cold weather protection and hot weather protection procedures.
11. Erected Precast Elements	2 PE/SE AWS-CW	Inspect erection of precast concrete including member configuration, connections, welding and grouting.
12. Other:	1 PE	Review contractor's field quality control procedures. Monitor testing lab and field inspection results to ensure conformance with construction documents. Notify Engineer of Record immediately of all discrepancies.

Masonry		Required Inspection Level: <input checked="" type="checkbox"/> 1 (Periodic) <input type="checkbox"/> 2 (Full Time)
Item	Agency # (Qualif.)	Scope
1. Material Certification	1 PE	Review certificates of compliance for masonry units, mortar and grout ingredients, and metal reinforcement and accessories.
2. Mixing of Mortar and Grout	2 ICC-SMSI	Inspect proportioning, mixing and retempering of mortar and grout. Review mix design proportions, and inspect onsite mixing operations.
3. Installation of Masonry	2 ICC-SMSI	Inspect size, layout, bonding, mortaring and placement of masonry units. Verify the installation of bond beams and special shapes.
4. Mortar Joints	2 ICC-SMSI	Inspect construction of mortar joints including tooling and filling of head joints.
5. Reinforcement Installation	2 ICC-SMSI AWS-CWI	Inspect the size, quality, positioning and placement of all reinforcing bars and wire for its conformance with the Contract Documents. Also inspect placement of inserts and anchorages. Inspect all lapping of steel reinforcement and welding of reinforcing.
6. Prestressed Masonry	ICC-SMSI	Not Applicable.
7. Grouting Operations	2 ICC-SMSI	Inspect cells prior to grouting. Inspect placement and consolidation of grout. Inspect masonry clean-outs for high-lift grouting. Perform random slump testing for grout.
8. Weather Protection	2 ICC-SMSI	Inspect cold weather protection and hot weather protection procedures. Verify that wall cavities are protected against precipitation. When ambient temperature falls below 40 deg F, or rises above 90 deg. F, follow procedures per ACI 530.1, Section 2.3. Keep temperature records and monitor curing procedures.
9. Evaluation of Masonry Strength	2 ICC-SMSI	Test compressive strength of mortar and grout cube samples (ASTM C780). Agency shall oversee construction of prisms in accordance with ASTM C1314. One set of hollow core prisms and one set of grout filled prisms are required for preconstruction testing and each 2,000 square feet of masonry wall. Prisms to be tested at 28 days. Reports to be in accordance with ASTM C1314.
10. Anchors and Ties	2 ICC-SMSI	Inspect type, size, location, spacing and embedment of dowels, anchors and ties. Inspect anchorage of masonry to other construction for conformance with Contract Documents and approved shop drawings.

Masonry	Required Inspection Level: <input checked="" type="checkbox"/> 1 (Periodic) <input type="checkbox"/> 2 (Full Time)	
Item	Agency # (Qualif.)	Scope
11. Other Reports	1 PE	Review contactor's field quality control procedures. Monitor testing lab and field inspection results to ensure conformance with construction documents. Notify Engineer of Record immediately of all discrepancies.

DRAFT

Structural Steel		
Item	Agency # (Qualif.)	Scope
1. Fabricator Certification / Quality Control Procedures	2 AWS/ AISC-SSI ICC-SWSI	Verify that structural steel fabricator is AISC certified.
2. Material Certification	1/2 AWS/ AISC-SSI ICC-SWSI	<p>Certified mill test reports for structural steel, bolts, nuts, washers, and welding electrodes shall be reviewed by the Special Inspector. Verify grade of steel. Material identification markings shall be reviewed for compliance by on site Testing Technician.</p> <p>Verify members designated as part of the Seismic Load Resisting System (See S6-1) meet the toughness requirements as stipulated in AISC 341-05.</p> <p>Verify that Contractor has submitted Welding Procedure Specifications per AWS D1.8 and that procedures and materials meet the requirements for Demand Critical Welds indicated as being part of the Seismic Load Resisting System. (See S6-1).</p>
3. Anchor Rods	2 AWS/ AISC-SSI ICC-SWSI	Review Contractor's as-built survey. Verify that all anchor rods have been properly torqued and have adequate fit-up. Verify plate washers have been installed and welded when indicated.
4. Protected Zones	2 AWS/ AISC-SSI ICC-SWSI	
5. Open Web Steel Joists	2 AWS/ AISC-SSI ICC-SWSI	
6. Bolting	2 AWS/ AISC-SSI ICC-SWSI	Inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections. Visually inspect 100% of all field installed high-strength bolts for proper installation and connection fit-up.
7. Welding	2 AWS-CWI ASNT	<p>Check welder qualifications. Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds. Shop and field inspection is required. The Special Inspector shall witness the welding of all complete and partial penetration groove welds, multipass fillet welds, and single-pass fillet welds greater than 5/16 inch. See specification Section 051200.</p> <p>Ultrasonic testing of all full-penetration welds. All full-penetration welds to be inspected by ASNT Level II qualified inspection agent.</p>

Structural Steel		
Item	Agency # (Qualif.)	Scope
8. Shear Connectors	2 AWS/ AISC-SSI ICC-SWSI	Inspect size, number, positioning and welding of shear connectors. Inspect studs for full 360 degree flash. Ring test all shear connectors with a 3 lb hammer. Bend test all questionable studs to 15 degrees.
9. Structural Details	2 AWS/ AISC-SSI	Inspect steel frame for compliance with structural drawings and approved shop drawings, including bracing, member configuration, size, camber, and connection details.
10. Metal Deck	2 AWS-CWI	Verify gage, width, and type. Inspect welding and side-lap fastening of metal roof and floor deck. Inspect deck welding to structure, side lap attachments, perimeter edge fasteners, and pour-stop welds. Check welder qualifications.
11. Metal Stair Framing	2 AWS/ AISC-SSI	Review metal stair framing connection details for conformance with approved miscellaneous metals shop drawings.
12. Expansion and Adhesive Anchoring	2 ACI-CCI ICC-RCSI	Witness installation of 25 percent for conformance with Manufacturer's requirements. Verify that materials are suitable for job conditions.
13. Field Correction of Fabricated Items	2 AWS/ AISC-SSI	Review documentation of RDP approved repair and verify completion of repairs.
14. Other Reports	1 PE	Review contractor's field quality control procedures. Monitor testing lab and field inspection results to ensure conformance with construction documents. Notify Engineer of Record immediately of all discrepancies.

Cold-Formed Steel Framing		
Item	Agency # (Qualif.)	Scope
1. Member Sizes	2 AWS/ AISC-SSI ICC-SWSI	Verify member sizes for conformance with the Contract Documents and approved shop drawings.
2. Material Thickness	2 AWS/ AISC-SSI ICC-SWSI	Review the gage of materials and the section properties of the members for conformance with the Contract Documents and approved shop drawings.
3. Material Properties	2 AWS/ AISC-SSI ICC-SWSI	Review the material properties of the members for conformance with the Contract Documents and approved shop drawings.
4. Mechanical Connections	2 AWS/ AISC-SSI ICC-SWSI	Inspect connections for conformance with the Contract Documents and approved shop drawings.
5. Welding	2 AWS/ AISC-SSI ICC-SWSI	Visually inspect welds for conformance with the Contract Documents and approved shop drawings. Verify that welding conforms to AWS specifications. Check welder qualifications.
6. Framing Details	2 AWS/ AISC-SSI ICC-SWSI	Field review of structural details for conformance with the Contract Documents and approved shop drawings.
7. Trusses		
8. Permanent Truss Bracing		
9. Other Fasteners	2 AWS/ AISC-SSI ICC-SWSI	Verify fastener type and installation procedures. Verify that fasteners conform to responsible RDP approved submittals the contact documents. Verify that fasteners are installed tight.
10. Field Correction of Fabricated Items	2 AWS/ AISC-SSI ICC-SWSI	Review documentation of RDP approved repair and verify completion of repairs.
11. Other:	1 PE	Review contactor's field quality control procedures. Monitor testing lab and field inspection results to ensure conformance with construction documents. Notify Engineer of Record immediately of all discrepancies.

w:\2016\2116011 - stamford police station\struc\special inspection\21-16-011-si-jcb-2016-04-11.docx

Technical Specifications

NEW POLICE
HEADQUARTERS

for the

City of Stamford

**725 BEDFORD STREET
STAMFORD, CONNECTICUT**

(DIVISIONS 01 – 33)

August 15, 2016

J H

JACUNSKI HUMES

ARCHITECTS, LLC

15 MASSIRIO DRIVE SUITE 101
BERLIN, CONNECTICUT
TEL 860 828 9221 FAX 860 828-9223

TABLE OF CONTENTS

NEW POLICE HEADQUARTERS *for the* **CITY OF STAMFORD** **725 BEDFORD STREET** **STAMFORD, CONNECTICUT**

- TABLE OF CONTENTS
- LIST OF DRAWINGS
- GEOTECHNICAL ENGINEERING REPORT, dated February 8, 2016, as prepared by Dr. Clarence Welti, P.E., P.C.
 - BORING LOCATION PLAN
 - FIELD TEST BORING LOGS

TECHNICAL SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

01 10 00 SUMMARY OF WORK

01 31 00 PROJECT COORDINATION

01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION

01 40 00 QUALITY REQUIREMENTS

01 42 00 REFERENCES

01 77 00 CLOSEOUT PROCEDURES

TABLE OF CONTENTS
(CONTINUED)

DIVISION 3 - CONCRETE

03 30 00 CAST-IN-PLACE CONCRETE
03 41 00 PRECAST STRUCTURAL CONCRETE
03 45 00 PRECAST ARCHITECTURAL CONCRETE

DIVISION 4 - MASONRY

04 20 00 UNIT MASONRY

DIVISION 5 - METALS

05 12 00 STRUCTURAL STEEL FRAMING
05 31 00 STEEL DECKING
05 50 00 METAL FABRICATIONS

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07 13 26 SHEET WATERPROOFING

07 81 00 APPLIED FIREPROOFING

TABLE OF CONTENTS
(CONTINUED)

DIVISION 31 - EARTHWORK

31 20 01 BUILDING EXCAVATION AND BACKFILL

DIVISION 33 - UTILITIES

33 31 00 SANITARY SEWAGE SYSTEMS

33 41 00 STORM DRAINAGE SYSTEMS

33 71 19 UNDERGROUND DUCTS AND UTILITY STRUCTURES

END OF TABLE OF CONTENTS

LIST OF DRAWINGS

NEW POLICE HEADQUARTERS

for the

CITY OF STAMFORD

**725 BEDFORD STREET
STAMFORD, CONNECTICUT**

TITLE SHEET

CIVIL DRAWINGS

PROPERTY & TOPOGRAPHIC SURVEY

SE-1 SITE PLAN DEPICTING 725 BEDFORD STREET

SE-1B SITE PHASING PLAN DEPICTING 725 BEDFORD STREET

SE-2A GRADING PLAN DEPICTING 725 BEDFORD STREET

SE-2B	UTILITY PLAN DEPICTING 725 BEDFORD STREET
SE-3	SEDIMENTATION AND EROSION CONTROL PLAN DEPICTING 725 BEDFORD STREET
SE-4	DETAILS DEPICTING 725 BEDFORD STREET
SE-5	DETAILS DEPICTING 725 BEDFORD STREET
SE-6	DETAILS DEPICTING 725 BEDFORD STREET

STRUCTURAL DRAWINGS

S-0.1	GENERAL NOTES, ABBREVIATIONS AND DRAWING LIST
S-0.2	ADDITIONAL NOTES AND SCHEDULES
S-0.3	DEAD LOADING DIAGRAMS
S-0.4	LIVE LOADING AND SNOW DIAGRAMS
S-0.5	GARAGE DEAD LOADING DIAGRAMS
S-0.6	GARAGE LIVE LOADING AND SNOW DIAGRAMS
S-1.0	FOUNDATION PLAN
S-2.0	FIRST FLOOR FRAMING PLAN
S-2.1	SECOND FLOOR FRAMING PLAN
S-2.2	THIRD FLOOR/ ROOF FRAMING PLAN
S-2.3	ROOF FRAMING PLAN
S-3.0	FOUNDATION DETAILS
S-3.1	FOUNDATION DETAILS
S-3.2	FOUNDATION DETAILS
S-3.3	FOUNDATION DETAILS
S-4.0	FRAMING DETAILS
S-4.1	FRAMING DETAILS
S-4.2	FRAMING DETAILS

S-4.3	FRAMING DETAILS
S-5.0	COLUMN SCHEDULE
S-5.1	COLUMN SCHEDULE DETAILS
S-6.0	BRACED FRAME ELEVATIONS
S-6.1	BRACED FRAME DETAILS
S-7.0	MASONRY DETAILS
GS-1.0	GARAGE FOUNDATION PLAN
GS-2.0	GARAGE FIRST FLOOR FRAMING PLAN
GS-2.1	GARAGE SECOND FLOOR FRAMING PLAN
GS-2.2	GARAGE THIRD FLOOR FRAMING PLAN
GS-2.3	GARAGE ROOF FRAMING PLAN
GS-2.4	GARAGE ALTERNATE 1 ROOF FRAMING PLAN
GS-3.0	GARAGE FOUNDATION DETAILS
GS-3.1	GARAGE FOUNDATION DETAILS
GS-3.5	GARAGE FRAMING DETAILS
GS-4.0	GARAGE BUILDING SECTIONS
GS-4.1	GARAGE ALTERNATE 1 BUILDING SECTIONS
GS-6.0	GARAGE BUILDING ELEVATIONS
GS-6.1	GARAGE ALTERNATE 1 BUILDING ELEVATIONS
GS-6.2	GARAGE PRECAST COLUMN SCHEDULE AND WALL LOADING ELEVATIONS

ARCHITECTURAL DRAWINGS

A-0.0	GENERAL NOTES
A-1.1	LOWER LEVEL FLOOR PLAN
A-1.2	MAIN LEVEL FLOOR PLAN

A-1.3	SECOND LEVEL FLOOR PLAN
A-1.4	THIRD LEVEL FLOOR PLAN
GA-1.1	GARAGE LOWER LEVEL FLOOR PLAN
GA-1.2	GARAGE MAIN LEVEL FLOOR PLAN
GA-1.3	GARAGE SECOND LEVEL FLOOR PLAN
GA-1.4	GARAGE THIRD LEVEL FLOOR PLAN
A-2.1	LOWER LEVEL REFLECTED CEILING PLAN
A-2.2	MAIN LEVEL REFLECTED CEILING PLAN
A-2.3	SECOND LEVEL REFLECTED CEILING PLAN
A-2.4	THIRD LEVEL REFLECTED CEILING PLAN
A-3.1	EXTERIOR ELEVATIONS
A-3.2	EXTERIOR ELEVATIONS
A-4.1	BUILDING SECTIONS
A-4.2	BUILDING SECTIONS
A-4.3	SECTIONS
A-4.4	SECTIONS
A-4.5	SECTION DETAILS
A-5.2	LARGE SCALE STAIR PLANS AND DETAILS
A-5.3	LARGE SCALE STAIR SECTION
A-5.4	LARGE SCALE ELEVATOR PLANS AND DETAILS
A-5.5	LARGE SCALE ELEVATOR SECTIONS
GA-5.1	PARKING GARAGE ENLARGED PLANS

A-6.1	MISC. DETAILS
A-6.2	MISC. DETAILS
A-6.3	MISC. DETAILS

A-6.6	MISC. DETAILS
-------	---------------

A-6.8	MISC. DETAILS
-------	---------------

A-8.1	COLUMN DETAILS
-------	----------------

A-8.2	COLUMN DETAILS
-------	----------------

A-8.3	COLUMN DETAILS
-------	----------------

A-8.4	COLUMN DETAILS
-------	----------------

A-8.5	COLUMN DETAILS
-------	----------------

A-8.6	COLUMN DETAILS
-------	----------------

A-8.7	COLUMN DETAILS
-------	----------------

A-8.8	COLUMN DETAILS
-------	----------------

A-8.9	COLUMN DETAILS
-------	----------------

A-9.1	DOOR AND WINDOW ELEVATIONS
-------	----------------------------

A-9.2	CURTAIN WALL PLAN AND DETAILS
-------	-------------------------------

A-9.3	CURTAIN WALL ELEVATIONS
-------	-------------------------

A-9.4	DOOR DETAILS
-------	--------------

A-9.5	WINDOW AND CURTAIN WALL DETAILS
-------	---------------------------------

A-11.1	CELL DETAILS
A-11.2	CELL DETAILS
A-11.3	CELL DETAILS
A-11.4	CELL DETAILS
A-11.5	CELL DETAILS

M-3.1

PART PLANS - MECHANICAL

P-6.1	DETAILS -PLUMBING
P-6.2	DETAILS -PLUMBING
P-6.3	DETAILS -PLUMBING

DR. CLARENCE WELTI, P.E., P.C.

GEOTECHNICAL ENGINEERING

227 Williams Street · P.O. Box 397
Glastonbury, CT 06033-0397

(860) 633-4623 / FAX (860) 657-2514

February 8, 2016

Mr. Mark Allen
Jacunski Humes Architects, LLC
15 Massirio Drive, Suite 101
Berlin, CT 06037

Re: Preliminary Geotechnical Study for New Police Station at 67, 713 and 805 Bedford Street, Stamford, CT

Dear Mark:

1.0 Herewith are boring data pertaining to the above. Twelve test borings were drilled to a maximum depth of 21.5 feet below the existing grade. The boring locations are indicated on the attached plan. *The borings were drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

2.0 The **Subject Project** is a proposed new Police Station at the SE corner of Bedford Street and North Street. The existing Police Station is to the north of the subject site. Foundations for the existing Police Station in proximity to the proposed building are on shallow spread footings. The exact location of the new facility has not yet been determined. Most of the building will have a slab on grade (possibly between Elev. 33 and Elev. 35 to minimize rock excavation), but a partial basement will be included in the final plans, probably in an area where the basement would not require significant rock excavation.

2.1 The existing grades in the site vary from about Elev. 30 to localized rock mounds as high as Elev. 44. Most of the flat areas on the site range from about Elev. 30 to Elev. 32. The building site abuts Bedford Street and North Street. The slab on grade nature of the building abutting the streets would minimize soil retention at the streets. The site will abut the parking garage for the State Circuit Court and it is possible that a basement could be included in this area as part of the subject structure.

2.2 Geotechnical considerations addressed by this study include the following:

* Foundation performance criteria; including settlement and seismic design criteria

- * Geotechnical parameters for foundation design
- * Provisions for lateral loading
- * Long term groundwater impact
- * General earthwork and OSHA requirements
- * Shoring adjacent to streets and existing buildings

3.0 The Geologic Origin of the natural inorganic soil in the deeper soil overburden areas is from glacial fluvial deposits. There are localized moraine deposits over the bedrock. The glacial fluvial deposits consist of stratified fine to coarse sand, some gravel and trace silt. The bedrock from rock cores and geologic mapping consists of a coarse grained foliated Gneiss with a foliation dip of about 40 to 60° to the west.

3.1 The Soil/ Rock Cross Section from the test borings are generally as follows:

Area bounded by borings B-1, B-2, B-4 and B-6

Topsoil to 7"; or Bituminous Concrete to 3" atop fine to coarse SAND, some Gravel, little Silt to 9" to 18"

Fine to fine to coarse SAND, little to some Silt, little Gravel to the top of bedrock at 9" to 4 feet, loose to medium compact

Locally FILL (see boring B-2); fine to medium SAND, some Silt, little Gravel, trace Asphalt to the top of rock at 2.5 feet below grade

Note: There are several large rock outcrops in this area, which extend above the grade elevations at the borings.

Bedrock: Harrison Gneiss

Note: The rock cores taken at boring B-1 and B-2 had recoveries of 90 and 100% and RQD values of 80 and 58%

Area bounded by borings B-5 and B-8

Bituminous Concrete to 3"

FILL; fine to coarse SAND, some Gravel, Cobbles and Blasted Rock, trace to some Silt 5 to 11 feet, loose to very dense

Note: Boring B-8 encountered auger refusal on fill at 5 feet

Possible FILL (see boring B-5); fine to coarse SAND, little Gravel, trace Gravel to auger refusal at 12 feet, loose to medium compact

Area of bounded by borings B-7 and B-9 thru B-12

Bituminous Concrete to 3 to 5"

FILL; fine to coarse SAND, little to some Gravel, trace to some Silt to 4 to 11 feet, loose to medium compact

Fine to coarse SAND, trace to some Silt, little to some Gravel to top of rock at 10 to 25.5 feet (Elev.20 to Elev.3), medium compact to very dense

Boring B-3 at Southeast corner of site

Bituminous Concrete to 3"

FILL; fine SAND, little to some Silt, little Brick Fragments to 6.5 feet, loose

Fine coarse SAND, some Gravel, trace Silt to 20.5 feet, medium compact to dense

Fine to medium SAND, some Silt, little Gravel (possible moraine) to 21.5+ feet, very dense

3.2 The Water Table, where evident at boring completion, was at 14 to 17 feet below grade (Elev.13 to Elev 16). The water table may vary 3 feet up or down.

4.0 The Criteria for Foundation Type and Loading are as follows:

1. The maximum total settlement shall not exceed 3/4". The maximum differential settlement shall not exceed 1/2 the maximum settlement.
2. The foundation must address the seismic section of the building code.
3. The Slab on Grade must not settle differentially more than 1/2" in excess of the structure subsidence.

These criteria are those normally applied to structures of similar character. If the structural engineer or owner has other criteria, the writer should be notified for possible supplemental input.

4.1 Regarding item 2 (above), the Seismic Site Soil Profile Classification is **"D"**. The mapped MCE spectral response acceleration values for Stamford, CT are $S_1 = 0.068$ for one second period and $S_s = 0.322$ for short period. For transfer of ground shear into the sand and gravel at spread footings the ultimate friction factor between the concrete and the crushed stone can be **0.60**.

5.0 The Recommended Foundation Type is spread footings. The footings can be on the natural soils, on bedrock, or on a controlled structural fill placed after the removal of any existing fills. The controlled fill shall conform to the gradation in section 6.0 below and should extend outside of the foundations for a distance equal to at least the depth of fill beneath the footings. There should be a minimum 6" layer of 3/8" crushed stone beneath the footings on the natural soils and bedrock to provide a uniformly sub grade.

5.1 The Allowable Bearing Pressures with the above preparation can be 4,000 psf for footings on the natural soils or on a controlled fill. The allowable loadings cited above can be increased by 1/3 for seismic or wind loading. At retaining walls the maximum pressure on the toe can be 50% higher than the average pressures, cited above.

5.2 Regarding the Static Lateral soil loading on basement walls and retaining walls that are part of the building; this shall be with at-rest pressure using the equivalent fluid loading of 60 pcf. Lateral soil loading on retaining walls apart from the building can be designed with active pressure using 35 pcf equivalent fluid pressure (level backfill). The ultimate sliding coefficient for spread footings on soil is 0.60.

5.2.1 Seismic lateral loading for basement walls and retaining walls within the building shall be a total lateral force (seismic plus static at-rest pressure) equal to $24H^2$ lb/ft located at $\frac{1}{2}H$ above the bottom of the walls. This value is based on the Mononobe-Okabe solution for the case with level backfill, no wall friction and no hydrostatic pressure. The value excludes the inertia of the soil and wall mass. Any requirements for the seismic analyses of retaining wall structures should be determined from the Building Code section 1805.5 and ASCE-7 section 9.14.

5.3 Summary of Foundation Design Parameters:

Parameter	Value
Allowable Bearing Pressure	4,000 psf
Backfill Unit Weight (Section 6.0)	125 pcf
Internal Friction Angle (Section 6.0)	34°
At-Rest Lateral Fluid Pressure	60 pcf
Active Lateral Fluid Pressure	35 pcf
Sliding Coefficient, concrete on soil	0.6
Frost Protection Depth	3.5 feet
Seismic Site Soil Profile Classification	C

Mapped MCE spectral response acceleration for short period, S_1	0.068
Mapped MCE spectral response acceleration for short period, S_s	0.322

6.0 Regarding Controlled Fill, Backfill of Basement Walls, Retaining Walls and Excavations at columns and walls, plus Slab Underlayment (to within 6" from the slab bottom) the material shall conform to the following or be 3/8" crushed stone:

Percent Passing	Sieve Size
100	3.5"
50 - 100	3/4"
25 - 75	No.4

The fraction, passing the No.4 sieve shall have less than 15%, passing the No. 200 sieve.

All backfill and fill must be compacted to at least 95% of modified optimum density.

6.1 All existing fills should be removed from beneath floor slabs and replaced with controlled conforming to section 6.0 above. There shall be a minimum 16" of controlled fill beneath **slab at grade floors** placed to within 6" of the slab bottom. The final 6" shall be 3/4" minus processed stone base conforming to the following gradation.

Percent Passing	Grain Size
100	1.25"
90 - 100	1"
75 - 100	3/4"
25 - 60	1/4"
10 - 35	No. 40
3 - 12	No. 100
0 - 5	No. 200

A vapor retarder is required beneath the slabs at grade in accordance with the building code.

6.2 At basements and areas with floors below the exterior grades, there (1) should be at least 8" of 3/8" crushed stone beneath the floors, (2) should be a perimeter foundation drain, (3) interior under drains about 6 feet inside the basement and foundation walls are recommended. The backfill of retaining walls shall conform to Section 6.0 above. Where below grade areas are used for other than mechanical purposes the use of waterproofing under the floor and on walls is recommended. Otherwise the area shall have damp proofing. Based on the apparent invert in the storm sewers, the basement drains would have to be pumped up from sumps to the storm sewers in the street. The maximum pumping rate will vary dependent on the location of the basement. Water stops are required at the footing/wall and wall/floor interfaces. Elevator pits should be water stopped and waterproofed.

7.0 Regarding earthwork this will be primarily in soils which fall in OSHA Class C. This will require sloping excavations, which are unshored and exceed 5 feet in height, to be cut back to slopes less than 34° from horizontal (1.5:1).

7.1 Temporary shoring may be required locally where the basement area is in proximity to either the street or nearby structures. The temporary shoring could be with soldier piles and lagging based on the soil/rock profile.

8.0 For Portland Cement Concrete pavements the concrete thickness for truck traffic would be 7". This would be placed on 8" of Gravel Subbase. For passenger car parking the concrete thickness would be 5" atop 8" of Gravel Subbase. ***For concrete aprons contiguous to the building the gravel subbase shall extend to 24" below grade. This is to avoid movement of the slab at flush doorways.*** The modulus of sub grade reaction may be taken as 200 pci.

8.1 Existing fills could be left in place under new pavements provided the sub grades are stable and there is at least 18" of controlled fill conforming to material in section 6.0 above. The recommended pavement sections atop the controlled fill are as follows.

For Truck Access; 4.5" of Bituminous Concrete on 8" of Processed Stone Base

For Passenger Vehicles; 3.0" of Bituminous Concrete on 8" of Processed Stone Base

9.0 This report has been prepared for specific application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Dr. Clarence Welti, P.E., P.C., should perform a general review of the final design plans and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

The report is labeled "Preliminary, based on the following: (1) There is no footprint indicated on the plan; (2) There is no established floor grade and (3) There is no basement area delineation.

If you have any questions please call me.

Very truly yours,



Max Welti, P.E.



Clarence Welti, PhD, P. E.
Pres. Dr. Clarence Welti, P. E., P. C.

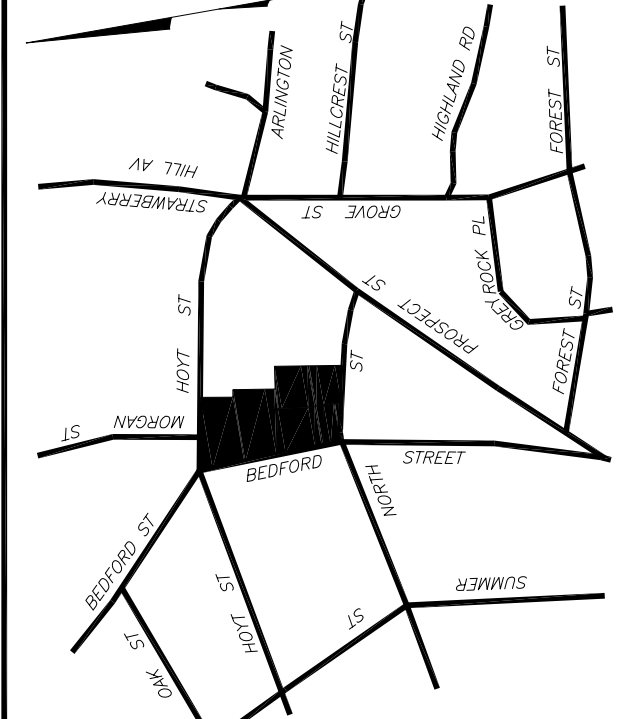
APPENDIX

BORING LOCATION PLAN

+

TEST BORING LOGS

BLOCK: 223 ZONE: R-H



ORIENTATION

NOTES:

- This survey has been prepared in accordance with Sections 20-300b-1 thru 20-300b-20 of the Regulations of Connecticut State Agencies and the "Standards for Surveys and Maps in the State of Connecticut" as adopted by the Connecticut Association of Land Surveyors, Inc. as a Property and Topographic Survey the Boundary Determination Category of which is a Resurvey conforming to Horizontal Accuracy Class A-2 and the locations and elevations of which conform to Topographic Accuracy Class T-2. It is intended to depict property boundaries, locations and elevations of improvements and topographic features.
 - Total area of surveyed parcels = 133,475 SF (3.0642 Acres).
 - Reference is made to the following:
 - Maps 2827, 5237, 5337, 5928, 6844, 8753 and 11996 of the Stamford Land Records (S.L.R.).
 - Warranty Deed recorded in Vol. 496 at Pg. 381 S.L.R.⁽¹⁾
 - Warranty Deed recorded in Vol. 518 at Pg. 222 S.L.R.⁽²⁾
 - Quit Claim Deed recorded in Vol. 752 at Pg. 77 S.L.R.⁽³⁾
 - Quit Claim Deed recorded in Vol. 3400 at Pg. 17 S.L.R.⁽⁴⁾
 - Easement recorded in Vol. 3314 at Pg. 61 S.L.R.
 - Instruments of record as labeled hereon.
 - Elevations depicted hereon are based on the North American Vertical Datum of 1988 (NAVD-88).
 - Parcel lies within FIRM Zone X as depicted on Community 080015 Panel No. 0516 Suffix G. Map Revised July 8, 2013.
 - Subsurface utility, structure and facility locations depicted hereon have been compiled, in part, from municipal records and field measurements. These locations must be considered approximate. The locations of these features must be verified by the appropriate authorities prior to construction.
 - Wetlands, if any, have not been depicted hereon.

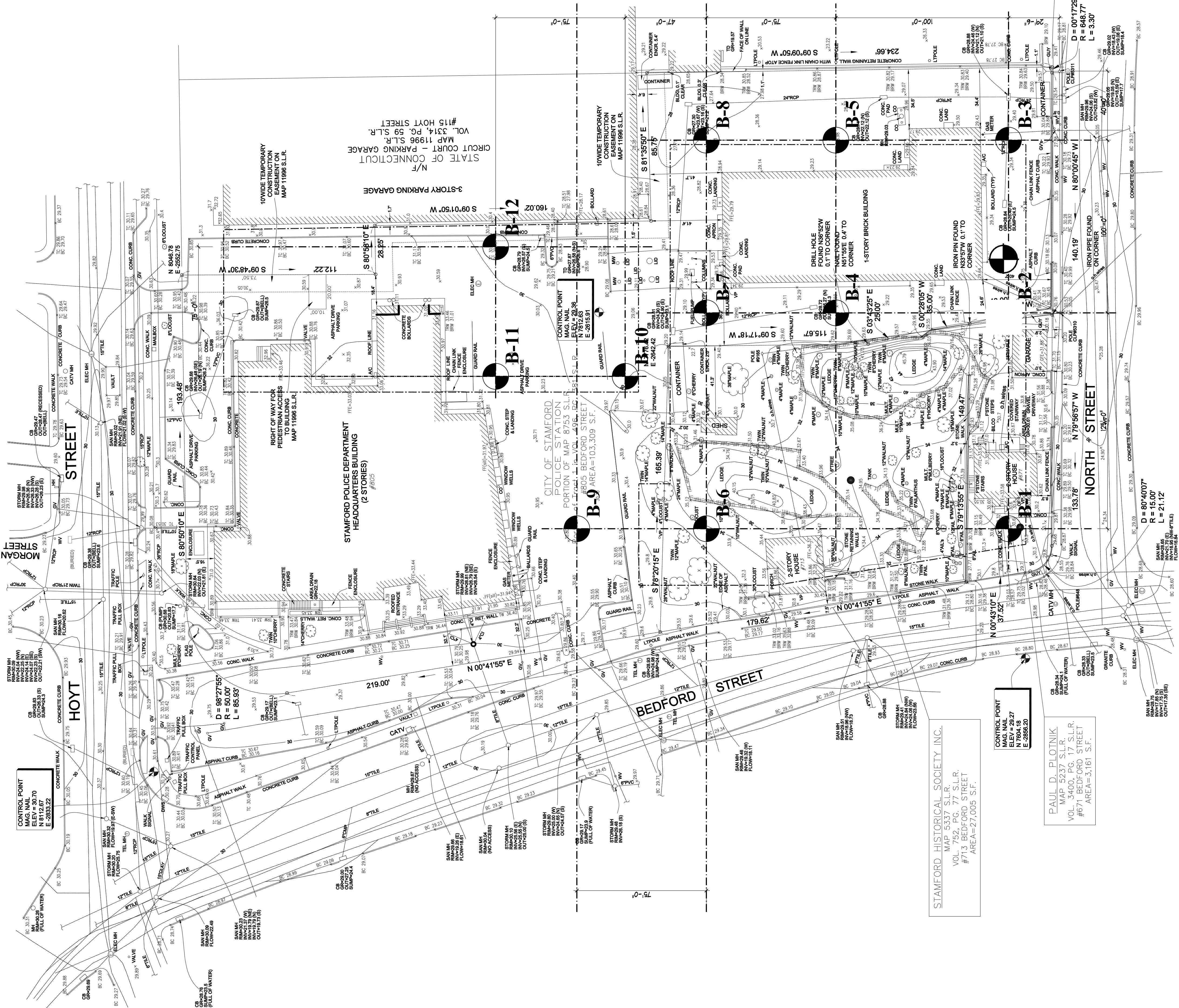
N/F
STATE OF CONNECTICUT
COUNTY COURT HOUSE
3.211 ACRES, MAP 6844 S.L.R.
VOL. 1137, PG. 314 S.L.R.
#123 HOYT STREET

PROPERTY & TOPOGRAPHIC SURVEY
DEPICTING
#671, #713 and #805 BEDFORD STREET
STAMFORD, CONNECTICUT
PREPARED FOR
THE CITY OF STAMFORD





JOB NO.: 1586A-2	DATE: 07/16/2015
DRAWN BY: CAP	CHECKED BY:
SCALE: 0 30 60	1" = 30'

This document and copies thereof are valid only if they bear the signature and embossed seal of the Professional Engineer. Any other use or unauthorized alterations render any declaration hereon null & void.

REDNISS & MEAD
ENGINEERS - SURVEYORS - PLANNERS
WWW.REDNISSANDMEAD.COM
203-327-6000



LEGEND	
	PROPERTY LINE
	CURB LINE
	CHAIN LINK FENCE
	STOCKADE FENCE
	GAS METER
	WATER VALVE
	FIRE HYDRANT
	STAND PIPE
	GAS VALVE
	OIL FILL
	VENT PIPE
	UTILITY POLE
	STONE RETAINING WALL
	CONCRETE WALL
	OVERHEAD WIRES
	MANHOLE
	STORM MANHOLE
	CATCH BASIN
	LIGHT POLE
	ELECTRIC MANHOLE
	UNDERGROUND GAS LINE
	UNDERGROUND WATER LINE
	UNDERGROUND ELECTRIC LINE
	UNDERGROUND TELEPHONE LINE
	UNDERGROUND CABLE LINE
	UNDERGROUND STORM LINE
	UNDERGROUND SANITARY LINE
	SPOT ELEVATION
	CONTOURS
	TREES (SIZE AND TYPE AS SHOWN)
	EVERGREEN
	ZONE LINE

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 30.5		HOLE NO. B-1		
TYPE	HSA		SS	NQ	LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/15/16	
SIZE I.D.	3.75"		1.375"	2.0"	N. COORDINATE	AT none FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/15/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
0	1	2-1-2-3	0.0'-2.0'			TOPSOIL				30
						BR. FINE SAND, SOME SILT, TRACE ROOTS & GRAVEL 0.6				
	2	2-2-2-60	2.0'-3.8'							
						WEATHERED ROCK 3.9				
5						CORED BEDROCK - GNEISS 4.5				
						RUN #1 4.5' - 9.5' RECOVERED 60" RQD=80%				25
10						BOTTOM OF BORING @ 9.5'				20
15										15
20										10
25										5
30										0
35										
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-1		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.		
		AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 29.5	HOLE NO. B-2
TYPE		HSA		SS	NQ	LINE & STA.	GROUND WATER OBSERVATIONS	
SIZE I.D.		3.75"		1.375"	2.0"	N. COORDINATE	AT none FT. AFTER 0 HOURS	
HAMMER WT.				140 lbs		E. COORDINATE	AT FT. AFTER HOURS	
HAMMER FALL				30"			START DATE 1/14/16 FINISH DATE 1/14/16	
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS			ELEV.
	NO.	BLOWS/6"	DEPTH					
0					ASPHALT 0.25 BR. FINE-CRS. SAND, SOME GRAVEL, LITTLE SILT - FILL GREY/BR. FINE-MED. SAND, SOME SILT, LITTLE GRAVEL, TRACE ASPHALT - FILL 1.5 CORED BEDROCK - GNEISS 2.5 RUN #1 2.5' - 7.5' RECOVERED 54" RQD=58%			25
	1	9-7-5-60	1.0'-2.5'		BOTTOM OF BORING @ 7.5'			7.5
5								
10								20
15								15
20								10
25								5
30								0
35								-5

LEGEND: COL. A:

SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON

PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%

DRILLER: J. BREWER

INSPECTOR:

SHEET 1 OF 1

HOLE NO. **B-2**

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 29.4		HOLE NO. B-3		
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/14/16	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT 14.2 FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/14/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
	NO.	BLOWS/6"	DEPTH							
0					ASPHALT 0.25					
	1	7-5-2-4	1.0'-3.0'		BR. FINE SAND, SOME SILT, LITTLE BRICK - FILL					
	2	4-3-4-4	3.0'-5.0'							25
5	3	5-6-6-7	5.0'-7.0'							
					LIGHT GREY/BR. FINE-CRS. SAND, SOME GRAVEL, TRACE SILT 6.5					
										20
10	4	37-60	10.0'-11.0'							
										15
15	5	10-12-10	15.0'-16.5'							
										10
20	6	18-25-60	20.0'-21.3'		GREY FINE-MED. SAND, SOME SILT, LITTLE GRAVEL 20.5					
					BOTTOM OF BORING @ 21.5' 21.5					
										5
25										
										0
30										
										-5
35										
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-3		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 29.5		HOLE NO. B-4		
TYPE	HSA		SS	NQ	LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/15/16	
SIZE I.D.	3.75"		1.375"	2.0"	N. COORDINATE	AT none FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/15/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
	NO.	BLOWS/6"	DEPTH							
0					ASPHALT 0.3					
					BR. FINE-CRS. SAND, SOME GRAVEL, LITTLE SILT .75					
					CORED BEDROCK - GNEISS					
					RUN #1 0.75' - 5.75' RECOVERED 60" RQD=70%					
5										25
					BOTTOM OF BORING @ 5.75'					5.75
10										20
15										15
20										10
25										5
30										0
35										-5
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-4		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 29.0		HOLE NO. B-5		
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/15/16	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT none FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/15/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
	NO.	BLOWS/6"	DEPTH							
0					ASPHALT 0.25					
	1	12-22-28-30	1.0'-3.0'		LIGHT GREY/BR. FINE-CRS. SAND, SOME GRAVEL & BLASTED ROCK, TRACE SILT - FILL					
	2	60	3.0'-3.2'							25
5										
										20
10	3	4-15-7	10.0'-11.5'		GREY FINE-CRS. SAND, SOME GRAVEL & COBBLES, LITTLE SILT - POSSIBLE FILL 10.0					
					AUGER REFUSAL @ 12.0'					12.0
										15
15										
										10
20										
										5
25										
										0
30										
										-5
35										
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-5		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 34.0		HOLE NO. B-6		
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/14/16	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT none FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/14/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
	NO.	BLOWS/6"	DEPTH							
0	1	7-10-9-5	0.0'-2.0'		TOPSOIL .20					
					BR. FINE-CRS. SAND, LITTLE SILT & GRAVEL					
	2	24-60	2.0'-3.0'		WEATHERED ROCK 2.5					
										30
5					AUGER REFUSAL @ 5.0' 5.0					
10										25
15										20
20										15
25										10
30										5
35										0
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-6		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 29.3		HOLE NO. B-7		
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/13/16	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT 15.0 FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/13/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
	NO.	BLOWS/6"	DEPTH							
0					ASPHALT 0.25					
	1	12-14-10-7	1.0'-3.0'		BR. FINE-CRS. SAND, SOME GRAVEL, TRACE SILT - FILL					
	2	3-10-21-40	3.0'-5.0'		BR. FINE SAND AND SILT 2.5					
5					GREY/BR. FINE-CRS. SAND, SOME GRAVEL, LITTLE SILT, FEW COBBLES 4.0					25
	3	39-31-60	5.0'-6.5'							
10										20
	4	14-20-18	10.0'-11.5'							
15					GREY FINE-CRS. SAND, SOME SILT, LITTLE GRAVEL 13.5					15
	5	8-12-16	15.0'-16.5'							
20										10
	6	7-13-18	20.0'-21.5'							
25										5
	7	60	25.0'-25.4'		AUGER REFUSAL @ 25.5' 25.5					
30										0
35										-5
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-7		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 28.0		HOLE NO. B-8		
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/13/16	
SIZE I.D.	"		1.375"		N. COORDINATE	AT none FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/13/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
	NO.	BLOWS/6"	DEPTH							
0					ASPHALT					0.6
	1	17-12-8-5	1.0'-3.0'		DARK BR. FINE-MED. SAND, SOME SILT, SOME GRAVEL, FEW COBBLES - FILL					
	2	1-2-1-5	3.0'-5.0'							25
5	3	60	5.0'-5.2'		AUGER REFUSAL @ 5.17'					5.17
					NOTE: MADE TWO ADDITIONAL BORING ATTEMPTS AT THIS LOCATION, WITH REFUSAL AT 5 AND 3 FEET BELOW THE EXISTING GRADES. CORED THRU BOULDEER ON SECOND ATTEMPT, BUT COULD NOT ADVANCE BORINGS BEYOND PAST 5 FEET.					20
10										
										15
15										
										10
20										
										5
25										
										0
30										
										-5
35										
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-8		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.				
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 30.5		HOLE NO. B-9		
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS			START DATE 1/12/16	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT none FT. AFTER 0 HOURS				
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS			FINISH DATE 1/12/16	
HAMMER FALL			30"							
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS					ELEV.
	NO.	BLOWS/6"	DEPTH							
0					ASPHALT 0.3					30
	1	12-14-13-14	1.0'-3.0'		BR. FINE-CRS. SAND, SOME GRAVEL, TRACE SILT - FILL					
	2	1-0-1-8	3.0'-5.0'		BR. FINE-CRS. SAND, TRACE SILT - FILL 3.0					
5					GREY/BR. FINE-CRS. SAND, SOME GRAVEL, TRACE SILT 4.5					
	3	16-21-27-35	5.0'-7.0'							25
10	4	60	10.0'-10.2'		AUGER REFUSAL @ 10.5'					20
15										15
20										10
25										5
30										0
35										
LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: J. BREWER INSPECTOR:				
						SHEET 1 OF 1		HOLE NO. B-9		

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.	
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 30.0	HOLE NO. B-10
TYPE	HSA		SS	NQ	LINE & STA.	GROUND WATER OBSERVATIONS	
SIZE I.D.	3.75"		1.375"	2.0"	N. COORDINATE	AT none FT. AFTER 0 HOURS	START DATE 1/12/16
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS	FINISH DATE 1/12/16
HAMMER FALL			30"				

DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS	ELEV.
	NO.	BLOWS/6"	DEPTH			
0					ASPHALT 0.4	30
	1	4-5-3-4	1.0'-3.0'		BR. FINE-CRS.SAND, LITTLE SILT & GRAVEL - FILL 1.0	
					BR.FINE SAND AND SILT - FILL	
	2	1-0-1-5	3.0'-5.0'			
5					BR. FINE SAND AND SILT, TRACE ROOTS 4.42	
	3	21-31-37-60	5.0'-6.6'		BR. FINE-CRS. SAND, SOME GRAVEL, TRACE SILT, FEW COBBLES 5.0	25
10						
	4	21-27-38	10.0'-28.2'			20
					CORED BEDROCK - GNEISS 12.5	
15					RUN #1 12.5' - 16.0' RECOVERED 42" RQD=76%	
						15
					BOTTOM OF BORING @ 16.0' 16.0	
20						10
25						5
30						0
35						-5

LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%		DRILLER: J. BREWER INSPECTOR:	
		SHEET 1 OF 1	HOLE NO. B-10

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.	
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 30.7	HOLE NO. B-11
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT 15.5 FT. AFTER 0 HOURS	START DATE 1/12/16
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS	FINISH DATE 1/12/16
HAMMER FALL			30"				

DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS	ELEV.
	NO.	BLOWS/6"	DEPTH			
0					ASPHALT	0.25
	1	7-10-13-12	1.0'-3.0'		BR. FINE-CRS. SAND, SOME GRAVEL, LITTLE SILT - FILL	1.42
					DARK BR. FINE SAND, SOME SILT - FILL	
	2	5-10-21-40	3.0'-5.0'			
5					LIGHT GREY/BR. FINE-CRS. SAND, SOME GRAVEL, TRACE SILT	4.0
	3	30-30-60	5.0'-6.3'			
10						
	4	20-22-28	10.0'-11.5'			
15						
	5	12-14-16	15.0'-16.5'			
20					AUGER REFUSAL @ 18.5'	18.5
25						
30						
35						

LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%		DRILLER: J. BREWER INSPECTOR:	
		SHEET 1 OF 1	HOLE NO. B-11

CLARENCE WELTI ASSOC., INC. P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT JACUNSKI HUMES ARCHITECTS		PROJECT NAME NEW POLICE STATION LOCATION BEDFORD STREET, STAMFORD, CT.			
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV. 29.8		HOLE NO. B-12	
TYPE	HSA		SS		LINE & STA.	GROUND WATER OBSERVATIONS		START DATE 1/14/16	
SIZE I.D.	3.75"		1.375"		N. COORDINATE	AT 17.0 FT. AFTER 0 HOURS			
HAMMER WT.			140 lbs		E. COORDINATE	AT FT. AFTER HOURS		FINISH DATE 1/14/16	
HAMMER FALL			30"						

DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS	ELEV.
	NO.	BLOWS/6"	DEPTH			
0					ASPHALT	0.25
	1	10-12-14-16	1.0'-3.0'		BR. FINE-CRS. SAND, SOME GRAVEL, LITTLE SILT	1.0
					BR. FINE-CRS. SAND, SOME GRAVEL, LITTLE SILT - FILL	
	2	17-14-13-11	3.0'-5.0'			
5						
	3	6-7-8-9	5.0'-7.0'			
10						
	4	14-22-26	10.0'-11.5'			
					GREY/BR. FINE-CRS. SAND, LITTLE GRAVEL, TRACE SILT	11.0
15						
	5	14-12-10	15.0'-16.5'			
20						
	6	5-6-8	20.0'-21.5'			
					BR. FINE SAND AND SILT	21.0
					BOTTOM OF BORING @ 21.5'	21.5
25						
30						
35						

LEGEND: COL. A: SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%					DRILLER: J. BREWER INSPECTOR:	
					SHEET 1 OF 1 HOLE NO. B-12	

01 10 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 PROJECT DESCRIPTION

- A. The Project consists of the construction of a new Police Headquarters and elevated concrete parking deck for the City of Stamford and the Stamford Police Department to be located at the intersection of Bedford Street and North Street, as shown and described on Contract Documents prepared by Jacunski Humes Architects, LLC, Berlin, CT
- B. The Work consists of sitework and site preparation for the construction of a new +/- 94,245 sq. ft., four story structure (3 stories above grade, 1 story below grade) and three story structural precast concrete parking garage structure. New construction of Police Headquarters includes non-combustible construction to provide program space for public lobby, administrative and general offices, detention cells and processing, storage and processing of evidence, firearms training range, patrol functions, training rooms, locker rooms, and police support functions. New construction of elevated parking garage structure includes non-combustible construction to provide program space for vehicle maintenance garage and vehicle parking.
- C. The project site area is +/-2.0838 acres. Sitework includes, but is not limited to, new utilities, site concrete work, drainage, paving and curbs, site lighting, parking control devices, fencing, precast unit bollards and road sign, and site improvements.
- D. Related site work includes site preparation in the form of mass rock removal and trench rock removal as further identified and described herein.

1.3 WORK UNDER OTHER CONTRACTS

- A. Separate contracts will be issued by the City of Stamford for certain additional work as deemed necessary for the completion of the Police Headquarters Facility. The installation of new material under these separate contracts may be required prior to the Substantial Completion of

the Contract for Construction. The Contractor for Construction shall be required to coordinate his work with and allow access to the work by separate Contractors.

1.4 WORK SEQUENCE / CONSTRUCTION SCHEDULE

- A. The Work will be conducted in phases to provide the least possible interference to the activities all subcontractors and work required by the Owner.
- B. The Construction sequence anticipated is as follows:
 - 1. Site remediation and site preparation in anticipation of new construction.
 - 2. New construction to commence at areas of Police Headquarters and elevated parking deck. General Contractor will be restricted to contract limit lines as indicated on the drawings so as not to impede the continued operation, access, and parking requirements of the Stamford Police Department.
 - 3. The General Contractor shall proceed with the following items at their option and with approval of a submitted Construction Schedule:
 - a. Remaining sitework and related site activities
 - b. Other work not described above
 - 4. Final sitework and establishment of lawn areas.
 - 5. Issuance of Certificate of Substantial Completion for Police Headquarters facility and elevated parking deck.
 - 6. Installation of new public parking lot and related sitework. City of Stamford to grant General Contractor access to existing parking areas only upon Owner's relocation to new construction and Police Department's use of new parking garage structure.
 - 7. Completion of punch list items as identified by the Owner and Architect.

1.5 CONTRACTOR USE OF PREMISES

- A. General: Limit use of the premises to construction activities in areas indicated.

1. Confine operations to areas within Contract limit lines indicated on the Contract Documents. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed without prior authorization from the Owner and shall remain under the authority and control of the Stamford Police Department and the City of Stamford.
2. General Contractor **shall not** limit access to existing elevated parking garage structure (State of CT, Courthouse Garage) without prior approval of the Stamford Police Department and the City of Stamford.
3. Confine the parking of workers, and construction vehicles, and the storage of construction materials to a designated staging area to be determined by the General Contractor with approval by the Owner.
 - a) **The City of Stamford will offer all contractors, subcontractors, and laborers a reduced monthly rate of \$53/month to park in the Bedford Street Parking Garage. (Regular rate is \$90/month). The garage is approximately three blocks from the project site.**
 - b) All costs for parking within the Bedford Street Parking Garage shall be borne by the contractors and included within their bid amount.
4. While the premise is owner occupied, keep entrances serving the premises clear and available to the Owner and Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

1.6 OWNER OCCUPANCY

- A. Completion Requirements: Timely completion of the project is critical. Aggressive construction scheduling and careful monitoring of critical path milestones cannot be overemphasized.
- B. New Construction: The General Contractor shall develop and be responsible to comply with a comprehensive construction schedule. The Owner is to relocate to new construction upon Substantial Completion as determined by the Architect, and Owner.
 1. Make all building and energy systems operational before Owner occupancy including, but not necessarily limited to the following:
 - a. Emergency lighting systems.
 - b. Fire rated enclosures.
 - c. Handicapped accessibility.

- d. Hardware requirements.
 - e. All other work necessary directed by the local Authorities Having Jurisdiction.
- 2. All costs associated with performance of the Work at premium rates will be borne by the Contractor.
- C. Partial Owner Occupancy: The Owner reserves the right to place and install equipment in completed areas of the building, prior to Substantial Completion, provided that such placing does not interfere with completion of the Work. Such placing of equipment shall not constitute acceptance of the total Work.
 - 1. A Certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy.
 - 2. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.
 - 3. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

1.7 INTENT

- A. These Specifications with the accompanying Drawings are intended to describe and illustrate all material, labor, and equipment necessary to complete the construction of a new Police Headquarters Facility and elevated parking structure for the City of Stamford.
- B. For convenience of reference, these Specifications are separated into titled Divisions and Sections. Such separations shall not, however, operate to make the Architect an arbiter to establish limits to Contracts between the General Contractor and Subcontractors. The Divisions of the Specifications do not necessarily define the limits of the Contractor's subcontracts; the work of any one subcontract may include items specified in several Divisions or Sections. The General Contractor may sublet work as he sees fit, but it is his responsibility to see that all work shown on the Drawings and/or specified is completed in accordance with the Contract.
- C. Furnish all materials and accomplish all work in strict accordance with the grades or standards of materials, standards of workmanship, and manufacturer's specifications listed or mentioned in these documents.

- D. The listing or mention of materials shall be sufficient indication that all such materials shall be furnished by the General Contractor, in accordance with the grades or standards indicated, free from defects impairing strength, durability or appearance and in sufficient quantity for the proper and complete execution of the work, unless specifically stated otherwise.
- E. The listing or mention of any method of installation, erection, fabrication or workmanship shall not operate to make the General Contractor an agent, but shall be for the sole purpose of setting a standard of quality for the finished work. The General Contractor is free to use any alternate method, provided only that, prior to the start of the work, such alternate method is approved in writing by the Architect, as resulting in quality equal to that intended by these documents. Unless an alternate method is approved, all work shall be in strict accordance with all methods of installation, erection, fabrication and workmanship listed or mentioned herein.

1.8 SOCIAL SECURITY TAXES

- A. The General Contractor and each Subcontractor shall pay the taxes measured by the wages of all their employees as required by the Federal Social Security Act and all amendments thereto, and accept the exclusive liability for said taxes. The Trade Contractor shall also indemnify and hold the Owner, and its respective officers, agents and servants and the Architect harmless on account of any tax measured by the wages aforesaid of employees of the Trade Contractor and his subcontractors, assessed against the Owner under authority of said law.

1.9 UNEMPLOYMENT INSURANCE

- A. The General Contractor and each Subcontractor shall pay unemployment insurance measured by the wages of his employees as required by law and accept the exclusive liability for said contributions. The Trade Contractor shall also indemnify and hold harmless the Owner on account of any contribution measured by the wages of aforesaid employees of the Trade Contractor and his Subcontractors, assessed against the Owner under authority of law.

1.10 OCCUPATIONAL SAFETY AND HEALTH ACT

- A. The General Contractor and each Subcontractor shall comply with the requirements of the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, including all standards and regulations which have been promulgated by the Governmental Authorities which

administer such Acts and said requirements, standards and regulations are incorporated herein by reference.

- B. The General Contractor and each Subcontractor shall comply with said regulations, requirements and standards and require and be directly responsible for compliance therewith on the part of his agents, employees, material men and Subcontractors; and shall directly receive and be responsible for all citations, assessments, fines or penalties which may be incurred by reason of his agents, employees, material men or Subcontractors failing to so comply.
- C. The General Contractor and each Subcontractor shall indemnify the Owner and Architect and save them harmless from any and all losses, costs and expenses, including fines and reasonable attorney's fees incurred by the Owner and Architect by reason of the real or alleged violation of such laws, ordinances, regulations and directives, Federal, State, and Local, which are currently in effect or which become effective in the future, by the General Contractor, his Subcontractors or material personnel.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION (Not applicable).

END OF SECTION 01 10 00

SECTION 01 31 00 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
 - 1. Coordination.
 - 2. Progress Meetings.
 - 3. Administrative and supervisory personnel.
 - 4. General installation provisions.
 - 5. Cleaning and protection.
- B. Field engineering is included in Sections 01 73 00, "Execution".
- C. Requirements for the General Contractor's Construction Schedule are included in Section 01 10 00, "Summary of Work".
- D. Requirements for the Scheduling and Coordination of Tests and Inspections are included in Section 01 40 00, "Quality Requirements".

1.3 COORDINATION

- A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation. No claim for extra compensation or extension of Contract time will be allowed for conditions resulting from a lack of said coordination and cooperation.
 - 1. Where installation of one part of the work, is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of schedules.
 2. Installation and removal of temporary facilities.
 3. Delivery and processing of submittals.
 4. Progress meetings.
 5. Project Close-out activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.4 PRE-CONSTRUCTION CONFERENCE

- A. The Owner and Architect will schedule a pre-construction conference and organizational meeting at the Project site no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Attend the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Architect and their consultants, the General Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
 1. Notify and arrange for attendance by all parties except the Architect, and Owner.
- C. Agenda: Items of significance that could affect progress will be discussed, including such topics as:
 1. Tentative construction schedule.
 2. Critical Work sequencing.

3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of Shop Drawings, Product Data and Samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

1.5 SUBMITTALS

- A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 1. Show the interrelationship of components shown on separate Shop Drawings.
 2. Indicate required installation sequences.
 3. Comply with requirements contained in Section 01 33 00, "Submittal Procedures."
 4. Refer to Divisions 22, 23, 26, and 28 for specific coordination drawing requirements for plumbing, mechanical, and electrical installations.
- B. Staff Names: Within fifteen (15) days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

1.6 COORDINATION MEETINGS

- A. Conduct Project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to regular progress job meetings.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

- C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7 PROGRESS JOB MEETINGS

- A. The Architect will conduct progress job meetings at the Project site at regularly scheduled intervals. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: Notify each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities, to attend these meetings. Persons familiar with the Project and authorized to conclude matters relating to progress shall be represented.
- C. Agenda: Review and correction or approval of minutes of the previous progress meeting. Review of other items of significance that could affect progress. Topics for discussion as appropriate to the current status of the Project.
 - 1. General Contractor's Construction Schedule: Prepare a written report including progress since the last meeting. Determine where each activity is in relation to the General Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 2. Review of present and future needs of each entity present, including such items as:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Deliveries.
 - e. Off-site fabrication problems.
 - f. Access.
 - g. Site utilization.
 - h. Temporary facilities and services.
 - i. Hours of Work.
 - j. Hazards and risks.
 - k. Housekeeping.
 - l. Quality and Work standards.
 - m. Change Order Proposals.
 - n. Documentation of information for payment requests.

- D. Reporting: The Architect will prepare and distribute copies of minutes of the meeting to Owner and General Contractor. General Contractor shall distribute copies to others that should be informed of decisions.
 - 1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.
 - 2. General Contractor shall provide at each scheduled Job Meeting a detailed, 2-week look-ahead schedule outlining in detail all planned construction activities to occur, or planned for, from the date of each Job Meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
- F. Recheck measurements and dimensions, before starting each installation.
- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

3.2 CLEANING AND PROTECTION

- A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
 - 1. Excessive static or dynamic loading.
 - 2. Excessive internal or external pressures.
 - 3. Excessively high or low temperatures.
 - 4. Thermal shock.
 - 5. Excessively high or low humidity.
 - 6. Air contamination or pollution.
 - 7. Water or ice.
 - 8. Solvents.
 - 9. Chemicals.
 - 10. Light.
 - 11. Radiation.
 - 12. Puncture.
 - 13. Abrasion.
 - 14. Heavy traffic.
 - 15. Soiling, staining and corrosion.
 - 16. Bacteria.
 - 17. Rodent and insect infestation.
 - 18. Combustion.
 - 19. Electrical current.
 - 20. High speed operation,
 - 21. Improper lubrication.

- 22. Unusual wear or other misuse.
- 23. Contact between incompatible materials.
- 24. Destructive testing.
- 25. Misalignment.
- 26. Excessive weathering.
- 27. Unprotected storage.
- 28. Improper shipping or handling.
- 29. Theft.
- 30. Vandalism.

END OF SECTION 01 31 00

01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 DEFINITIONS

The following definitions apply to this section of the specifications:

- A. Owner: The Owner is defined as the Owner, Owner's Representative, Project Manager, or Program Manager.
- B. Provisional Project Construction Schedule: The schedule of construction activities, as prepared by the Owner, which gives all project stakeholders an estimated amount of time for the construction phase of the Project.
- C. Project Construction Schedule: The detailed CPM Construction Schedule prepared by the General Contractor for the duration of the Construction Phase of the Project.
- D. Interim Project Construction Schedule: The detailed 90-day "look-ahead" CPM Project Construction Schedule prepared by the Contractor as a prelude to the Project Construction Schedule. The Interim Project Construction Schedule is based on the milestones indicated in the Provisional Project Construction Schedule. This Schedule is required for the Contractor to receive payment for work performed during the first 60 days of the Project. The purpose of this schedule is to give the Contractor adequate time to plan and schedule all of the work for the Project, while they are mobilizing and beginning to perform work.
- E. Master Project Schedule: A schedule prepared by the Owner to track all activities of the entire Project.
- F. Updated Project Construction Schedule: The Project Construction Schedule prepared each month by the Contractor in support of their request for payment.
- G. Revised Project Construction Schedule: The Project Construction Schedule that has been changed by the General Contractor, during the course of construction, and approved by the Owner. The Revised Project Construction Schedule may include changes in logic, changes in the

durations of the activities, changes in the sequencing of the work, and fragments.

- H. Recovery Project Construction Schedule: The Project Construction Schedule prepared by the General Contractor to support their efforts to recover lost time during the Project.
- I. CPM (Critical Path Method): Critical Path Method (CPM) is a system for planning, scheduling, controlling, and monitoring progress on a Project. The CPM system uses networks of activities interrelating time and dollars to monitor progress on Projects. CPM uses network analysis to identify those tasks, which are on the critical path, where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. The system provides a means of evaluating delays and impacts caused by changes and delays attributed to Owners and Contractors.
- J. Critical Path: The longest continuous sequence of activities through the network schedule that establishes the minimum overall project duration and contains no float.
- K. Activity: An activity is defined as any portion or element of work, action, and/or reaction that is precisely described, readily identifiable and is a function of a logical sequential process.
 - 1. Critical Activity – Activities on the Critical Path. They must start and finish on the planned start and finish dates, otherwise there will be a delay in the completion of the Project.
 - 2. Predecessor Activity – an activity that must be completed before a given activity can be started.
 - 3. Successor Activity – an activity that succeeds another activity.
- L. Float: Any activity not on the critical path will have a certain amount of leeway or float time associated with it. Float time is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of a chain of activities in Project Construction Schedule. Float Time is the amount of time that an activity can slip past its duration without delaying the rest of the project.
- M. Fragnet: The subdivision of a project network diagram into segments, usually representing some form of subproject (change).
- N. Milestone: A clearly identifiable point in a project or set of activities that commonly denotes a reporting requirement or completion of a key component of a project.

- O. Phasing: The process of segregating activities into a series of sequential phases.
- P. Delay: An interruption or hindrance to planned progress.

1.3 GENERAL REQUIREMENTS

- A. The work under this contract will be planned, scheduled, executed and reported using the Critical Path Method, hereinafter referred to as CPM.
- B. The primary objectives for developing and maintaining a Project Construction Schedule are to insure the adequate planning, scheduling and execution of the construction activities so they may be performed in an orderly and expeditious manner, within the Contract Time and the Milestone Dates stipulated by the Contract; to provide optimum coordination between Contractors; to establish the basis for measuring and monitoring individual Contractor progress and overall project progress; to detect problems for the purpose of taking corrective action to maintain the Master Project Schedule; and to provide a mechanism or tool for determining and monitoring such corrective actions.
- C. The Provisional Project Construction Schedule prepared for this project, is made available by the Owner as an aid to the Contractor. It is intended that Contractor's actual Project Construction Schedule include the milestone dates indicated in the Provisional Project Construction Schedule. However, the services provided by the owner, the existence of schedules, networks, vector charts or any other charts or services prepared or performed by the Owner shall in no way relieve the Contractor of the responsibility of complying with all of the requirements of the Contract Documents, including but not limited to the responsibility of completing the Work within the Contract Time and the responsibility of planning, scheduling and coordinating the work. The Contractor is required to comply with all control procedures specified herein and with any reasonable changes that may be necessary, in the opinion of the Owner, during the contract duration.
- D. All Milestone dates or specific dates listed in these specifications, or elsewhere in the Contract Documents represent only the major items of construction/erection work or interface dates. The Milestone dates indicated are considered essential to the satisfactory performance of this contract and to the coordination of all work on the project. The Milestone dates listed are not intended to be a complete listing of all work under this Contract or of all interfaces with other project Contractors. The Milestone dates listed represent the latest allowable completion dates. Earlier completion dates may be established as agreed by the Contractor and the Owner.

- E. If the General Contractor should desire or intend to complete the work earlier than any required Milestone or Completion date, the Owner shall not be liable to the General Contractor for any costs or other damages should the General Contractor be unable to complete the Work before such Milestone or Completion date. The duties, obligations and warranties of the Owner to the General Contractor shall be consistent with and applicable only to the completion of the Work on the Milestone and Completion dates required in the Owner-Contractor Agreement unless the Owner and General Contractor otherwise agree in writing.
- F. The General Contractor shall maintain, as part of its organization, a staff of sufficient size, knowledgeable in the use and application of Scheduling Application and whose responsibility will be to prepare input information for the Project Construction Schedule, monitor progress, provide input for updating and revise logic diagrams when necessary.
- G. The General Contractor is required to adhere to the Milestone Dates as set forth in the General and Supplemental Conditions, Provisional Project Construction Schedule, or as determined elsewhere in the contract documents.
- H. Float time is not for the exclusive use or benefit of either the General Contractor or the Owner. The Contractors work shall proceed according to early start dates, and the Owner shall have the right to reserve and apportion float time according to the needs of the project. The General Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any affect upon contract completion times, providing that the actual delay does not exceed the float time associated with those activities.
- I. Extensions of time for performance as described in the Contract Documents will be granted only to the extent that time adjustment for the activity or activities affected by any condition or event which entitles the General Contractor to a time extension exceed the total float or slack along the path of activities affected at the time of Notice to Proceed of a Change Order or the commencement of any delay or condition for which an adjustment is warranted under the Contract Documents, pursuant to paragraph 1.07 Requested Time Adjustment Schedule.

1.4 POST AWARD ACTIVITIES

- A. The General Contractor shall perform the following activities after receipt of the Notice to Proceed:
 - 1. Immediately after Notice to Proceed, the General Contractor shall begin the preparation of his Interim Project Construction Schedule and the Project Construction Schedule. The General Contractor

shall assemble, with the assistance of his Subcontractors and Suppliers, information regarding the project that includes but is not limited to:

- a. A detailed Interim Project Construction Schedule or Project Construction Schedule that represents the General Contractor's best judgment of how he shall prosecute and complete the work in compliance with the Contract Milestone Dates and any Specific Dates stipulated in the Contract. The level of detail required in the Contractor's schedule should generally be a function of the complexity of the work
- b. The identity and duration of all activities to be included in this Interim Project Construction Schedule and the Project Construction Schedule. Activities shall meet the following criteria:
 1. Activity descriptions shall be clear and concise. The beginning and end to each activity shall be readily verifiable.
 2. Responsibility for each activity shall be identified with a single performing organization.
 3. The level of detail of the Network shall be such that no activity shall have a duration longer than fourteen (14) calendar days, except for procurement and General Conditions Activities or except at the discretion of the Owner. Include written two week look ahead for Architect's review.
 4. Identify phasing and location of activities as required.
- c. The identity of long lead items and delivery dates of all major pieces of equipment or materials.
- d. The identity of any potential problems or constraints related to the implementation of the Interim Project Construction Schedule and/or the Project Construction Schedule.

The Owner will be available, during normal working hours, to consult with the General Contractor if questions arise while the contractor assembles the information required for the Interim Project Construction Schedule and/or the Project Construction Schedule.

- B. The General Contractor shall, within fourteen (14) calendar days following receipt of the Notice to Proceed, submit to the Owner an Interim Project Construction Schedule, in Critical Path Method format (or CPM), for his construction/erection scope of work for the first 90-days of the Project, compatible in Primavera P3 format. The Owner will review the General Contractor's Interim Project Construction Schedule to determine if it meets the specific requirements of the Provisional Project Schedule. The General Contractor shall, within sixty (60) calendar days following the

receipt of the Notice-to-Proceed, submit to the Owner the Project Construction Schedule in the same format indicated above. The Owner will review the General Contractor's Project Construction Schedule to determine if it meets the specific requirements of the Provisional Project Schedule. The form of submittal for the Interim Project Construction Schedule and the Project Construction Schedule including logic diagrams is as follows:

1. The General Contractor shall submit to the Owner a computer disk in Primavera P3 or compatible format and two (2) full size printed copies of his proposed contract activities. The Interim Project Construction Schedule and the Project Construction Schedule shall consist of a network diagram with activity descriptions and durations and supporting data that will explain the General Contractor's planning of the work.
2. The network diagram shall show:
 - a. The order and interdependencies of the General Contractors activities and the major points of interface or interrelation with the activities of others, including Specific Dates for completion.
 - b. Conformance with and identification of the specified mandatory Milestone dates specified in the Contract Documents.
 - c. The description and quantity of work by activity.
 - d. For all equipment and materials fabricated or supplied for this Project, the network shall show a sequence of activities including:
 1. Procurement
 2. Engineering and Preparation of Submittals
 3. Approval of Submittals
 4. Fabrication/Manufacturing
 5. Delivery
 6. Erection/installation
 - e. Delivery of Owner-furnished material and equipment.
 - f. Critical Path (or Paths).
 - g. Training of Owner personnel on Equipment
 - h. Testing of equipment and materials.
 - i. A complete detailed sequence of operations of the work within the time limits specified in the contract.
- C. The Interim Project Construction Schedule and the Project Construction Schedule shall indicate an early completion date for the project that is no later than the project's required completion date. All activity duration's shall be given in calendar days. The Interim Project Construction

Schedule and the Project Construction Schedule shall also indicate each of the following:

1. Interfaces with the work of outside Contractors, e.g., utilities, power, and with any separate Contractor.
 2. Detailed description of the activity along with the coding and phasing, if applicable.
 3. Estimated duration time for each activity.
 4. Early start date for each activity.
 5. Late start date for each activity.
 6. Early finish date for each activity.
 7. Late finish date for each activity.
 8. Float available for each path of activities containing float.
 9. Identification of all critical path activities in the mathematical analysis.
 10. The critical path for the project, with said path of activities being clearly and easily recognizable on the time-scaled network diagram.
 11. The relationship between all non-critical activities and activities on the critical path shall be clearly shown on the network diagram.
 12. The responsibility code for the Contractor or Subcontractor performing each activity or portion thereof.
 13. For each activity, the identification of all predecessor and successor activities.
 14. For each activity, the number of man-hours required to complete each activity.
- D. The General Contractor shall submit, with the Interim Project Construction Schedule and the Project Construction Schedule, a narrative report indicating anticipated allocation of the following resources and work shifts to be utilized on the project.
1. Labor resources
 2. Equipment resources
 3. Whether work will be performed on a single, double or triple shift, and whether it is to be done on a 4, 5, 6 or 7-day work week basis.
 4. Construction logic and a summary of the sequence of the work.
 5. An explanation of the coding and/or phasing used.
- E. It is to be expressly understood and agreed by the General Contractor that the Interim Project Construction Schedule and the Project Construction Schedule is an estimate to be revised from time-to-time as progress proceeds, and that the Owner does not guarantee that General Contractor can start work activities on the "early start" or "late start" dates or complete work activities on the "early finish" or "late finish" date shown in the Interim Project Construction Schedule and the Project Construction Schedule, or as same may be updated or revised; nor does

the Owner guarantee that General Contractor can proceed at all times in the sequence established by said schedule. If the Contractor's Interim Project Construction Schedule and the Project Construction Schedule indicates that the Owner or a separate Contractor is to perform an activity by a specific date, or within a certain duration, the Owner or any separate Contractor under contract with Owner shall not be bound to that date or duration unless the Owner expressly and specifically agrees in writing to same, the Owner's overall review and approval or acceptance of the Interim Project Construction Schedule and the Project Construction Schedule does not constitute an agreement to specific dates, durations or sequences for activities of the Owner or any separate Contractor.

- F. The Owner will review the General Contractor's Interim Construction Project Schedule and the Construction Project Schedule, including logic diagrams and computer-generated mathematical analysis, for compatibility with the Contract Documents. If required, a meeting will be held between the Owner and General Contractor to resolve any conflicts between the Contractor's Interim Project Construction Schedule and/or the Project Construction Schedule and the Contract Documents. The General Contractor shall revise his schedule as required by the Owner to support the Contract Documents and shall submit his revised schedule to the Owner within fourteen (14) days.
- G. Within fourteen (14) calendar days following acceptance of the Interim Project Construction Schedule or the Project Construction Schedule, the General Contractor will provide two (2) full size printed copies and electronic copy of the General Contractor's Interim Project Construction Schedule or the Project Construction Schedule and a computer listing of all network activities, and an electronic file copy on a disk (CD) to the Owner. The Owner shall review the Interim Project Construction Schedule or the Project Construction Schedule, and after the Owner agrees that it conforms to the Contract Documents, the General Contractor's Interim Project Construction Schedule or the Project Construction Schedule will be used to monitor progress of the work and support requests for payment.
- H. The General Contractor will develop and maintain the Master Project Schedule, of which the Contractor's Interim Project Construction Schedule or the Project Construction Schedule will be made a part. This Master Project Schedule will be the controlling schedule document utilized for managing overall project progress.
- I. Within ninety (90) calendar days following the receipt of the Notice to Proceed, the General Contractor shall participate in a meeting with the Owner to review, evaluate and approve the Project Construction Schedule.

- J. If the General Contractor thereafter desires to make changes in its method of operating and scheduling, he shall follow the procedures set out in paragraph 1.05, Network Revisions, of this section.
- K. Approval by the Owner of the General Contractor's Interim Project Construction Schedule or the Project Construction Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract-required Milestone and Completion date. Omissions and errors in the approved Interim Project Construction Schedule or the Project Construction Schedule shall not excuse performance that is not in compliance with the contract.

Approval by the Owner in no way makes them an insurer of the Interim Project Construction Schedule's or the Project Construction Schedule's success nor shall it make the Owner liable for time or cost overruns from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of Owner approval of or acquiescence to the Interim Project Construction Schedule or the Project Construction Schedule.

- L. The General Contractor shall include in the Project Construction Schedule all procurement related activities that lead to the delivery of materials to the site in a timely manner. The schedule of off-site activities shall include, but is not limited to, the following:
 - 1. Dates for submittals, ordering, manufacturing, or fabricating, and delivery of equipment and materials. Long lead items requiring more than one month between ordering and delivery to site shall be clearly noted.
 - 2. All significant activities to be performed by the Contractor during the fabrication and erection/installation in a Contractor's plant or on a job site, including materials/ equipment purchasing.
 - 3. The General Contractor's drawings and submittals to be prepared and submitted to the Owner and Architect
- M. The General Contractor shall be solely responsible for expediting the delivery of all material they intend to furnish, so that the construction progress shall be maintained according to the current schedule for the Work as approved by the Owner.
- N. The General Contractor shall advise the Owner, in writing, whenever they anticipate that the delivery date of any material and/or equipment furnished by the General Contractor for installation will be later than the delivery date shown on the schedule, subject to schedule updates.
- O. Submittals, equipment orders and similar items are to be treated as schedule activities, and shall be given appropriate activity numbers.

- P. The General Contractor, in developing his procurement schedule, will confirm and verify that the off-site activities do not control the Critical path of on-site activities.

1.5 COMPUTER COST AND SCHEDULE REPORTS

- A. Every month the General Contractor will provide a Preliminary Computer Generated Update Report for the Owner and Architect to use to determine the percent complete and remaining duration of all activities. The data approved in this report shall be used, by the General Contractor, to update the Project Construction Schedule on a Monthly Basis. This report shall be submitted along with the submission of the application for payments. The General Contractor's Project Manager and/or Superintendent, and the Owner shall meet at the job site for the purpose of reviewing the General Contractor's report of actual progress, and obtaining from the General Contractor (following his meeting with all concerned Subcontractors and suppliers) up-to-date and accurate progress data. Applications for payments will not be processed without the Updated Project Construction Schedule.

B. Report Content:

1. The Preliminary and Final Monthly Update Reports shall include the following minimum information for each activity sorted by activity number, by remaining float (from the least to the most), and by late start date, in chronological order:
 - a. Activity number
 - b. Activity codes
 - c. Activity description
 - d. Estimated duration in days
 - e. Early and late start dates (or Actual if in Progress or Completed)
 - f. Early and late finish dates (or Actual if in Progress or Completed)
 - g. Percentage of activity completed as of the previous report (Proposed Current % of Activity Completed)
 - h. Remaining duration as of Previous Report
 - i. Proposed current remaining duration

- C. All updated Preliminary and Final Monthly Reports will be distributed to the Owner and Architect as follows:

- 1- Paper Copy
- 1- Electronic Copy (PDF format)

- D. The General Contractor shall also submit a narrative report with the Preliminary and Final Monthly Reports which shall Include, but not be limited to, a description of problem areas, current and anticipated delaying factors and their impact, an explanation of corrective action taken, any newly planned activities, and any proposed logic revisions for a Recovery Schedule. The narrative report shall also include:
1. A description of the actual work accomplished during the reporting period
 2. A list of major equipment delivered and/or installed during the reporting period.
 3. A list of major equipment remaining to be delivered to the Project Site including the current availability and anticipated jobsite delivery date
 4. Changes or additions to Contractor's supervisory personnel since the preceding progress report
- E. In addition to the above, the General Contractor may be required to submit from time to time the following reports:
1. Critical Items Report: The General Contractor shall submit periodically to the Owner a Critical Items Report identifying items by cause and impact that are, or will, seriously affect the General Contractor's progress or ability to perform work in accordance with the current General Contractor Construction Schedule.
- Such reports will not be required more than once every sixty (60) days and shall be furnished in sufficient detail to define the cause and potential impact of any actual or anticipated changes in material or equipment deliveries (Contractor or owner-furnished manpower, availability, weather conditions, or other items critical to maintaining the schedule.

1.6 NETWORK REVISIONS

- A. Should the General Contractor, after approval of the Initial Project Construction Schedule, desire to change his plan of construction, he shall submit his requested revisions to the Owner and Architect along with a written statement of the revisions including a description of the logic for rescheduling the work, methods of maintaining adherence to intermediate milestones and Specific Dates and the reasons for the revisions. The General Contractor shall revise his Project Construction Schedule to include the effect of changes, acts of God, or other conditions or events that have affected the network. If the requested changes are acceptable to the Owner and Architect, the Contractor will incorporate them into the Project Construction Schedule, in the next reporting period.

- B. When the Owner orders changes by Change Order which have the potential to impact the Milestone Dates as set forth in the General and Supplemental Conditions, Provisional Project Construction Schedule, or as determined elsewhere in the contract documents, the General Contractor shall prepare a Network (fragnet) and provide it to the Owner and Architect for concurrence or revision as the Owner deems necessary. After the network has been mutually agreed upon, the General Contractor will incorporate it into the Project Construction Schedule. Change Order logic will affect only those activities and performance dates directly concerned. Adjustments in scheduled intermediate Completion Dates or for the Contract as a whole, will be considered only to the extent that there is insufficient remaining float to absorb these changes.
- C. Any change to the approved Project Construction Schedule must be approved in writing by the Owner.
- D. Neither the updating or revision of the Project Construction Schedule nor the submission, updating, change or revision of any report or schedule submitted to the Owner by the General Contractor under this Section nor the Owner's review or concurrence of any such report or schedule shall have the effect of amending or modifying, in any way, the Contract Time, any Contract Completion Date, or Contract Milestone Dates or of modifying or limiting in any way the Contractors obligations under this Contract.

1.7 RECOVERY SCHEDULE

- A. If the General Contractor's schedule, to the extent that any of the mandatory specific or milestone dates or completion dates, fall behind by 14 days or more, or in the opinion of the Owner are in jeopardy, the General Contractor shall be required to, at no extra cost to the Owner, prepare and submit to the Owner a supplementary Recovery Schedule, in a form and detail appropriate to the need, to explain and display how he intends to reschedule those activities to regain compliance with the Project Construction Schedule during the Immediate subsequent pay period.
- B. The General Contractor and Owner shall do the following after determination of the requirement of a Recovery Schedule:
 - 1. Within three (3) calendar days, the General Contractor shall meet with the Owner to present and review a draft version of the Recovery Schedule. The Recovery Schedule shall represent the Contractor's best judgment as to how he shall reorganize his work so that he may return to the completion dates indicated in the Project Construction Schedule within the immediate subsequent

- pay period. The Recovery Schedule shall be prepared to a similar level of detail as the Project Construction Schedule and shall have a maximum duration of one (1) month that shall coincide with the pay period.
2. Within five (5) calendar days, the General Contractor shall participate in a conference with the Owner to review and evaluate and approve the final Recovery Schedule. Any revisions required as a result of this review shall be resubmitted by the Contractor for approval within two (2) calendar days of the conference. The approved Recovery Schedule shall then be the Schedule which the Contractor shall use in planning, organizing, directing, coordinating, performing and executing the Work (including all activities of subcontractors, equipment vendors and suppliers) for its one (1) month duration, to regain compliance with the Project Construction Schedule.
- C. Five (5) calendar days prior to the expiration of the Recovery Schedule, the Owner and the General Contractor will meet at the job site for the normal monthly update and to determine the effectiveness of the Recovery Schedule and to determine whether the Contractor has regained compliance with the Project Construction Schedule. At the direction of the Owner, one of the following will happen:
1. If, in the opinion of the Owner, the General Contractor is still behind schedule, the General Contractor will prepare another Recovery Schedule, at the Contractors expense, pursuant with 1.06 (A&B) of this Section, to take effect during the immediate subsequent pay period.
 2. If, in the opinion of the Owner, the General Contractor has sufficiently regained compliance with the Project Construction Schedule, the use of the Project Construction Schedule will be resumed.

1.8 REQUESTED TIME ADJUSTMENT SCHEDULE

- A. The Updated Project Construction Schedule submitted by General Contractor shall not show a completion date later than the Contract Time, subject to any time extensions approved by Owner; provided, however, that if the General Contractor believes he is entitled to an extension of the Contract Time under the Contract Documents, the General Contractor shall submit to the Owner, with each progress payment update, a separate schedule analysis (entitled "Requested Time Adjustment Schedule"), indicating suggested adjustments in the Contract Time which should, in the opinion of General Contractor, be made in accordance with the contract Documents by time extension, due to changes, delays or conditions occurring during the past month or previously, or which are expected or contemplated by General Contractor (whether such

conditions are excusable under the Contract or are alleged to be due to Contractor or Owner fault), this separate schedule, if submitted, shall be time-scaled utilizing a computer generated and computer drawn network analysis schedule, unless otherwise approved by the Owner and shall be accompanied or preceded by a formal time extension request as required by the Contract and a detailed narrative justifying the time extension requested.

The network analysis should include all of the related activities that have led the General Contractor to believe that they have been delayed. The Requested Time Adjustment Schedule should indicate where the delay began and ended, and where activities could not start because of the delay. If a delay occurred, but the schedule indicates that the predecessor activity could not have begun due to some other delay, then this would not be a cause for requesting a time extension for that particular instance. If a delay occurred, and some of the successor work was able to start, then this would be considered a partial delay, which may or may not be a cause for a time extension.

- B. The time extension request shall include schedule forecasts that predict the actual Project Completion Date, and any separable portions thereof specified by the Owner plus a forecast of the actual achievement of any milestones listed in the Contract Agreement.
- C. To the extent any time extension requests are pending at the time of any update in the Construction Schedule, the "Requested Time Adjustment Schedule" shall also be updated each month, to reflect any adjustments made by Contractor in the logic, sequence or duration of any activities in the Construction Schedule, or any time extensions previously granted by Owner, and to reflect actual or expected progress, in order that the "Requested Time Adjustment Schedule" shall clearly and accurately reflect the General Contractor's actual intention and proposed time adjustments as of the latest update.
- D. The Owner shall have no obligation to consider any time extension request unless the requirements of the Contract Documents, and specifically, but not limited to these requirements, are complied with; and the Owner shall not be responsible or liable to General Contractor for any constructive acceleration due to failure of the Owner to grant time extensions under the Contract Documents should the General Contractor fail to substantially comply with the submission requirements and the justification requirements of this Contract for time extension requests. The General Contractor's failure to perform in accordance with the Project Construction Schedule shall not be excused, nor be chargeable to the Owner, because the General Contractor has submitted time extension requests or the "Requested Time Adjustment Schedule."

1.9 COORDINATION

- A. The General Contractor shall coordinate his work with that of other Contractors and shall cooperate fully with the Owner in maintaining orderly progress toward completion of the work as scheduled. The Owner's decisions regarding priority between the General Contractors work and the work of other Contractors at the site shall be final and shall not be cause for extra compensation or extension of time, except where extension of time is granted because of a delay for which the General Contractor is otherwise entitled to an extension of time under the Contract Documents.
- B. The milestone dates referred to in the Contract Documents for delivery of Owner furnished equipment and materials and interface activities of other General Contractors on the site are based on dates set forth in separate contracts with the Owner and represent the best information available at the time.
- C. The failure of the Owner-furnished equipment and materials to arrive as scheduled, or the failure of other Construction Contractors to meet their schedule, shall not be justification for an extension of time, except where such failure causes, in the opinion of the Owner, an unreasonable delay in the General Contractors work, in which case the provisions of the General Conditions regarding extensions of time and extra work shall apply.
- D. The General Contractor shall keep himself, and his Subcontractors, advised at all times during the course of the work regarding the delivery status of the Owner-furnished equipment and materials and of the progress of construction work being performed under separate contracts.
- E. The Owner will, upon written request by the General Contractor, furnish information that may be available to the Owner.

1.10 CONTRACTOR COVENANTS AND GUARANTEES

- A. The General Contractor covenants and guarantees that the General Contractor will not:
 - 1. Misrepresent to the Owner its planning scheduling or execution of the work.
 - 2. Utilize schedules materially different from those made available by the General Contractor to the Owner or any Subcontractor or separate the Contractors for the direct execution and coordination of the Work, or which are not feasible or realistic.

3. Prepare schedules, updates, revisions or reports for the work which do not accurately reflect the actual intent or reasonable and actual expectations of Contractor and its Subcontractor as to:
 - a. The sequences of activities,
 - b. The duration of activities,
 - c. The responsibility of activities,
 - d. Resources availability,
 - e. Labor availability or efficiency,
 - f. Foreseeable weather conditions,
 - g. The percentage complete of any activity,
 - h. Completion of any item of work or activity,
 - i. Project milestone completion,
 - j. Delays, slippage's, or problems encountered or expected,
 - k. Subcontractor requests for time extensions or delay claims of subcontractors,
 - l. If applicable, the float time available.
- B. The General Contractor's failure to substantially comply with the foregoing covenant and guarantee shall be a substantial and material breach of contract which will permit the Owner to terminate the Contract for default, or withhold payments under the Contract Documents, and shall entitle the Owner to the damages afforded for misrepresentation or fraud by these Contract Documents or applicable law.
- C. Should the General Contractor fail to substantially comply with the provisions of the Contract Documents relating to planning and scheduling the work by the Project Construction Schedule, and the Owner shall have the right, at their option, to retain the services of scheduling consultants or experts (including attorneys if necessary, in their opinion) to prepare a schedule in accordance with the Contract Documents and to review and analyze same, in order to allow the Owner to evaluate the program of the Work by the Contractor, to determine whether the General Contractor is substantially complying with the Contract Documents, and to direct such action on the part of the Contractor, as permitted by the Contract Documents, as required to ensure, under the Owner's schedule prepared hereunder, that the General Contractor will comply with such schedule. All costs incurred by the Owner in preparing the schedule hereunder shall be charged to the General Contractor's account. If the General Contractor fails to substantially comply with the scheduling and execution of the work requirements of the Contract Documents, the Contractor hereby agrees, in such instance, to comply with such schedules, as the Owner develops, or directs, and activity sequences and duration's as the Owner may reasonably require, without additional cost to the Owner (subject only to cost adjustments for such changes in the work as the Owner may direct), to ensure completion within the Contract Time.

1.11 DEFAULT

- A. Failure of the General Contractor to substantially comply with the requirements of this Section shall constitute reason that the General Contractor is failing to prosecute work with such diligence as will ensure its completion within the Contract times and shall be considered grounds for termination by the Owner.

END OF SECTION 01 32 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the General Contractor. They do not include Contract enforcement activities performed by the Architect.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
 - 2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

- A. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

1. Costs of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests, performed on original construction, do not indicate compliance with Contract Documents.
- B. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
 1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
 2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
 3. Providing facilities for storage and curing of test samples.
 4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
 5. Security and protection of samples and test equipment at the Project site.
- C. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the General Contractor, except where they are specifically indicated as the General Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
 1. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the owner's responsibility.
 2. The General Contractor agrees to engage and pay for the quality control services specified as the General Contractor's responsibility, including retesting, from the independent agency engaged by the Owner.
- D. Duties of the Testing Agency and Special Inspector: The independent testing Agency and the Special Inspector, engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections, shall cooperate with the Architect and Contractor in performance of their duties, and shall provide qualified personnel to perform required inspections and tests.
 1. The Agency or the Special Inspector shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Neither the Agency nor the Special Inspector is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
 3. Neither the Agency nor the Special Inspector shall not perform any duties of the General Contractor.
- E. Coordination: The General Contractor and each Agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the General Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. The General Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01 40 00

01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. This Section specifies applicability of industry standards to products specified, administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. Submittals and administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01 33 00, "Submittal Procedures."

1.3 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.
- C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.
- D. Approved: The term approved, when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

- F. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. Install: The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. Provide: The term provide means to furnish and install, complete and ready for the intended use.
- I. Installer: An Installer is the Contractor or another entity engaged by the General Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 1. The term experienced, when used with the term Installer, means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
 - 2. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
 - 3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no choice or option. However, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
 - a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- J. Project site is the space available to the General Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

- K. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finishes,” “accessories,” and similar terms. Such terms such are self-explanatory and have well-recognized meanings in the construction industry.
 - 1. “Products” are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term “product” includes the terms “material,” “equipment,” “system,” and terms of similar intent.
 - a. “Named Products” are items identified by manufacturer’s product name, including make or model designation, indicated in the manufacturer’s published product literature, that is current as the date of the Contract Documents.
 - 2. “Materials” are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
 - 3. “Equipment” is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. These Specifications with the accompanying Drawings are intended to describe and illustrate all material, labor, and equipment necessary to complete the new Police Headquarters and Elevated Parking Garage, Bedford and North Streets, Stamford, CT.
- B. Specification Format: These Specifications are organized into Divisions and Sections based on the MASTERSPEC numbering system, 2014 edition.
- C. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 - 1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be

interpreted as appropriate. Words that are implied, but not stated, shall be interpolated, as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

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

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

- D. In general, the Specifications will describe the "quality" of the work and the Drawings, the "extent" of the work. The Drawings and Specifications are cooperative and supplementary, however, and each item of the work is not necessarily mentioned in both the Drawings and the Specifications. All work necessary to complete the project, so described, is to be included in this Contract.
- E. In case of disagreement between Drawings and Specifications, or within either document itself, the better quality or greater quantity of work shall be the determining basis for all decisions and/or adjustments. Any work done by the General Contractor without consulting the Architect, when the same requires a decision, shall be done at the Contractor's risk.
- F. Omissions or Errors: If any omissions or errors are noted or instructions at variance with the obvious intent of the documents, it is the responsibility of the Contractor to call them to the Architect's attention before signing the Contract.

1.5 SUBMITTALS

- A. Comply with requirements contained in Section 01 30 00, "Submittals and Product Substitutions".

1.6 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: When the General Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

- C. Responsibility to furnish material: Listing or mention of materials is sufficient indication to make it the General Contractor's responsibility to furnish said materials in accordance with the grades or standards indicated, free from defects impairing strength, durability or appearance, and in sufficient quantity for the proper and complete execution of the work, unless specifically stated otherwise.
- D. Responsibility for or methods: The listing or mention of any method of installation, erection, fabrication or workmanship shall not operate to make the contractor an agent, but shall be for the sole purpose of setting a standard of quality for the finished work. General Contractor is free to use any alternate method, provided only that, prior to the start of the work, such alternate method is approved in writing by the Architect, as resulting in quality equal to that intended by these documents. Unless an alternate method is approved, all work shall be in strict accordance with all methods of installation, erection, fabrication and workmanship listed or mentioned herein.

1.7 INDUSTRY STANDARDS

- A. Compliance: Furnish all materials and accomplish all work in accordance with the grades or standards of materials, standards of workmanship, and manufacturer's literature, as referenced in these documents.
- B. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- C. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
- D. Conflicting Requirements: Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

- E. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.
- F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products in accordance with the Architect's and manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
 - 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
 - 3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
 - 4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.
 - 5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
 - 6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
 - 7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
 - 8. Packages, materials and equipment showing evidence of damage may be rejected by the Architect.

9. Store rigid insulation board away from the building.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
 1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
 1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated, or equal to that described.
 2. Semiproprietary Specification Requirements: Where three or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
 - a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

- a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
- 5. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
- 6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
 - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.
- 7. Visual Selection: Where specified product requirements include the phrase " as selected from manufacturer's standard colors, patterns, textures " or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
 - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 42 00

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:
 - 1. Land survey Work
 - 2. Civil engineering services
 - 3. Dimensional layout of building elements.
 - 4. Site as-built documentation

1.3 SUBMITTALS

- A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents.
- B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals" and "Project Close-out".

1.4 QUALITY ASSURANCE

- A. Surveyor: Engage a Registered Land Surveyor registered in the State of Connecticut to perform land surveying services required.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Owner will identify existing control points and property line corner stakes.

- B. Verify layout information shown on the Drawings, in relation to the property survey, and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
 - 2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.
- C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- D. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning the work, investigate and verify the existence and location of underground utilities and other construction.
 - 1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer and storm sewer.
 - 2. Close attention shall be required for any excavations within the vicinity of existing underground utilities.

3.2 PERFORMANCE

- A. Working from lines and levels established by the property survey, field measurements, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
 - 1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
 - 2. As construction proceeds, check every major element for line, level and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.
 - 1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized

tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

- C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.
- D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.
- E. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.
- F. Site As-Built Drawing: Organize and submit to the Architect and Owner a site as-built drawing in a form acceptable to the local authority having jurisdiction.
 - 1. Drawing shall indicate all as-built conditions of the following:
 - a. in-place foundation walls,
 - b. site elevations,
 - c. elevations and inverts for all storm water, sanitary waste systems, underground structures, underground tanks, and connections to existing underground utilities.
 - 2. Submit final drawings in a reproducible format as determined by, and acceptable to, the local authority having jurisdiction and in a format that will comply with the Owner's requirements of a Final Certificate of Occupancy.

END OF SECTION 01 73 00

01 77 00 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project closeout by each Trade Contractor, including but not limited to:
 - 1. Final inspection procedures
 - 2. Record document submittal
 - 3. Submittal of warranties
 - 4. Final cleaning
- B. Closeout requirements for specific construction activities are included in the appropriate sections of the specifications.
- C. Closeout requirements pertaining to final engineering are included in Section 01 73 00 "EXECUTION".
- D. Refer to Section 01 78 23 "Operation and Maintenance Data" for requirements for preparation, format, and submittal procedures for O&M Manuals and As-Built documentation.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection by the Architect for certification of Substantial Completion, complete the following. List exceptions in the request.
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise the Owner of pending insurance change-over requirements.
 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
 4. Obtain and submit releases to the Architect enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
 5. Submit record drawings, maintenance manuals and similar final record information to the Architect.
 6. Deliver tools, spare parts, extra stock, and similar items.
 7. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
 8. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Final Inspection Procedures: Submit a request for final inspection, to the Architect. Following the Architect's final inspection, the Architect will either prepare the Certificate of Substantial Completion, or advise the General Contractor of construction that must be completed or corrected before the certificate will be issued.
1. The Architect will repeat final inspection when requested by the General Contractor and assured that the Work has been substantially completed.
 2. Results of the completed final inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
1. Submit the final payment request to the Architect with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 2. Submit an updated final statement to the Architect, accounting for final additional changes to the Contract Sum.
 3. Submit a certified copy of the Architect's Final Inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Trade Contractor(s).
 4. Submit consent of surety to final payment.

5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Reinspection Procedure: The Architect will re-inspect the work upon receipt of notice from the General Contractor that the Work, including Final Inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Owner and Architect.
 1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the General Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 2. If necessary, re-inspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 3. Note related Change Order numbers where applicable.
 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Submit to the Architect.
- C. Maintenance Manuals: See Section 01 78 23 "Operation and Maintenance Data" for O&M requirements.

1.6 WARRANTEE SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen (15) days of completion of that designated portion of the Work.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.
- C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Schedule: Provide warranties on products and installations as indicated and specified in each Specification Section relating to each product.
- E. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: General cleaning during construction is required by the General Conditions and included in Section 01 50 00 "TEMPORARY FACILITIES".
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - a. Remove labels that are not permanent labels.
 - b. Clean transparent materials. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - d. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.
- D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.
- E. If the General Contractor fails to demonstrate a commitment to accomplish the required cleaning in an orderly, timely fashion, the Owner reserves the right to employ a professional cleaning service, and to deduct any costs thereof from the General Contractor's contract amount.

3.2 WARRANTY PROCEDURES

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty

by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

END OF SECTION 01 77 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 01, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs the Work. Note also all Addenda.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Topping slabs for garage structure.
 - 3. Cast in place washes for the garage structure.
 - 4. Topping slabs in the building.
 - 5. Foundation and basement walls.
 - 6. Slabs-on-grade.
 - 7. Suspended slabs.
 - 8. Fill for steel deck.
 - 9. Concrete toppings.
 - 10. Building frame members.
 - 11. Building walls.
 - 12. Shear walls.
 - 13. Equipment pads and bases.
 - 14. Fill for steel pan stairs.
 - 15. Grade beams.
 - 16. Grouting of base plates.
 - 17. Anchor rod placement.
 - 18. Expansion and adhesive anchors.
 - 19. Moisture vapor reduction admixture (MVRA).
- B. Related Sections:
 - 1. Section 312001 "Building Excavation and Backfill" for sub-base under slabs-on-grade.

1.3 ACTION SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 01 Specification Sections.

- B. Product Data: For each type of product indicated, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, epoxy grout, nonshrink grout, and others if requested by the Engineer.
- C. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Data for Credit IEQ 4.3: For [liquid floor treatments] [and] [curing and sealing compounds], documentation including printed statement of VOC content.
 - 3. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements, and for equivalent concrete mixtures that do not contain portland cement replacements.
- D. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Field water is not to be added.
 - 2. Admixtures are not to be added in the field.
- E. Submit a written description of cold weather and hot weather protection procedures for review and approval a minimum of 15 days prior to start of Work.
- F. Submit a written description of curing procedures for review and approval a minimum of 15 days prior to start of Work. Description to include curing methods and duration of curing.
- G. Shop drawings shall be reviewed and "checked" by the Fabricator prior to being submitted to the Engineer. Unchecked shop drawings shall be rejected and returned to the Contractor.
- H. Contractor to provide a detailed submittal schedule identifying all submittals and the date they are to be received by BVH Integrated Services, Inc. Submittal schedule is to be submitted two weeks prior to the start of the submittal process and updated every two weeks.
- I. Submit locations of all proposed construction joints in foundation walls, concrete beams, structural slabs, and retaining walls for review and approval a minimum of 15 days prior to start of Work.

- J. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Include special reinforcement required for openings through concrete structures.
1. Submit detailed shop drawings which clearly show location, splicing, cover, sizes, and spacing of all reinforcing and wire fabric. Schedules and diagrams shall indicate bends, sizes, lengths of reinforcing members and splice lengths. All reinforcement in concrete footings, walls and grade beams shall be shown in elevation, 1/8" = 1'-0" scale with top of walls, top of shelves, and bottom of footings clearly indicated and sections indicating bar placement, spacing, size and cover. All construction joints, as required on the Contract Drawings or requested by the Contractor, shall be shown with any additional reinforcement required. Show and locate all concrete openings, including those required for other Divisions. Any drawings submitted without showing construction joints and openings will be rejected and will not be reviewed.
 2. All reinforcement in structural slabs and slabs-on-grade shall be shown on 1/8" scale drawings with the bottom and top reinforcement shown on separate drawings. All supplement reinforcement required, including but not limited to slab edge reinforcing, corner bars, re-entry bars, slab openings, and girder bars are to be clearly indicated on the 1/8" scale shop drawings.
- K. No reinforcing shall be cut, fabricated, shipped to the job site, or placed before shop drawings have been approved by the Engineer of Record. Only shop drawings bearing the appropriate Engineer's stamp marked "Furnished As Submitted" or "Furnished As Corrected" or "Furnished As Corrected and Resubmit For Record" shall be used in the field.
- L. Laboratory test reports for concrete materials and mix design tests.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding Certificates: Submit certifications signed by an AWS Certified Welding Inspector of pre-qualified welding procedures, qualifications of welding procedures unless pre-qualified, qualification of welding operators, and qualifications of welders.
- B. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.

4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.
14. Anchoring adhesive.
15. Water vapor reducing admixture.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following Codes, Specifications, and Standards, except where more stringent requirements are shown or specified.
1. American Concrete Institute (ACI) 301, "Specification for Structural Concrete for Buildings."
 2. ACI 318, "Building Code Requirements for Reinforced Concrete."
 3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
 4. ACI 117, "Specification for Tolerances for Concrete Construction and Materials."
- B. Concrete Testing Service: Engage a testing agency acceptable to Engineer to design concrete mixes to perform material evaluation tests associated with the mix design.
- C. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- E. Testing Agency Qualifications: Owner will engage an independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- H. Mockups: Cast mockup 14 days prior to start of concrete work of size indicated or as required to demonstrate typical joints, form tie spacing, and proposed surface finish, texture and color. Maintain sample panel exposed to view for duration of Project, after Architect's acceptance of visual qualities.
1. Build mockups as indicated, or as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Obtain Architect's approval of mockups before starting construction.
 4. If Architect determines that mockups do not meet requirements, demolish and remove them from the site and cast another until the mockup is approved.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging for completed work.
 6. Demolish and remove mockups when directed.
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination," and the following:
1. At least seven days prior to concrete work, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish a preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including but not limited to the following:
 - a. Contractor's superintendent.
 - b. Agency responsible for field quality control.

- c. Ready-mix concrete producer.
 - d. Concrete subcontractor.
 - e. Primary admixture manufacturers.
 - f. Engineer of Record.
 - g. Special Inspector, if applicable.
 - h. Construction Manager's superintendent, if applicable.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.7 WARRANTY FOR SLAB MOISTURE VAPOR REDUCING ADMIXTURE

- A. The manufacturer's standard warranty document executed by an authorized company official. The manufacturer's warranty is in addition to, and not a limitation of, other rights the Owner may have under provisions of the Contract Documents.
 - 1. Warranty Period: Life of concrete commencing on the date of acceptance of the project by the Owner or Notice of Completion.
 - 2. Warranty Terms: Terms to include moisture related failures, including all finished floor materials and labor.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Forms for Exposed to View Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
- B. Forms for Unexposed to View Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: New 45-degree wood, metal, PVC, plastic or rubber strips, 3/4 by 3/4 inch, nailed 6 inches on center, and installed in inside corners of forms.
- D. Form-Release Agent: Commercially formulated form-release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, adjustable length, removable or snap-off metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For slabs-on-grade, use full 4" x 3" x 8" concrete blocks with a compressive strength equal to or greater than the adjacent cast-in-place concrete.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I/II.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal, unless otherwise noted.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding 0.15 percent by mass of cement material. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Moisture Vapor Reduction Admixture (MVRA): ASTM C 494/C494M, Type S.
- C. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
 - b. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - c. Sika Corporation; FerroGard 901.
- D. Concrete Moisture Vapor Reduction Admixture (MVRA): Concrete moisture vapor reduction admixture for all interior slab (on ground and elevated) and structural roof deck construction shall be a non-toxic, liquid admixture that is specifically designed to have a natural chemical reaction with pre-existing elements inside the concrete to eliminate the route of moisture vapor emission through the slab by restricting the integral capillary system. The chemical reaction forms a permanent barrier (capillary break) that is integral to the concrete, insoluble and irremovable.
 1. Basis-of-Design Product: "Barrier One High Performance Concrete Admixture" manufactured by Barrier One, Inc.; 522 S. Hunt Club Blvd., #303, Apopka, FL 32703. Contact manufacturer's representative: P: 877.224.5850; F: 866.594.3490 or email at info@barrierone.com.
 2. Provide the above named product, or upon approval of the Architect / Structural Engineer, provide a product that meets or exceeds the below project specific performance requirements at the expense of the concrete moisture vapor reduction admixture manufacturer.
 - a. Project specific quality control process to include but not be limited to:
 - 1) Independent procurement of one cylinder per day of placement of concrete containing MVRA; do not proceed without MVRA representative being present.
 - 2) Independent testing of all cylinders for hydraulic conductivity per ASTM D5084.
 - 3) Assessing each cylinder for maximum flow of 6.0 E-08 cm/sec.
 - 4) Should any cylinder exceed the maximum flow, procure a core from that day's placement.
 - 5) Independently test core for hydraulic conductivity per ASTM D5084.
 - 6) Should any core exceed the maximum flow, provide a topical moisture mitigation system for all areas not meeting the stated limit. Moisture mitigation system to include all labor, material and warranty that meets or exceeds the terms of the concrete moisture vapor reduction admixture manufacturer's warranty.

- b. Warranty Requirements: Said product must be installed according to and in compliance with the manufacturer's published data sheet to include but not be limited to dosing instructions, on site representation requirements, and the use of an ASTM E 1745 vapor retarder, installed following ASTM E 1643 and ASTM F 710 guidelines; suspended concrete slabs do not require a vapor retarder.
 - 1) MVRA manufacturer's warranty shall include:
 - a) Term: Life of the concrete.
 - b) Repair and/or removal of failed flooring.
 - c) Placement of a topical moisture remediation system.
 - d) Replacement of flooring materials like original installed to include material and labor.
 - 2) MVRA manufacturer shall provide an adhesion warranty to match the term of the adhesive manufacturer's warranty in accordance with the MVRA manufacturer's requirements for conveyance of such.

2.6 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, swellable conformable polyurethane/butyl blended rubber based material free of sodium bentonite, for adhesive bonding to concrete, 1/2 by 1 inch.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Grace; ADCOR ES Hydrophilic Waterstop or approved equal as determined by Architect.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class B minimum. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Stego Industries, LLC; Stego Wrap, 15 mil Class A or approved equal.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: Comply with ASTM C 171, polyethylene film or white burlap-polyethylene sheet or waterproof paper.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating. Moisture loss not more than 0.55 kg/sq. m when applied at 200 sq. ft./gal. Subject to compliance with current US EPA regulations for volatile organic compounds (VOC) emissions and floor finish adhesives.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, 1/2 inch asphalt-saturated cellulosic fiber preformed into strips unless otherwise noted.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Anchoring Adhesive: ASTM C 881, two-compound material suitable for use on dry or damp surfaces. Epcon G5, as manufactured by ITW Ramset/Red Head; PE 1000, as manufactured by Powers Fasteners; or HIT RE-500-SD as manufactured by HILTI. Holes shall be drilled with a rotary hammer drill and carbide-tipped drill bit.
- D. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, comply with ASTM C 1107, of consistency suitable for application, 30-minute working time, and a seven-day compressive strength of 6,000 psi for a mixture with a "flowable" consistency, defined as 140 percent flow on flow table, ASTM C230, five drops in three seconds.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency acceptable to the Engineer of Record for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- B. Submit written reports including all statistical data to the Engineer of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been approved by the Engineer.
- C. Cementitious Materials:[Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.] [Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:]
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 - 5. Silica Fume: 10 percent.
 - 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 - 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- F. Use accelerating admixture in concrete slabs, as required, for placement and workability.
- G. Add air-entraining admixture where specified at manufacturer's prescribed rate to result in concrete at point of placement and having total air content with a tolerance of plus or minus 1-1/2 percent of the value indicated.
- H. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

- I. Corrosion-Inhibiting Admixture: DCI corrosion inhibitor by Grace Construction Products or approved equivalent. Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Dosage rate of 2 gallons per cubic yard.

2.11 CONCRETE MIXTURES

- A. Design mixes to provide concrete with the following properties:

1. Concrete for footings, foundations, grade beams, columns, piers, and walls to be normal weight concrete with a 4,500 psi, 28-day minimum compressive strength; water-cement ratio 0.45 maximum (water content shall include surface water in aggregates); minimum cement content of 6 sacks per cubic yard, maximum 3/4 inch aggregate, four plus or minus 1 inch slump; 6 percent air content by volume.
2. Concrete for slabs-on-grades, slabs on metal deck, and housekeeping pads to be normal weight concrete with a 4,000 psi, 28-day minimum compressive strength, minimum cement content of 6 sacks per cubic yard, water-cement ratio 0.45 maximum (water content shall include surface water in aggregates), maximum 3/4-inch aggregate, four plus or minus 1 inch slump. Provide six percent air content by volume at all exterior slabs. No additional air entrainment is to be provided at interior slabs. Provide water vapor reducing admixture (MVRA) in all interior slabs, coordinate locations with Architect.
3. Concrete for steel pan stairs to be normal weight concrete with a 4,000 psi, 28-day minimum compressive strength, minimum cement content of 6 sacks per cubic yard, water-cement ratio 0.45 maximum (water content shall include surface water in aggregates), maximum 3/8-inch aggregate, four plus or minus 1 inch slump. Provide six percent air content by volume at all exterior slabs.
4. Concrete garage slabs on grade, garage topping slabs and washes. To be normal weight concrete with a 5000 psi, 28-day minimum compressive strength; water-cement ratio 0.40 maximum (water content shall include surface water in aggregates), maximum 3/4-inch aggregate, four plus or minus 1 inch slump. Provide six percent air content by volume at all exterior slabs. Provide corrosion inhibitor at a rate of 2.0 gal/yd³ in the elevated garage ramp slabs and the elevated garage slabs.
5. Concrete topping slabs at building interior sally ports. To be normal weight concrete with a 4,000 psi, 28-day minimum compressive strength; water-cement ratio 0.45 maximum (water content shall include surface water in aggregates), maximum 3/4-inch aggregate, four plus or minus 1 inch slump. Provide corrosion inhibitor at a rate of 2.0 gal/yd³. Provide Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.

- B. If mixes are to be pumped, allowable slump can be increased to six plus or minus 1 inch. Submit separate mix designs, including all backup data, for each pump mix for approval by the Engineer.
- C. Adjustments to Concrete Mixes: Field water is not to be added. Mix design adjustments may be requested by the Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by the Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in Work.
- D. Do not air entrain concrete at interior slabs and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL

- A. Coordinate the installation of joint materials, vapor retarder, embedded items, anchor bolts and other related materials with placement of forms and reinforcing steel.
- B. Thoroughly clean forms, metal deck and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, welding ferrules and/or other debris just before placing concrete.

3.2 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch, tolerances for concrete surfaces exposed to view.
 - 2. Class C, 1/2 inch, tolerances for other concrete surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of exposed concrete, and where indicated on Contract Documents to produce uniform smooth lines and tight edge joints.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- M. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed.

3.3 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures to receive masonry construction and as indicated in the Contract Documents.

3.4 REMOVING AND REUSING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the Work may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements in place until concrete has achieved at least 80 percent of its 28-day design compressive strength.
 - 2. Formwork to remain in place for a minimum of 14 days.
 - 3. Determine compressive strength of in-place concrete by testing field cured test specimens representative of concrete location or members according to ACI 301.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched

forms for exposed concrete surfaces unless approved by Architect and Engineer.

3.5 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643, ACI 302.2, ASTM F-710, and the manufacturer's written instructions.
 - 1. Place vapor retarder sheeting in position with longest dimension parallel with direction of pour.
 - 2. Lap joints 6 inches (minimum) and seal with manufacturer's recommended mastic or pressure-sensitive tape.

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for details and methods of reinforcement placement and supports and as specified.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover as indicated for in ACI 318. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least two full panels. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
 2. Provide formed keyways at least 1-1/2 inches deep by one-third the wall thickness in width in construction joints in walls, and between walls and footings.
 3. Locate horizontal joints in walls and columns as indicated on the Drawings or as approved by the Engineer.
 4. Unless otherwise shown on the Drawings, walls shall have vertical construction joints located no more than 60 ft. apart. No vertical construction joint shall be within 4'-0" of any column pier, corner, or footing joint. Exposed foundation walls shall have control joints spaced at 20'-0" (maximum) on center between construction joints, unless otherwise noted.
 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction (Control) Joints in Slabs-on-Grade: Provide contraction joints in slabs-on-grade to form panels of patterns as shown. Use saw cuts 1/8-inch wide by one-quarter of slab depth.
1. Contraction joints shall be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.
 2. If joint pattern is not shown, provide joints not exceeding 15 ft. in each direction and located to conform to bay spacing whenever possible (at column centerlines, half bays, third bays).
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install smooth dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
- 3.8 WATERSTOPS
- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive

bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

- A. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.
- B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Notify other trades to permit installation of their work.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. A representative of the Moisture Vapor Reducing Admixture (MVRA) must be present at the jobsite for each day of placement of treated concrete. The Contractor must not proceed without the MVRA representative being present for the placement process. Please provide ten days notice of the placement of all batches of treated concrete.
- E. Deposit concrete continuously in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
- F. Deposit concrete in forms in horizontal layers no deeper than 48 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic, to avoid cold joints.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints and segregation.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set and lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- G. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- H. Cold Weather Placement: Cold weather is defined as a period when for more than three consecutive days the average daily temperature is less than 40 deg. F and the air temperature is not greater than 50 deg. F for more than one-half of any 24-hour period. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. Comply with ACI 306.1 and as indicated:
1. When air temperature has fallen to or is expected to fall below 40 deg. F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg. F and not more than 80 deg. F at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agent or chemical.
 4. Slabs-on-Grade (Slab Depth Less Than 10 Inches):
 - a. Concrete operations for slabs indicated above are to take place within a heated enclosure where the air temperature is maintained between 50 deg. F and 85 deg. F for a minimum of 24 hours prior to concrete placement and 72 hours after concrete placement. Ground surface is to be free of frost or frozen materials for slabs-on-grade.
 5. Structural Slabs, Formed Footings, Walls and Piers: The protection means listed below are guidelines only. It is the Contractor's responsibility to provide any and all additional measures necessary to maintain the concrete between 50 deg. F and 85 deg. F for the time period indicated below and comply with ACI 306.1.

- a. Elements with a minimum dimension up to 16 inches are to be protected by the formwork (3/4-inch plywood minimum) and mineral wool blankets (minimum R value of 8.0) for formed and unformed surfaces for 72 hours. If the air temperature is expected to go below 0 deg. F, then a heated enclosure is required.
 - b. Elements with a minimum dimension above 16 inches to 22 inches are to be protected by the formwork (3/4-inch plywood minimum) and mineral wool blankets (minimum R value of 8.0) for formed and unformed surfaces for 72 hours. If the air temperature is expected to go below -29 deg. F, then a heated enclosure is required.
 - c. Elements with a minimum dimension above 22 inches to 34 inches are to be protected by the formwork (3/4-inch plywood minimum) and mineral wool blankets (minimum R value of 8.0) for formed and unformed surfaces for 72 hours.
 - d. Elements with a minimum dimension above 34 inches are to be protected by the formwork (3/4-inch plywood minimum) and mineral wool blankets (minimum R value of 8.0) for formed and unformed surfaces for 72 hours.
6. The Subcontractor and the Inspection Agency are each to maintain independent records of the following information during cold weather:
- a. For each section of concrete placed, record the date, time, outside air temperature, enclosure temperature, temperature of concrete during placement, weather conditions, and methods used to protect the concrete.
 - b. For each section of concrete placed, record the maximum and minimum temperature in each 24-hour period for 72 hours after the concrete is placed. Temperature readings are to be taken at the concrete surface or at three-inch-deep probes into the concrete. A minimum of one thermometer shall be provided at each spread footing or pier placed and a minimum of three thermometers provided for each 60-ft. section of wall or wall footing placed. For walls greater than 10 ft. in height, provide two thermometers at the top of the wall (surface-mounted or probes) and one thermometer within 2 ft. of the base of the wall (probe at formed surface) per each 60-ft. length of wall. Temperature readings are to represent the severe conditions. Corners and edges of concrete are the most vulnerable to freezing and are to be considered the severe condition.
- I. Hot Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot weather conditions exist. Hot weather is any combination of high ambient temperature, high concrete temperature, low relative humidity, wind speed, or solar radiation that will impair the quality of

freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration.

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg. F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to the Engineer.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: Provide a formed finish on formed concrete surfaces not exposed to view or concealed by other construction. Tie holes and defective areas are to be repaired and patched, and fins and other projections exceeding 1/4-inch in height rubbed down or chipped off.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove and smooth fins and other projections completely.
 1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 1. Smooth-Rubbed Finish: Provide smooth-rubbed finish on schedule concrete surfaces that have received smooth-formed finish treatment. Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface

treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces. Finish slab to elevation indicated on Contract Documents.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish slab-on-grade surfaces to the following minimum tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; specified minimum local values of flatness, F(F) 15; and of levelness, F(L) 12.
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; specified minimum local values of flatness, F(F) 21; and of levelness, F(L) 15; at surfaces to receive thin-set flooring.

3. Finish and measure slab on metal deck and elevated structural slab surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 5/16 inch.
 4. Coordinate required finish surface tolerances with actual architectural floor finishes. Grind smooth any surface defects that would telegraph through applied floor covering system.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated, unless otherwise indicated on the Drawings.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 6 inches maximum high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 4000 psi at 28 days.

4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on the Architectural Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously cured for not less than seven days.
- C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure if forms are loosened. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- E. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

- F. Concrete slabs receiving moisture sensitive flooring or roofing materials shall not be moisture cured. Cure concrete according to ACI 308.1 and ACI 302.2, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 3. Curing Compound:
 - a. Apply curing compound to concrete surfaces as soon as final finishing operations are complete (within two hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subject to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete. Verify compatibility with floor finish supplier/manufacturer.
- G. Contractor to coordinate and verify that all curing methods and materials are compatible with architectural finishes. Submit appropriate data for review.

- a. Moisture cure or use moisture-retaining covers to cure all concrete surfaces exposed to view (including slabs) and concrete to receive a concrete topping. Do not use moisture-retaining covers to cure concrete exposed to view if concrete surface will be marred.
- b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
- c. Cure concrete surfaces not exposed to view and concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project. Concrete slabs receiving moisture sensitive flooring or roofing materials shall not be moisture cured.

H. Cure all grout in accordance with the manufacturer's requirements.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Concrete: Repair and patch defective areas immediately after removing forms when approved by Architect/Engineer. Remove and replace concrete that cannot be repaired and patched to Architect's/Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Remove and replace concrete having defective surfaces if defects cannot be repaired to the satisfaction of the Engineer.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, holes left by tie rods and bolts, and voids more than 1/4 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching

- mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect/Engineer. If defects cannot be repaired to the satisfaction of the Engineer, remove and replace the concrete.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment when acceptable to the Engineer/Architect. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping when acceptable to the Engineer. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to

blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar when acceptable to the Engineer. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's/Engineer's approval for method and procedure, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's/Engineer's approval.

3.16 ADHESIVE ANCHORING

- A. All adhesive anchoring to be performed in accordance with the manufacturer's recommendations.
- B. Drill appropriate sized hole to the required depth with rotary hammer drill and carbide drill bit.
- C. Clean hole of all dust, debris and standing water with a nylon brush and compressed air.
- D. Prepare adhesive in accordance with the manufacturer's requirements and follow required procedures for placement during cold weather applications.
- E. Check initial adhesive color with provided color chart.
- F. Inject adhesive into base of hole. Provide dosage control screens for overhead applications.
- G. Install threaded anchor or reinforcing. Adhesive is to coat the entire length of hole and insert.
- H. All adhesive to set prior to disturbing insert.

3.17 ANCHOR ROD PLACEMENT

- A. All anchor rods placed in new concrete are to be set using a plywood or steel template to secure the anchor rods in their proper location and elevation.
 1. Secure template to formwork to ensure proper alignment.
 2. Anchor rods to be secured in place prior to start of concreting.

3. Contractor's option to provide plastic anchor rod sleeves to allow for minor adjustments of anchor rod locations. Sleeves are to be fully grouted with non-shrink grout prior to grouting of leveling or base plates.
 4. Non-shrink grout to be installed and attain the required 7-day design strength at all locations of base plates with leveling nuts prior to the placement of supported structural slabs.
- B. All anchor rods and epoxy grouted reinforcing placed in existing concrete are to be set in epoxy grout for the entire length of required embedment.
1. Hole in existing concrete to be sized, drilled, cleaned and prepared in accordance with the epoxy grout supplier's requirements.
 2. Epoxy grout is to be installed per manufacturer's requirements. Maintain temperature of grout to required levels during cold weather.
- C. An anchor rod is considered out of tolerance if the non-adjusted, cast plan location is not within 1/4-inch of the required plan location, and if the anchor rod projection is not within 1/2-inch the required projection. Anchor rods that are considered out of tolerance are rejected and are to be repaired and/or replaced as required by the Engineer at no cost to the Owner.
- D. All anchor rods that have been repaired or modified are to be load tested as directed by the Engineer of Record. Owner's testing lab to perform load test as directed by the Engineer of Record. Contractor to pay for all costs associated with load testing. Contractor is also responsible for all costs associated with additional repairs including design services of the Engineer of Record if load test fails.

3.18 PLACEMENT OF NON-SHRINK GROUT

- A. Non-shrink grout beneath base plates and bearing plates is to be formed and placed as a flowable mix.
- B. All manufacturer's requirements for mixing, placement, cold/hot weather requirements, surface preparation, curing and protection are to be followed.

3.19 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete, plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. The Contractor shall notify the Owner's inspection agency 24 hours prior to placing concrete to inspect secured reinforcing. No concrete shall be placed until reinforcing has been inspected by the Owner's testing and inspection agency.
3. When concrete is pumped, test cylinders shall be made from concrete taken at discharge end of the pumping train.
4. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
5. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample at point of placement, but not less than one test for each day's pour of each concrete mixture. First truck to be tested of each placement. If first truck does not meet project requirements, test each additional truckload until two passing results are obtained.
6. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure one set of four standard cylinder specimens for each composite sample, unless otherwise directed.
 - b. Provide one set of field cured cylinders for each concrete type for any days that are less than or expected to be less than 40 deg. F within 24 hours after concrete placement. Field-cured cylinders to be cured under the same conditions and temperatures as the cast-in-place concrete.
8. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at 7 days and two specimens at 28 days, and one specimen retained in reserve for later testing if required.
 - a. Test field-cured specimens as indicated for laboratory-cured specimens.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be considered satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Structural Engineer, Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Engineer.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
16. Testing of slabs containing moisture vapor reduction admixture will be carried out by the MVRA admixture manufacturer to include, but not be limited to 4-inch cylinders on all project slabs. Samples will be taken from every concrete placement on the project. The sample cylinders will be sent to an independent laboratory and tested for permeability, the results will be provided to the Owner, Architect and Contractor prior to the installation of floor coverings as part of the warranty closeout documents.

C. Inspection of Adhesive Anchoring:

1. Testing agency shall randomly review anchoring procedures to verify conformance with manufacturer's installation requirements. Witness approximately 25 percent of total. The percentage of adhesive anchoring witnessed may be modified by the Structural Engineer of Record, depending upon initial results.

D. Sampling and Testing of Non-Shrink Grout:

1. Owner's testing agency is to cast one set of six (6) 2" x 2" cubes of grout for each 10 cu. ft. of grout or fraction thereof for each day's grouting. Test two cubes at seven days, two cubes at 28 days, with two cubes retained in reserve for later testing if required. If test results for any strength test are below the required strength, the grout is rejected and is to be replaced at no cost to the Owner.
2. Sampling, curing, and testing to be in conformance with ASTM C 1107. Molds utilized shall be made of brass or steel.
3. Testing agency is to note the location of all grouted plates represented by each set of grout cylinders.
4. The contractor shall notify the Owner's testing agency laboratory 24 hours before grout placement and shall cooperate in the making of cylinders by the testing laboratory.

END OF SECTION 03 30 00

08/17/2016

SECTION 03 41 00 - PRECAST STRUCTURAL CONCRETE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. City of Stamford General Conditions and Division 01, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs the Work. Note also all Addenda.

1.2 SUMMARY

- A. Section Includes:

- 1. Precast structural concrete including pre-topped double tees, un-topped double tees, NEXT beams, columns, walls and shearwalls.
 - 2. Precast structural concrete with brick facings.
 - 3. Precast structural concrete with commercial architectural finish.

- B. This Section does not include cast-in-place concrete for washes and field topping, where indicated.

- C. All connection assemblies to be fabricated with stainless steel. Base plates, anchor bolts for columns and connection embed assemblies for structural steel at roof to be hot-dipped galvanized steel after fabrication of the connection assembly.

- D. This Section includes the application of a silane sealer to the wearing surfaces of all precast units and a 2-ft. section above each level on all columns and walls.

- E. Related Sections:

- 1. Section 033000 "Cast-in-Place Concrete" for concrete topping and placing connection anchors in concrete.
 - 2. Section 042000 "Unit Masonry" for inserts or anchorages required for precast concrete slab connections.
 - 3. Section 051200 "Structural Steel Framing" for furnishing and installing connections attached to structural-steel framing.
 - 4. Section 079200 "Joint Sealants" for elastomeric joint sealants and sealant backings.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design precast structural concrete, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Precast structural concrete units and connections shall withstand design loads indicated within limits and under conditions indicated.
- C. Structural Performance: Provide precast structural concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:
 - 1. Dead Loads: As indicated.
 - 2. Live Loads: As indicated.
 - 3. Roof Loads: As indicated.
 - 4. Snow Loads: As indicated.
 - 5. Seismic Loads: As indicated.
 - 6. Wind Loads: As indicated.
 - 7. Design precast structural concrete framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements. Maintain precast structural concrete deflections within limits of ACI 318.
 - a. Thermal Movements: Allow for in-plane thermal movements resulting from annual ambient temperature changes of minus 18 deg F to 120 deg F.
 - 8. Fire-Resistance Rating: Select material and minimum thicknesses to provide indicated fire rating.
 - 9. Vehicular Impact Loads: Design spandrel beams acting as vehicular barriers for passenger cars to resist a single 6000-lbf service load and 10,000-lbf ultimate load applied horizontally in any direction to the spandrel beam, with anchorages or attachments capable of transferring this load to the structure. Design spandrel beams assuming the load to act at a height of 18 inches above the floor or ramp surface on an area not to exceed 1 sq. ft..

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

- C. Shop drawings shall be reviewed and "checked" by the Fabricator prior to being submitted to the Engineer. Unchecked shop drawings shall be rejected and returned to the Contractor.
- D. Contractor to provide a detailed submittal schedule identifying all submittals and the date they are to be received by BVH Integrated Services, Inc. Submittal schedule to be submitted two weeks prior to the start of the submittal process and updated every two weeks.
- E. Shop Drawings: Include member locations, plans, elevations, dimensions, shapes and sections, openings, support conditions, and types of reinforcement, including special reinforcement. Detail fabrication and installation of precast structural concrete units.
 - 1. Indicate joints, reveals, and extent and location of each surface finish.
 - 2. Indicate welded connections by AWS standard symbols. Show size, length, and type of each weld.
 - 3. Detail loose and cast-in hardware, lifting and erection inserts, connections, and joints.
 - 4. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
 - 5. Include and locate openings larger than by 10 inches.
 - 6. Indicate location of each precast structural concrete unit by same identification mark placed on panel.
 - 7. Indicate relationship of precast structural concrete units to adjacent materials.
 - 8. Indicate locations and details of brick units, including corner units and special shapes, and joint treatment.
 - 9. Indicate estimated camber for precast floor slabs with concrete toppings.
 - 10. Indicate shim sizes and grouting sequence.
 - 11. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
- F. Samples:
 - 1. For each type of finish indicated on exposed surfaces of precast structural concrete units with architectural finish, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.

- a. Where other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
- 2. Samples for each thin brick units required, showing full range of color and texture expected. Include Samples showing color and texture of joint treatment.
 - a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
 - b. Grout Samples for Verification: Showing color and texture of joint treatment.
- G. Delegated-Design Submittal: For precast structural concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator.
- B. Welding certificates.
- C. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Reinforcing materials and prestressing tendons.
 - 3. Admixtures.
 - 4. Bearing pads.
 - 5. Structural-steel shapes and hollow structural sections.
 - 6. Brick units and accessories.
- D. Material Test Reports: For aggregates.
- E. Source quality-control reports.
- F. Field quality-control and special inspection reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that assumes responsibility for engineering precast structural concrete units to comply with performance requirements. Responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Participates in PCI's Plant Certification program and is designated a PCI-certified plant as follows:
 - a. Group CA, Category C4A - Prestressed Deflected-Strand Structural Members.
- B. Installer Qualifications: A precast concrete erector qualified as evidenced by PCI's Certificate of Compliance, to erect Category S2 - Complex Structural Systems.
- C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- D. Design Standards: Comply with ACI 318 and design recommendations in PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.
- E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."
- F. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D.1.1M, "Structural Welding Code - Steel."
 2. AWS D1.4, "Structural Welding Code - Reinforcing Steel."
- G. Fire-Resistance Calculations: Where indicated, provide precast structural concrete units whose fire resistance meets the prescriptive requirements of authorities having jurisdiction or has been calculated according to PCI MNL 124, "Design for Fire Resistance of Precast Prestressed Concrete," and is acceptable to authorities having jurisdiction.
- H. Sample Panels: After sample approval and before fabricating precast structural concrete units with architectural finish and/or brick facing, produce a minimum of 2 sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
 1. Locate panels where indicated or, if not indicated, as directed by Architect.
 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
 3. After approval of repair technique, maintain one sample panel at fabricator's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.

4. Demolish and remove sample panels when directed.

I. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Support units during shipment on nonstaining shock-absorbing material in same position as during storage.

B. Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1. Store units with dunnage across full width of each bearing point unless otherwise indicated.

2. Place adequate dunnage of even thickness between each unit.

3. Place stored units so identification marks are clearly visible, and units can be inspected.

C. Handle and transport units in a position consistent with their shape and design in order to avoid excessive stresses that would cause cracking or damage.

D. Lift and support units only at designated points shown on Shop Drawings.

1.8 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction before starting that Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Form-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that

will not bond with, stain, or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

- C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Stainless Steel Reinforcing Bars: ASTM A 955, Grade 60, deformed.
- C. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- E. Supports: Suspend reinforcement from back of form or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 116.

2.3 PRESTRESSING TENDONS

- A. Pretensioning Strand: ASTM A 416/A 416M, Grade 250 or Grade 270, uncoated, 7-wire, low-relaxation strand.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure on the South Elevation, mix gray with white cement, of same type, brand, and mill source to achieve the color desired by the Architect.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 116, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project. Assume specialty fine aggregate for the exposed to view surface on the South Elevation.
- C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 116.

- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.
 - 1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
 - 5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M.
- F. Corrosion-Inhibiting Admixture: DCI corrosion inhibitor by Grace Construction Products or approved equivalent. Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete. Dosage rate of 2 gallons per cubic yard.

2.5 STEEL CONNECTION MATERIALS

- A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.
- B. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.
- C. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A; carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563; and flat, unhardened steel washers, ASTM F 844.
- D. Zinc-Coated Finish: For items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M after the assemblies have been fabricated..
 - 1. For steel shapes, plates, and tubing to be galvanized, limit silicon content of steel to less than 0.03 percent or to between 0.15 and 0.25 percent or limit sum of silicon and 2.5 times phosphorous content to 0.09 percent.
 - 2. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.
- E. Welding Electrodes: Comply with AWS standards.

- F. Precast Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install precast structural concrete units.

2.6 STAINLESS-STEEL CONNECTION MATERIALS

- A. Stainless-Steel Plate: ASTM A 666, Type 304, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F 593, Alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless-steel washers. Lubricate threaded parts of stainless-steel bolts with an antiseize thread lubricant during assembly.

2.7 BEARING PADS

- A. Provide one of the following bearing pads for precast structural concrete units as recommended by precast fabricator for application:
1. Elastomeric Pads: AASHTO M 251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore, Type A durometer hardness, ASTM D 2240; minimum tensile strength 2250 psi, ASTM D 412.
 2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. 70 to 90 Shore, Type A durometer hardness, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test 1 specimen for every 200 pads used in Project.
 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; 80 to 100 Shore, Type A durometer hardness, ASTM D 2240; complying with AASHTO's "AASHTO Load and Resistance Factor Design (LRFD) Bridge Specifications," Division II, Section 18.10.2; or with MIL-C-882E.
 4. Frictionless Pads: Tetrafluoroethylene, glass-fiber reinforced, bonded to stainless- or mild-steel plate, of type required for in-service stress.
 5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.

2.8 GROUT MATERIALS

- A. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.
- B. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.9 THIN-BRICK UNITS AND ACCESSORIES

- A. Thin-Brick Units: As specified by the Architect.
- B. Sand-Cement Mortar: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144. Mix at ratio of 1 part cement to 4 parts sand, by volume, with minimum water required for placement.
- C. Latex-Portland Cement Pointing Grout: ANSI A118.6 and as follows:
 - 1. Dry-grout mixture, factory prepared, of portland cement, graded aggregate, and dry, redispersible, ethylene-vinyl-acetate additive for mixing with water; uniformly colored.
 - 2. Commercial portland cement grout, factory prepared, with liquid styrene-butadiene rubber or acrylic-resin latex additive; uniformly colored.
 - 3. Colors: As selected by Architect from manufacturer's full range.

2.10 CONCRETE MIXTURES

- A. Prepare design mixtures for each type of precast concrete required.
- B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at precast structural concrete fabricator's option.
- C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318.
- D. Normal-Weight Concrete Mixtures: Proportion by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.38.
 - 3. Dosage of Corrosion Inhibitor: 6.0 gallons per cubic yard.
 - 4. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows, with a tolerance of plus or minus 1-1/2 percent:
 - a. Air Content: 6 percent for 1-inch- nominal maximum aggregate size.
 - b. Air Content: 6 percent for 3/4-inch- nominal maximum aggregate size.
 - c. Air Content: 7 percent for 1/2-inch- nominal maximum aggregate size.

- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 116.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 116.
- G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- H. Concrete Mix Adjustments: Concrete mix design adjustments may be proposed if characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.
- I. Mix design for field cast-in-place concrete to match the requirements for precast concrete.

2.11 FORM FABRICATION

- A. Forms: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of forms with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
 - 1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
- B. Maintain forms to provide completed precast structural concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
 - 1. Form joints are not permitted on faces exposed to view in the finished work.
 - 2. Edge and Corner Treatment: Uniformly chamfered.

2.12 FABRICATION

- A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing precast structural concrete units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in precast structural concrete units as indicated on the Contract Drawings.
- D. Cast-in openings larger than 10 inches in any dimension. Do not drill or cut openings or prestressing strand without Engineer's approval.
- E. Reinforcement: Comply with recommendations in PCI MNL 116 for fabricating, placing, and supporting reinforcement.
 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcement exceeds limits specified, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
 2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 3. Place reinforcement to maintain at least 3/4-inch minimum coverage. Increase cover requirements according to ACI 318 when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 4. Place reinforcing steel and prestressing strand to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 5. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Reinforce precast structural concrete units to resist handling, transportation, and erection stresses.

- G. Prestress tendons for precast structural concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 116.
 - 1. Delay detensioning or post-tensioning of precast, prestressed structural concrete units until concrete has reached its indicated minimum design release compressive strength as established by test cylinders cured under same conditions as concrete.
 - 2. Detension pretensioned tendons either by gradually releasing tensioning jacks or by heat cutting tendons, using a sequence and pattern to prevent shock or unbalanced loading.
 - 3. If concrete has been heat cured, detension while concrete is still warm and moist to avoid dimensional changes that may cause cracking or undesirable stresses.
 - 4. Protect strand ends and anchorages with bituminous, zinc-rich, or epoxy paint to avoid corrosion and possible rust spots.
- H. Comply with requirements in PCI MNL 116 and in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.
 - 1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 116.
 - 1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."
- K. Comply with ACI 306.1 procedures for cold-weather concrete placement.
- L. Comply with PCI MNL 116 procedures for hot-weather concrete placement.
- M. Identify pickup points of precast structural concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each precast structural concrete unit on a surface that will not show in finished structure.
- N. Cure concrete, according to requirements in PCI MNL 116, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is

high enough to ensure that stripping does not have an effect on performance or appearance of final product.

- O. Discard and replace precast structural concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 116 and meet Architect's approval.

2.13 FABRICATION TOLERANCES

- A. Fabricate precast structural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 116 product dimension tolerances.

- B. Brick-Faced Precast Structural Concrete Units: Restrict the following misalignments to 2 percent of number of bricks in a unit:

- 1. Alignment of Mortar Joints:

- a. Jog in Alignment: 1/8 inch.
 - b. Alignment with Panel Centerline: Plus or minus 1/8 inch.

- 2. Variation in Width of Exposed Mortar Joints: Plus or minus 1/8 inch.
 - 3. Tipping of Individual Bricks from the Panel Plane of Exposed Brick Surface: Plus 1/16 inch; minus 1/4 inch less than or equal to depth of form-liner joint.
 - 4. Exposed Brick Surface Parallel to Primary Control Surface of Panel: Plus 1/4 inch; minus 1/8 inch.
 - 5. Individual Brick Step in Face from Panel Plane of Exposed Brick Surface: Plus 1/16 inch; minus 1/4 inch less than or equal to depth of form-liner joint.

- C. Stone Veneer-Faced Precast Structural Concrete Units:

- 1. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated: Plus or minus 1/4 inch.
 - 2. Variation in Joint Width: 1/8 inch in 36 inches or a quarter of nominal joint width, whichever is less.
 - 3. Variation in Plane between Adjacent Stone Units (Lipping): 1/16-inch difference between planes of adjacent units.

2.14 FINISHES

- A. Standard Grade: Normal plant-run finish produced in molds that impart a smooth finish to concrete. Surface holes smaller than 1/2 inch caused by air bubbles, normal color variations, form joint marks, and minor chips and spalls

are permitted. Fill air holes greater than 1/4 inch in width that occur more than once per 2 sq. in. Major or unsightly imperfections, honeycombs, or structural defects are not permitted. Limit joint offsets to 1/8 inch.

- B. Grade B Finish: Fill air pockets and holes larger than 1/4 inch in diameter with sand-cement paste matching color of adjacent surfaces. Fill air holes greater than 1/8 inch in width that occur more than once per 2 sq. in.. Grind smooth form offsets or fins larger than 1/8 inch. Repair surface blemishes due to holes or dents in molds. Discoloration at form joints is permitted.
- C. Screed or float finish unformed surfaces. Strike off and consolidate concrete with vibrating screeds to a uniform finish. Hand screed at projections. Normal color variations, minor indentations, minor chips, and spalls are permitted. Major imperfections, honeycombing, or defects are not permitted.
- D. Smooth, steel trowel finish unformed surfaces. Consolidate concrete, bring to proper level with straightedge, float, and trowel to a smooth, uniform finish.
- E. Finish all precast units in accordance with the following:
 - 1. All surfaces of walls, columns, wall-columns, and stair elements to have a standard, medium blast finish.
 - 2. Exposed exterior face of spandrel sections to receive Class A, blast finish in accordance with the approved final mockup. All other surfaces of spandrel sections, including bottom, top and exposed edges, to have a standard blast finish.
 - 3. All traffic bearing surfaces to have a medium broomed finish in accordance with ACI 301.
- F. Apply roughened surface finish according to ACI 318 to precast concrete units that will receive concrete topping after installation.

2.15 STRUCTURAL FRAMING UNITS

- A. Type: Precast, prestressed structural concrete framing units, including beams, columns, wall-columns, walls, stairs, spandrels and pre-topped double tees.
- B. Furnish units free of voids and honeycombs.
- C. Provide minimum standard finish to precast concrete units or finish as indicated.
- D. Reinforce units to resist transportation and erection stresses.
- E. Include cast-in weld plates where required.
- F. Coordinate with other trades for installation of cast-in items.

- G. All connections are to be fabricated with stainless steel. .

2.16 MISCELLANEOUS

- A. Silane Sealer: Sealer shall be 40 percent silane sealer applied at the rate by which the sealer will pass the NCURP 244 criteria.

2.17 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to evaluate precast structural concrete fabricator's quality-control and testing methods.
1. Allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.
- B. Testing: Test and inspect precast structural concrete according to PCI MNL 116 requirements.
1. Test and inspect self-consolidating concrete according to PCI TR-6.
- C. Strength of precast structural concrete units will be considered deficient if units fail to comply with ACI 318 requirements for concrete strength.
- D. If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, employ a qualified testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M.
1. A minimum of three representative cores will be taken from units of suspect strength, from locations directed by Architect.
 2. Cores will be tested in an air-dry condition or, if units will be wet under service conditions, test cores after immersion in water in a wet condition.
 3. Strength of concrete for each series of 3 cores will be considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
 4. Test results will be made in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports will include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.

- d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- E. Patching: If core test results are satisfactory and precast structural concrete units comply with requirements, clean and dampen core holes and solidly fill with same precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- F. Dimensional Tolerances: Units with dimensions smaller or larger than required and not complying with tolerance limits may be subject to additional testing.
 - 1. Precast concrete units with dimensions larger than required will be rejected if the appearance or function of the structure is adversely affected or if larger dimensions interfere with other construction. Repair or remove and replace rejected units, as required, to comply with construction conditions.
- G. Defective Units: Discard and replace precast structural concrete units that do not comply with requirements, including strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install precast concrete units until supporting, cast-in-place, building structural framing has attained minimum allowable design compressive strength or until supporting steel or other structure is complete.

3.2 INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting precast structural concrete units to supporting members and backup materials.
- B. Erect precast structural concrete level, plumb, and square within specified allowable tolerances. Provide temporary structural framing, supports, and bracing as required to maintain position, stability, and alignment of units until permanent connection.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast structural concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 4. For hollow-core slab voids used as electrical raceways or mechanical ducts, align voids between units and tape butt joint at end of slabs.
- C. Connect precast structural concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
 - 1. Do not permit connections to disrupt continuity of roof flashing.
- D. Field cutting of precast units is not permitted without approval of the Architect.
- E. Fasteners: Do not use drilled or powder-actuated fasteners for attaching accessory items to precast, prestressed concrete units.
- F. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.
 - 1. Protect precast structural concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
 - 2. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780.
 - 3. Clean weld-affected steel surfaces with chipping hammer followed by brushing, and reprime damaged painted surfaces.

4. Remove, reweld, or repair incomplete and defective welds.
- G. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.
 1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connections, apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.
- H. Grouting: Grout connections and joints and open spaces at keyways, connections, and joints where required or indicated on Shop Drawings. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled.
 1. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces.
 2. Fill joints completely without seepage to other surfaces.
 3. Trowel top of grout joints on roofs smooth and uniform. Finish transitions between different surface levels not steeper than 1 to 12.
 4. Place grout end cap or dam in voids at ends of hollow-core slabs.
 5. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
 6. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

- A. Erect precast structural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.
- B. Minimize variations between adjacent slab members by jacking, loading, or other method recommended by fabricator and approved by Architect.

3.4 FIELD CAST-IN-PLACE CONCRETE

- A. All field cast concrete to be mixed, placed, cured, protected and finished in accordance with Specification Section 033000 "Cast-In-Place Concrete" and ACI 301.
- B. All reinforcing and welded wire fabric located in field cast concrete to be epoxy coated.

3.5 SILANE SEALER

- A. Apply silane sealer in accordance with manufacturer's guidelines. Application rate to be 200 SF per gallon.
- B. Apply silane sealer to all driving surfaces, stair treads, stair risers, stair landings and to the lower 2 ft. of all columns and walls at each floor level.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Erection of precast structural concrete members.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Field welds will be visually inspected and nondestructive tested according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.
- D. Testing agency will report test results promptly and in writing to Contractor, Structural Engineer and Architect.
- E. Sampling and Testing of Non-Shrink Grout:
 - 1. Owner's testing agency is to cast one set of six (6) 2" x 2" cubes of grout for each 10 cu. ft. of grout or fraction thereof for each day's grouting. Test two cubes at seven days, two cubes at 28 days, with two cubes retained in reserve for later testing if required. If test results for any strength test are below the required strength, the grout is rejected and is to be replaced at no cost to the Owner.
 - 2. Sampling, curing, and testing to be in conformance with ASTM C 1107. Molds utilized shall be made of brass or steel.
 - 3. Testing agency is to note the location of all grouted plates represented by each set of grout cylinders.
 - 4. The contractor shall notify the Owner's testing agency laboratory 24 hours before grout placement and shall cooperate in the making of cylinders by the testing laboratory.
- F. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

G. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

H. Prepare test and inspection reports.

3.7 REPAIRS

A. All patching and repairs are to be performed only after the patching or repair procedure is reviewed and approved by the Architect and Engineer.

B. Repair precast structural concrete units if permitted by Architect.

1. Repairs may be permitted if structural adequacy, serviceability, durability, and appearance of units has not been impaired.

C. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

D. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

E. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

F. Remove and replace damaged precast structural concrete units that cannot be repaired or when repairs do not comply with requirements as determined by Architect.

G. Final approval of the actual patching and repair is subject to the approval of the Owner, Architect and Engineer. If the patch or repair cannot be performed to the Owner's, Architect's and Engineer's approval, then the precast unit is to be replaced at no cost to the Owner.

3.8 CLEANING

A. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

B. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's written recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges,

and rinse with clean water. Protect other work from staining or damage due to cleaning operations.

2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 41 00

08/17/2016

03 45 00 – PRECAST ARCHITECTURAL CONCRETE**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. This Section includes furnishing and installing precast architectural concrete units as indicated on the drawings and specified herein. Architectural precast concrete includes the following:
 - 1. Architectural precast concrete cladding and load-bearing units as indicated on the drawings.
 - 2. Protection bollards installed within sitework
 - 3. Road sign
 - 4. Cast-in inserts, anchorages, and loose hardware required for securing precast to supporting and adjacent members.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Section 04 20 00 "Unit Masonry" for cast stone products that are required to match precast architectural concrete in quality, color, and texture of surface finish.
 - 2. Section 03 30 00 "Cast-in-place concrete" for concrete formed and placed on site.
 - 3. Section 03 41 00 "Precast Structural Concrete" for precast structural concrete parking structures plant cast and erected on site.
 - 4. Section 07 92 00, "Joint Sealers" for caulking and sealants installed within joints of precast architectural concrete.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data and instructions for manufactured materials and products. Include mix designs, certifications, and laboratory test reports as required.

- C. Shop drawings: The precast concrete manufacturer shall prepare and submit for review erection plans and elevations drawn at 1/4" scale or larger, which shall indicate the necessary hardware for attachment to the structure and to adjacent panels, and show sections and erection details of all panel types. (Subsequent submissions of these drawings, after initial review, shall also indicate unit identification marks). Erection plans and elevations shall indicate all elevations and plan dimensions of panels, including all interface conditions with structural supports furnished under other Sections, and shall clearly indicate such items as bearing pads, grout where required for vertical support (and allocation for the responsibility for its placement), lateral attachments, bearing seat conditions, etc. Elevations on erection drawings shall also indicate vertical expansion joints which affect the location and detail of precast elements. Upon the return of these erection drawings to the Contractor, Contractor shall submit "shop cards" or "shop tickets" (detail drawings of individual pieces) showing all hardware for erection as well as forming detail and dimensions for the individual pieces. Shop tickets shall also indicate all reinforcing sizes and details, to enable full understanding of detail reinforcing requirements.

The precast manufacturer shall not proceed with fabrication of any product prior to review of the erection drawings and shop tickets for the panels involved, by both the General Contractor and Architect.

The precast manufacturer shall be responsible for the precast units fitting the given building dimensions and conditions as given on the final approved drawings. The review by the Architect applies to sizes and general arrangement, but does not necessarily apply to the checking of detail dimensions or quantities of pieces.

- D. Samples: Design reference samples for initial verification of design intent, for exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; each sample to be approximately 12 by 12 by 2 inches.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except as otherwise indicated:
1. ACI 318, "Building Code Requirements for Reinforced Concrete."
 2. Concrete Reinforcing Steel Institute, "Manual of Standard Practice."
 3. Prestressed Concrete Institute MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
 4. American Welding Society, "Structural Welding Code."

- B. Fabricator Qualifications: Firm having a minimum of five (5) years successful experience in fabrication of architectural precast concrete units, similar to members required for this project will be acceptable. Fabricator must have sufficient production capacity to produce, transport, and deliver required units without causing delay in the work.
1. **Fabricator must be designated as a PCI-certified plant for Group A, Category A1 – Architectural Cladding and Load Bearing Units at the time of bidding; or designated as an APA-certified plant for production of architectural precast concrete products as the time of bidding.**
- C. Design modifications may be made only as necessary to meet field conditions and to ensure proper fitting of the work or decreasing sizes of members or altering profiles and alignment shown. Provide complete design calculations and drawings prepared by the Precast Design Engineer, if design modifications are anticipated.
- D. Erector Qualifications: Minimum of three (3) years successful experience in erection of architectural precast concrete units similar to units required for this project.
- E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality- control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."
- F. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two (2) sample panels approximately 20 square feet each in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels complete with anchors, connections, flashings, and joint fillers.
1. Locate panels as directed by Architect and as in agreement by the General Contractor.
2. Damage part of an exposed-face surface and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain one (1) sample panel at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed by the Architect and General Contractor.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver precast concrete units to project site in such quantities and at such times to assure continuity of installation.
- B. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.
- C. Support units during shipment on non-staining shock-absorbing material.
- D. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- E. Place stored units so identification marks are clearly visible, and units can be inspected.
- F. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.
- G. Lift and support units only at designated points indicated on Shop Drawings.

1.6 COORDINATION

- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. **Fabricator must be designated as a PCI-certified plant for Group A, Category A1 – Architectural Cladding and Load Bearing Units at the time of bidding; or designated as an APA-certified plant for production of architectural precast concrete products as the time of bidding.**

2.2 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.
 - 1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.
 - 2. Profiles as indicated on the drawings and to support adjacent construction materials.
- B. Form Liners: Units of face design, texture, arrangement, and configuration **to match those used for precast concrete design reference sample**. Use with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.
- C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.3 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II (2.0 oz. zinc psf) zinc coating and chromate treatment, hot-dip galvanized after fabrication and bending.
 - 1. Galvanized Reinforcing Bars must be used for all bars within 3", of weather-exposed panel faces.
- C. Steel Wire: ASTM A 82, plain, cold-drawn, steel.
- D. Welded Wire Fabric: ASTM A 185/A 185M, fabricated from steel wire into flat sheets.
 - 1. Galvanized Fabric must be used for all fabric within 3" of weather-exposed panel faces.
- E. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type III.
 1. Use only one brand, type, and source of supply of cement throughout the project, unless otherwise acceptable to Architect.
 2. **Utilize Lehigh White Portland Cement for all surfaces exposed to view in finished product.**
 3. Standard gray portland cement may be used for non-exposed backup concrete only.
- B. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33/C 33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
 1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: Uniformly graded to match design reference sample.
 2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.
- C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

2.5 GROUT MATERIALS

- A. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.
- B. Nonmetallic, Non-shrink Grout: Packaged, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents,

complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30- minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Masterflow 713" Master Builders, Inc.
 - b. "Five Star Grout," U.S. Grout Corp.

2.6 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type of concrete required.
- B. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the project for each type of concrete required, complying with ACI 318.
- C. Facing Mix: Standard-weight concrete consisting of specified portland cement, aggregates, admixtures, and water to produce the following properties:
 1. Compressive Strength: 5000 psi minimum at 28 days.
 2. Total Air Content: Not less than 4 percent or more than 6 percent.
 3. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.
 4. Maximum Water-Cementitious Materials Ratio: 0.45.
- D. Backup Concrete: Standard-weight concrete with compressive strength of 5000 psi at 28 days.
- E. Submit written reports to Architect of proposed mix for each type of concrete at least fifteen (15) days prior to start of precast unit production. Do not begin concrete production until Architect has reviewed mixes and evaluations.
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by Architect before using in the work.
- G. Admixtures: Use air-entraining admixture in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion or

provide increased workability for low-slump concrete may be used subject to Architect's acceptance.

- H. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantities of admixtures as required to maintain quality control.

2.7 FABRICATION

- A. General: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and following dimensional tolerances, unless otherwise indicated.
- B. Inspection: The precast panels which span between supports are subject to inspection by the Testing Agency and Inspecting Engineer, in the fabrication plant. This Contractor shall notify the Testing Agency with twenty-four (24) hours advance notice of a scheduled pour, and be responsible for canceling such notice if pour is cancelled, or expense of visit will be charged to Contractor. Contractor shall provide access to plant and cooperate with inspectors. Testing Agency will also provide field inspection of the connections to the structural frame of such panels and all other panels requiring lateral support.
- C. Forms: Accurately construct forms mortar-tight and of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and, when prestressed, pretensioning and detensioning operations. Maintain form work to provide completed precast concrete units of shapes, lines, and dimensions indicated, within specified fabrication tolerances.
- D. Dimensional Tolerances of Finished Units: Overall height and width measured at face adjacent to mold at time of casting:
 - 1. 10 feet or less: Plus or minus 1/8 inch.
 - 2. 10 feet to 20 feet: Plus 1/8 inch, minus 3/16 inch.
 - 3. 20 feet to 30 feet: Plus 1/8 inch, minus 1/4 inch.
 - 4. Each additional 10 feet: Plus or minus 1/16 inch per 10 feet.
 - 5. Angular deviation of plane of side mold: 1/32 inch per 3 inches depth or 1/16 inch total, whichever is greater.
 - 6. Openings within one unit: Plus or minus 1/4 inch, except plus or minus 1/8 inch for windows and door frame8.
 - 7. Out-of-square (difference in length of two diagonal measurements): 1/8 inch per 6 feet or 1/4 inch total, whichever is greater.
 - 8. Thickness: Minus 1/8 inch, plus 1/4 inch.

9. Tolerances of other dimensions not otherwise indicated:
Numerically greater of plus or minus 1/16 inch per 10 feet, or plus or minus 1/8 inch.
- E. Position Tolerances: For cast-in items measured from datum line locations as shown on reviewed shop drawings:
 1. Anchors and inserts: Within 3/8 inch of centerline location.
 2. Blockouts and reinforcements: Within 1/4 inch of position shown on shop drawings, where such positions have structural implications or affect concrete cover; otherwise within plus or minus 1/2 inch.
- F. Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square unless otherwise indicated.
 1. Precast units that are warped, cracked, broken, spalled, stained, or otherwise defective will not be acceptable.
- G. Expansion Joints: Free of grout, mortar, or other obstructions to expansive movement, with expansion joint filler where indicated.
 1. Spandrels and Arches: Midpoint between mullions, with expansion filler strip, unless otherwise shown.
 2. Copings: Every joint between units, unless otherwise indicated. Align joints with vertical expansion joints in adjacent block.
 3. Mullions: Provide for expansion at top connectors to rigid building structural members, unless otherwise shown.
- H. Cast-In Items: Provide reglets, slots, holes, and other accessories in units to receive windows, cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.
- I. Surface Finish: Fabricate precast units and provide exposed surface finishes as follows:
 1. Smooth, light sandblast surface finish free of pockets, sand streaks, and honeycomb, with uniform color and texture.
 2. Color of all exposed precast architectural concrete to resemble white limestone **and utilize Lehigh white cement and white sand / aggregate** to resemble cast stone units as specified within Section 04 20 00, "Unit Masonry" (Rockcast: "Crystal White").
 3. As-cast or float finish for unexposed surfaces only.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Deliver anchorage items to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions, and directions as required for installation.
- B. Deliver all precast concrete for installation by Section 04200 in a manner to assure unimpeded sequence of the work.
- C. Do not install precast units until supporting masonry has attained minimum allowable design compressive strength.
- D. Install precast concrete members plumb, level, and in alignment within PCI MNL-117 and specified limits of erection tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as members are being permanently connected.
 - 1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
- E. Cleaning: Clean exposed facings to remove dirt and stains on units after erection and completion of joint treatments. Wash and rinse in accordance with precast manufacturer's recommendations. Protect other work from damage due to cleaning operations. Do not use cleaning materials or processes that could change the character of exposed concrete finishes.

3.2 ERECTION TOLERANCES

- A. Warpage: Fabricate and install wall panels so that each panel after erection complies with following dimensional requirements:
 - 1. Bowing (concave or convex) of any part of a flat surface not to exceed length of bow/360, with a maximum of 3/4 inch up to 30 feet.
 - 2. Maximum warpage of one corner out of plane of other three, the greater of 1/16 inch per foot distance from nearest adjacent corner, or 1/8 inch.
- B. Tolerances for Location of Precast Units: Fabricate and erect precast units so that joints between panels meet the following:
 - 1. Face width of joints: Plus or minus 3/16 inch.
 - 2. Joint taper: 1/40 inch per foot length, with maximum length of tapering in one direction of 10 feet.
 - 3. Step in face: 1/4 inch.
 - 4. Jog in alignment of edge: 1/4 inch.

5. Alignment for exterior panels is outside face.
6. Variation from plumb: Plus or minus 1/2 inch in any 40-foot run.
7. Variation from level: Plus or minus 1/2 inch in any 40-foot run.

3.3 PERFORMANCE REQUIREMENTS

- A. Conduct inspections, perform testing, and make repairs or replace unsatisfactory precast units as required.
 1. Limitations as to amount of patching permitted are subject to acceptance by Architect.
- B. In addition to above, in-place precast units may be rejected for the following:
 1. Exceeding specified installation tolerances.
 2. Damage during transportation, handling, or construction operations.
 3. Surface finish deficiencies in exposed-to-view surfaces.
 4. Other defects as listed in PCI MNL-117.

3.4 CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, weld slag, and other deleterious material from precast architectural concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast architectural concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 45 00

04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Clay unit masonry (brick) in modular and thin brick veneers.
 - 2. Concrete unit masonry (cmu).
 - 3. Cast Stone masonry units in modular and thin stone veneers.
 - 4. Mortar and Grout.
 - 5. Reinforcing steel and joint reinforcement.
 - 6. Ties, anchors, flashing and lintels related to masonry construction.
 - 7. Rigid cavity insulation related to masonry construction.
 - 8. Cavity wall drainage and mortar dropping collection systems within multi-wythe cavity walls and as indicated on the drawings.
 - 9. Field mock-up panel of Architect's design utilizing all materials specified (6' x 4' min.)
- B. Products installed but not furnished under this Section include the following:
 - 1. Steel lintels in unit masonry as specified in Section 05 50 00 "Metal Fabrications."
- C. Related Sections: The following sections contain requirements that relate to this Section:
 - 1. Wood nailers and blocking built into unit masonry are specified in Section 06 10 00 "Rough Carpentry."
 - 2. Fire rated filler and caulk at tops of rated partitions are specified in Section 07 84 00, "Firestopping".
 - 3. Installation of recessed mounting hardware, backboxes, conduits, and related hardware is specified within Division 22, Division 23, Division 26, Division 27 and Division 28.
 - 4. Metal stud and gypsum board backup walls are specified in Section 09 29 00 "Gypsum Board Assemblies"
 - 5. Rigid insulation board for vertical foundation wall installations are specified in Section 07 21 00 "Thermal Insulation".

6. Air and water barriers on exterior wall assemblies are specified in Section 07 27 26 "Fluid Applied Membrane Air Barriers".

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide unit masonry that develops the following installed compressive strengths (f'm):
 1. For concrete unit masonry: As follows:
 - a. f'm = 1500 psi.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each different masonry unit, accessory, and other manufactured product indicated.
- C. Samples for verification purposes of the following:
 1. Full-size units for each different exposed masonry unit required showing full range of exposed color, texture, and dimensions to be expected in completed construction.
 2. Accessories embedded in the masonry.
- D. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
 1. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.
 2. Each material and grade indicated for reinforcing bars.
 3. Each type and size of joint reinforcement.
 4. Each type and size of anchors, ties, and metal accessories.
- E. Material test reports from a qualified independent testing laboratory employed and paid by Contractor indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
 1. Mortar complying with property requirements of ASTM C 270.
 2. Grout mixes. Include description of type and proportions of grout ingredients.
 3. Masonry units.

1.5 QUALITY ASSURANCE

- A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures," except as otherwise indicated.
 - 1. Revise ACI 530.1/ASCE 6 to exclude Sections 1.4 and 1.7; Parts 2.1.2, 3.1.2, and 4.1.2; and Articles 1.5.1.2, 1.5.1.3, 2.1.1.1, 2.1.1.2, and 2.3.3.9 and to modify Article 2.1.1.4 by deleting requirement for installing vent pipes and conduits built into masonry.
- B. Comply with ACI 530/ASCE5 "Building Code Requirements for Masonry Structures, Section 9.5 Lateral Support for bracing requirements of partitions.
- C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- D. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality from one manufacturer for each cementitious component and from one source and producer for each aggregate.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.
- C. Store cementitious materials off the ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

- E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.
- F. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Comply with manufacturer's recommendations for handling, storage and protection during installation.
- G. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary, for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
- H. Fire Protection: Do not store rigid insulation or similar combustible materials within building.

1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.
- C. Cold-weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:
 - 1. Do not lay masonry units that are wet or frozen.
 - 2. Remove masonry damaged by freezing conditions.

3. Refer to BIA Technical Note 1 for compliance with cold weather construction practices.
- D. Hot-Weather Construction: Comply with referenced unit masonry standard, BIA Technical Note 1.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

2.2 CONCRETE MASONRY UNITS

- A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.
 1. Provide special shapes where indicated and as follows:
 - a. Furnish and install **bullnose units** for all outside corners unless otherwise indicated. (interior c.m.u. wall locations only)
 2. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.
 - a. Concrete Masonry Units: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.
 - b. Concrete Building Brick: Specified dimensions as follows:
 - 1) Standard Modular: 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.
- B. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C 90-90, C145, and Grade N and as follows:
 1. Unit Compressive Strength: Provide units with minimum average net area compressive strength indicated below:
 - a. 1900 psi.
 2. Weight Classification: Lightweight.
 3. Aggregates: Lightweight, expanded shale, clay or slate produced by the rotary kiln method complying with ASTM C-331, and shall be graded (#4-0 Gradation) to assume constant texture. The blending

- of screenings or any other deleterious substance which will impair the fire rating or insulation values is prohibited.
 - 4. Units made with pumice or burn-off aggregates will not be accepted.
 - 5. **All cmu units exposed to view after completion of construction shall contain The Dry Block Integral Water Repellent System by W.R. Grace & Co.**
- D. Fire Rated Concrete Masonry Units: ASTM E 119, UL 618 and the American Insurance Association Specifications for the equivalent thickness for 2 hours or better, and meeting the requirements for concrete masonry units above.
- E. Concrete Building Brick: ASTM C 55 and as follows:
- 1. Unit Compressive Strength: Provide units with minimum average net area compressive strength indicated below:
 - a. 3500 psi.
 - b. Not less than the unit compressive strengths required to produce concrete unit masonry construction of compressive strength indicated.
 - 2. Weight Classification: Lightweight.

2.3 BRICK MADE FROM CLAY - MODULAR

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of brick required.
- 1. Sizes: Brick Type - Provide standard modular brick (7-5/8 inch x 2-1/4 inch x 3-5/8 inch).
 - 2. For sills, caps and similar applications resulting in exposure of brick for surfaces which otherwise would be concealed from view, provide uncured or unfrosted units with all exposed surfaces finished.
- B. Facing Brick: ASTM C216 (current edition) for Facing Brick:
- 1. Grade: SW, severe weathering
 - 2. Durability Designation: Grade
 - 3. Minimum Compressive Strength (gross area psi): 3,000 (avg. of 5 brick), 2,500 (individual)
 - 4. Max. 5-hour boiling absorption: 17% (avg. of 5 brick), 20% (individual)
 - 5. Max. Saturation Coefficient: 0.78 (avg of 5 brick), 0.80 (individual)
 - 6. Appearance Classification: Type FBX
 - 7. Brick Bond: Where indicated on the drawings, brick to be installed in **Running Bond**.

- C. Products: Subject to compliance with requirements, provide one of the following:
1. Field Brick: Basis of Design shall be the following:
 - a. **Belden Brick Company, Modular 503-505A, manufactured at Sugarcreek Plant 6, ASTM C-216, Grade SW, Type FBX.**
 - b. **Field panel has been erected and is available for viewing at Stamford Police Department, 805 Bedford Street, Stamford, CT.**
 - c. Substitutions will be evaluated based upon their performance and aesthetic comparison to the Field Panel along with the ability to produce both "modular" and "thin brick" from the same manufacturer and plant location.
 2. Field Panels: Final determination of brick and mortar color to be determined from field panels constructed on site. All masonry materials including three (3) color selections for mortar for each masonry unit color. Final decisions on suitable match will be at the sole discretion of Owner and Architect.

2.4 BRICK MADE FROM CLAY – THIN BRICK

- A. General: Thin brick material matching the modular brick listed above shall be provided to the Precast Structural Concrete contractor (Section 03 41 00) for their use in fabricating precast structural concrete for the elevated parking garage structure.
1. Sizes: Brick Type - Provide standard thin flat back brick (7-5/8 inch x 5/8 inch x 3-5/8 inch).
- B. Facing Brick: ASTM C216 (current edition) for Facing Brick:
1. Grade: SW, severe weathering
 2. Durability Designation: Grade
 3. Minimum Compressive Strength (gross area psi): 3,000 (avg. of 5 brick), 2,500 (individual)
 4. Max. 5-hour boiling absorption: 17% (avg. of 5 brick), 20% (individual)
 5. Max. Saturation Coefficient: 0.78 (avg of 5 brick), 0.80 (individual)
 6. Appearance Classification: Type FBX
 7. Brick Bond: Where indicated on the drawings, brick to be installed in **Running Bond**.
- C. Products: Subject to compliance with requirements, provide one of the following:

1. Thin Brick: Basis of Design shall be the following:
 - a. **Belden Brick Company, Modular 503-505A, manufactured at Sugarcreek Plant 6, ASTM C-216, Grade SW, Type FBS.**
 - b. Substitutions will be evaluated based upon their performance and aesthetic comparison to the Field Panel along with the ability to produce both “modular” and “thin brick” from the same manufacturer and plant location.

2.4 CAST STONE MATERIALS

- A. All cast stone shall comply with ASTM C 1364.
- B. Physical properties: Provide the following:
 1. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.
 2. Absorption - ASTM C 1195: 6% maximum by the cold water method.
 3. Air Content – ASTM C 173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.
 4. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.
 5. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.
- C. Raw Materials
 1. Portland cement – Type I or Type III, Lehigh White Cement, ASTM C 150.
 2. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the VDT casting method.
 3. Fine aggregates - Manufactured or natural white sands, ASTM C 33, except for gradation.
 4. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
 5. Admixtures- Comply with the following:
 - a. ASTM C 260 for air-entraining admixtures.
 - b. ASTM C 494/C 495M Types A - G for water reducing, retarding, accelerating and high range admixtures.
 - c. Other admixtures: Integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.
 - d. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.

- e. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.
 - 6. Water – Potable
 - 7. Reinforcing bars: ASTM A 615/A 615M: Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.
 - 8. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.
 - 9. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a stainless steel finish, Type 302 or 304.
- D. Color And Finish
- 1. **All Cast Stone to match color, texture, and finish of Precast Architectural Concrete, Section 03 45 00.**
 - 2. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in.² and not obvious under direct daylight illumination at a 5 ft. distance.
 - 3. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft. distance.
 - a. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.
 - 1) Total color difference – not greater than 6 units.
 - 2) Total hue difference – not greater than 2 units.
 - 4. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft distance.
 - 5. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
 - 6. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.
- E. Reinforcing
- 1. Reinforce the units for safe handling and structural stress.
 - 2. Minimum reinforcing shall be 0.25 percent of the cross section area.
 - 3. Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
 - 4. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction. Units less than 24 in. in both their length and width dimension shall be non-reinforced.

5. Welded wire fabric reinforcing shall not be used in dry cast products.
- F. Curing
1. Cure units in a warm curing chamber approximately 100°F at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F or 5 days @ 70°F) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.
- G. Manufacturing Tolerances
1. Cross section dimensions shall not deviate by more than $\pm 1/8$ in. from approved dimensions.
 2. Length of units shall not deviate by more than length/ 360 or $\pm 1/8$ in., whichever is greater, not to exceed $\pm 1/4$ in.
 - a. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
 3. Warp, bow or twist of units shall not exceed length/ 360 or $\pm 1/8$ in., whichever is greater.
 4. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in., on unformed sides of unit, 3/8 in. maximum deviation.
- H. Sizes: **Cast Stone products shall be available as both full depth units and thin veneer units as indicated on the drawings.** Thin veneer units to match color and finish of full depth units and be supplied to Precast Structural Concrete (Section 03 41 00) Contractor for incorporation into precast parking garage structure as indicated on the drawings.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce required mortar color.
- B. Masonry Cement: ASTM C 91.
1. For colored pigmented mortars use premixed colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations.
 2. **Color of mortar to match color of Cast Stone / Precast Architectural Concrete (White) and include the use of Lehigh White Cement.**

- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Colored Masonry Cement:
 - a. "Lafarge Masonry Cement," Lafarge North America Inc.
 - b. "Masonry Cement," Lehigh Hanson, Heidelberg Cement Group.
 - c. "Colored Masonry Cement," The Flamingo Brixment Corporation.
 - 2. Varying mortar colors may be selected for each type and color of masonry utilized.

2.6 REINFORCING STEEL

- A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.
- B. Steel Reinforcing Bars: Material and grade as follows:
 - 1. Grade 60.
- C. Deformed Reinforcing Wire: ASTM A 496.

2.7 JOINT REINFORCEMENT

- A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standard and this article, formed from the following:
 - 1. Galvanized carbon steel wire, ASTM-A153, Class B-2, hot-dipped, 1.5 oz. galvanized coating.
- B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
 - 1. Wire Diameter for Side Rods: 3/16 inch.
 - 2. Wire Diameter for Cross Rods: 9 gage.
 - 3. For single-wythe masonry provide type as follows with single pair of side rods:
 - a. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.
 - b. Subject to compliance with requirements, provide one of the following:
 - 1) "120 Truss-Mesh, Extra Heavy Duty", by Hohman & Barnard, Inc., or equal.

4. For multiwythe masonry provide type as follows:
 - a. Truss design with single pair of side rods and adjustable rectangular tie eye sections spaced not more than 16 inches o.c.; with side rods spaced for embedment within each face shell of backup wythe and eyes extended to accommodate pintle ties which will engage the outer wythe by at least 1-1/2 inches.
 - b. Products: Subject to compliance with requirements, provide one of the following:
 - 1). "170-2X Lox-All Truss Style Adjustable Joint Reinforcement with Eyes and 2X hook, Extra Heavy Duty", by Hohman & Barnard, Inc., or equal.

2.8 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.
- B. Galvanized Carbon Steel Wire: ASTM A 82, ASTM-A153, Class B-2, hot dipped, 1.5 oz. galvanized coating.
- C. Galvanized Steel Sheet: As follows:
 1. Galvanized Steel Sheet: ASTM A 366 (commercial quality) cold-rolled carbon steel sheet, hot-dip galvanized after fabrication to comply with ASTM A 525, Class B2 (for unit lengths over 15 inches) and Class B3 (for unit lengths under 15 inches), for all sheet metal ties and anchors.

2.9 ADJUSTABLE ANCHORS FOR CONNECTING MASONRY TO CONCRETE OR METAL STUD CONSTRUCTION

- A. General: A dual-diameter barrel with factory-installed EPDM washers to seal both the face of the insulation and the air/vapor barrier (an extra-large washer helps secure insulation to backup). Projecting Thermal Wings are steel reinforced and coated with highly flame resistant plastic to create a thermal break, decreasing thermal transfer through rigid insulation. The Wings accept a standard or seismic hook, spin to easily orient pintles / hooks to masonry joints, and provide up to 1/2" of adjustability to account for variations in wall thickness. Install with a standard 5/16" hex socket.
 1. Performance Characteristics: Capable of withstanding a 200 lb. force in either tension or compression without deforming over, or developing play in excess of, .05 inch.

- B. Masonry Veneer Anchors: Units consisting of wire tie section and metal anchor section complying with the following requirements:
 - 1. Wire Tie Diameter: 3/16 inch
 - 2. Wire Tie Shape: Double Leg Pintle.
 - 3. Wire Tie Length: 3 inch, 4 inch or 5 inch as required to extend 1-1/2 inches, but no closer than 1-1/4 inch from the outside face of masonry, into masonry wythe of veneer.
- C. Products: Subject to compliance with requirements, provide the following:
 - 1. Screw-Attached Masonry Veneer Anchors:
 - a. "Thermal 2-Seal Wing Nut Anchor with 2X-Hook", Hohman & Barnard, Inc., or equal.
 - b. Stainless Steel barrel finish. Stainless Steel hook finish. Carbon Steel Screw finish.
 - 2. Provide powder-actuated fasteners, with a minimum working strength value of 100 lbs., driven through holes in the masonry veneer anchors into the concrete or metal stud.

2.10 ADJUSTABLE ANCHORS FOR CONNECTING MASONRY TO STRUCTURAL STEEL

- A. General: Two-piece assemblies as described below allowing vertical or horizontal differential movement between wall and structural steel parallel to plane of wall, but resisting tension and compression forces perpendicular to it.
 - 1. Performance Characteristics: Capable of withstanding a 100 lb. force in either tension or compression without deforming over, or developing play in excess of, .05 inch.
- B. For anchorage of masonry inner wythes to the face of steel columns, and to the underside of structural steel members, furnish to the structural steel fabricator continuous channel slots formed from 16 ga. (mill) galvanized sheet steel.
 - 1. Provide channel slot anchors formed from 3/16 inch diameter wire.
- C. Products: Subject to compliance with requirements, provide the following:
 - 1. Channel Slots:
 - a. "362-C Gripstay Channels", Hohmann & Bernard, or equal.
 - 2. Triangle Tie Slot Anchors:
 - a. "363 Flexible Gripstay Anchors", Hohmann & Bernard, or equal.
 - 3. Hot dipped galvanized finish

- D. For the anchorage of masonry to the webs of steel beams at cavity wall conditions, furnish to the structural steel fabricator channel anchor slots formed from 16 gauge brite sheet steel, 8" long.
 - 1. Provide channel slot anchors formed from 16 gauge corrugated brite sheet metal, 3-1/2" long.
- E. Products: Subject to compliance with requirements, provide the following:
 - 1. Channel Slots:
 - a. "360 Gripstay Channel", Hohmann & Bernard, or equal.
 - 2. Corrugated Channel Slot Anchors:
 - a. PTA 364 Anchors with clear butyrate tubes, Hohmann & Bernard, or equal.
 - 3. Hot dipped galvanized finish.

2.11 ANCHORS FOR CONNECTING MASONRY TO CONCRETE FOUNDATION WALL

- A. General: Two-piece assemblies as described below allowing vertical differential movement.
 - 1. Performance Characteristics: Capable of withstanding a 100 lb. force in either tension or compression without deforming over, or developing play in excess of, .05 inch.
- B. For anchorage of masonry inner wythes to the face of foundation walls, furnish to the concrete trade contractor continuous dovetail slots formed from 16 ga. (mill) galvanized sheet steel.
- C. Products: Subject to compliance with requirements, provide the following:
 - 1. Dovetail Slots:
 - a. 305 Dovetail Slot, Hohmann & Bernard, or equal.
 - 2. Triangle Tie Slot Anchors:
 - a. "315 Dovetail Triangular Ties, 14 gage, 3/16" wall tie diameter", Hohmann & Bernard, or equal.

2.12 ANCHORS FOR CONNECTING INTERIOR MASONRY PARTITIONS TO UNDERSIDE OF METAL DECKING AND JOINT STABILIZATION

- A. For anchorage of interior masonry partitions to the underside of metal decking or other structure above, and for joint stabilization assemblies at expansion, contraction or isolation joints. Spacing at 16 inches maximum centers.

- B. Products: Subject to compliance with requirements, provide the following:
1. Joint Stabilization Anchors:
 - a. Slip Set Stabilizer, Hohmann & Bernard, or equal.

2.13 MISCELLANEOUS ANCHORS

- A. Provide 4 x 3 x 1/4 x 6 inch long steel clip angle anchors for laterally bracing masonry partitions to floor deck and underside of beams or girders above, arranged in pairs on each face of partition requiring bracing, spaced at 4' - 0" maximum centers.
1. Provide these anchors in all locations where the length of a partition between lateral supports (buttresses, crosswalls, columns with ties), exceeds 36 times its thickness.
 2. Provide these anchors in all partitions interrupted by control joints (except crosswalls).

2.14 SELF-ADHERING MEMBRANE MATERIALS

- A. Flexible rubberized asphalt, self-adhering and self-sealing through-wall flashing. Weight: 32 mil of self-adhesive rubberized asphalt integrally bonded to 2 mil of cross-laminated, high density polyethylene film to provide a min 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
1. Application: Use where flashing is fully concealed in masonry, where self-adhering membrane is protecting structural steel from exposed cavity, and as indicated on the drawings.
 - a. "PERM-A-BARRIER Wall Flashing", Grace Construction Products, or equal.
 - b. "S100 Sealant", Grace Construction Products, or equal, for sealing of finished terminations, edges of patches, and overlaps in through wall flashings.

2.15 MISCELLANEOUS MASONRY ACCESSORIES

- A. Nonmetallic Control Joint and Brick Expansion Joint Strips: Premolded filler strips complying with ASTM D 1056, Type 2 (closed cell) , Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-deflection range of 2-5 psi), compressible up to 35 percent, of width and thickness indicated, formulated from the following material:
1. Neoprene.

- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. "NS Closed Cell Neoprene Sponge", Hohmann and Barnard, Inc., or equal.
- C. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep Holes: Provide the following:
 - 1. Cell Vents: A 100% recycled polyester plastic non-woven mesh vent which is treated with a flame retardant and ultra-violet inhibitors. Used in vertical joints between brick masonry in masonry wall construction to provide for the drainage of moisture and promotion of air flow. The weep vents also prevent insects from entering through the openings.
 - 2. Size: For masonry veneers, 3/8"w. x 2-1/2"h. x 3-1/2"l,
 - 3. Color: White
 - 4. Products: Subject to compliance with requirements, provide one of the following:
 - a. "Mortar Trap Weep Vents", Hohmann and Barnard, Inc., or equal.
- E. Wire Mesh Wall Ties: 2" x 2" x 16 gauge hot dipped galvanized wire for intersections of non-structural masonry walls.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "MWT Mesh Wall Ties", Hohmann and Barnard, Inc., or equal.
- F. Mortar Net: Provide the following:
 - 1. High-density polyethylene in two (2) inch thickness. Product to be 90% open weave mesh in a dovetail configuration connected by a continuous bottom strip.
 - a. "Mortar Trap", Hohmann & Bernard, or equal.

2.16 CAVITY WALL INSULATION

- A. Continuous Exterior Cavity Wall Insulation: Glass-fiber-reinforced enhanced polyisocyanurate foam core sheathing faced with nominal 4 mil embossed blue acrylic-coated aluminum on one side and 1.25 mil embossed aluminum on the other side, complying with ASTM C1289 and meeting the following physical properties:

1. ASTM C1289 type 1, class 2.
 2. Compressive Strength (ASTM D1621): 25 psi, minimum.
 3. Aged thermal Resistance (ASTM C518, measured at Mean Temp of 75F): F-6.5 at 1 inch of thickness with 15 year thermal warranty.
 4. Flexural Strength (ASTM C203): Minimum 55 psi.
 5. Water Absorption (ASTM C209): Minimum 0.1 percent by volume.
 6. Water Vapor Permeance (ASTM E96): <0.03 perms.
 7. Maximum Use Temperature: 250 degrees F.
 8. Class A (<and/or= 25 Flame spread Index and <450 Smoke Developed Index) classified at Max. thickness per UL 723 criteria or ASTM E84 criteria.
 9. Acceptable Products: The Dow Chemical Company "THERMAX™ XARMOR ci Exterior Insulation.", or equal.
 - a. Panel Size: 4'-0" wide x 8'-0" long, square edge, shiplap panels.
 - b. Thickness and Stabilized R-Value: Nominal 2 inch thickness, R-13.0, or as indicated on the drawings.
- B. Flashing Tape: Provide insulation manufacturer's recommended tape for counter-flashing and penetrations through the insulation layer.
1. Acceptable Products: "WEATHERMATE™" Straight Flashing 4 inch at all horizontal and vertical seams, The Dow Chemical Company, or equal.
 - a. Meets ASTM 711 for self-adhering flashing.
 - b. Meets ASTM D5034 standard test method for breaking strength and elongation of textile fabrics.
 - c. Meets ASTM D3330 standard test method for peel adhesion for pressure sensitive tape.
 - d. Meets ASTM D1970 standard test method for self-adhering polymer modified bituminous sheet materials used as steep roofing underlayment for ice dam protection.
 - e. Meets ASTM G154 standard practice for operating fluorescent ultraviolet lamp apparatus for exposure of nonmetallic materials.
 - f. Water vapor transmission less than 1 perm
 - g. Application temperature: 30 degrees F to 120 degrees F.
 - h. UV resistance: 120 days.
- C. Penetration Filler: Provide insulated sheathing manufacturer's recommended polyurethane foam for sealing penetrations of insulated sheathing.
1. Acceptable Products: The Dow Chemical Company "GREAT STUFF PRO™ Gaps & Cracks" single-component polyurethane low-pressure foam sealant, or equal.

- a. Meets ASTM E84 standard test method for surface burning characteristics of building materials.
 - b. Meets Modified ASTM E814 standard test method for fire block.
 - c. Complies with Underwriters laboratories, Inc. Classification, as a sealant fire block.
 - d. Polyurethane based foam is minimal expanding, single component foam.
 - e. Cures quickly and has a moisture resistant skin.
 - f. Allows for movement/shifting within a structure.
 - g. Fills and seals gaps up to 3".
 - h. Flexural strength, ASTM C203, parallel to rise, psi, minimum: 8.8
 - i. Compressive strength, ASTM D1621m parallel to rise, psi: 9.3
 - j. Tensile strength, ASTM D1623, parallel to rise, psi: 14.4
- D. Adhesive and Fasteners: Type recommended by insulation board manufacturer for application indicated. The spacing of all fasteners is to be installed according to manufacturer's recommendations.

2.17 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
- 1. Do not use calcium chloride in mortar or grout.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification for job-mixed mortar and ASTM C 1142 for ready-mixed mortar, of types indicated below:
- 1. For exterior, above-grade loadbearing and nonloadbearing walls and parapet walls, for reinforced masonry and where indicated, use type indicated below:
 - a. Type S.
 - 2. For interior loadbearing walls; for interior nonloadbearing partitions, and for other applications where another type is not indicated, use type indicated below:
 - a. Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
- B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.
- C. Notify Architect and do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.
- B. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
- C. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.
- D. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.
- E. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.

3.3 CONSTRUCTION TOLERANCES

- A. Comply with construction tolerances of referenced unit masonry standard.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

- B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
 - 1. Running bond with vertical joint in each course centered on units in courses above and below.
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: In each course, rake back 1/4-unit length for one-half running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.
- F. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around all built-in items.
 - 1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - 2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
 - 3. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid brick masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units as follows:
 - 1. With full mortar coverage on horizontal and vertical face shells.
 - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - 3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

- C. Cut joints flush for masonry walls to be concealed or to be covered by other materials.
- D. Tool joints for masonry walls to be exposed in compliance with referenced masonry standard.
- E. Tool joints in block and brick veneer as directed by the Architect.

3.6 STRUCTURAL BONDING OF MULTIPLY THE MASONRY

- A. Use individual metal ties and pintles installed in continuous horizontal joint reinforcement, embedded in horizontal mortar joints to bond wythes together.
- B. Use pintles of lengths required to extend 1-1/2 inches into back of veneer wythe, and no closer than 1-1/4 inch from the exterior mortar surface.
- C. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.
 - 1. Provide continuity with horizontal joint reinforcement at corners using prefabricated "L" units, in addition to masonry bonding.
- D. Intersecting and Abutting Walls: Provide vertical control joints at junctures, provide same type of bonding specified for structural bonding between wythes and space as follows:
 - 1. Locate and provide control joints not to exceed 18 feet between joints, unless noted otherwise.
 - 2. Provide continuity with horizontal joint reinforcement using prefabricated "T" units.
- E. Nonbearing Interior Partitions: Build full height of story to within 1/2 inch of underside of floor or roof deck above and as follows:
 - 1. Install pressure-relieving joint filler in joint between top of non-fire rated partition and underside of deck above.
 - 2. Installation of fire rated filler and caulk by Section 07270 - Firestopping.

3.7 CAVITIES / AIR SPACES

- A. Keep cavities/air spaces clean of mortar droppings and other materials during construction. Strike joints facing cavities/air spaces flush.

- B. Tie exterior wythe to backup with individual metal tie pintles set into continuous horizontal joint reinforcing.
- C. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 2 feet o.c., unless otherwise indicated.
- D. Do not apply insulation to exterior face of backup wythe until fluid-applied membrane air barrier is applied, inspected, and approved by the Owner's Commissioning Agent.

3.8 CAVITY WALL INSULATION

- A. On units of extruded polystyrene board insulation, install small pads of adhesive spaced approximately 1 foot o.c. both ways on inside face or attach to inside face with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Cut insulation board to 16 inch width to fit typical vertical spacing of ties, or closer if required to accommodate smaller spacing as may occur. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill all cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.9 HORIZONTAL JOINT REINFORCEMENT

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, 1/2" inch elsewhere. Lap reinforcing a minimum of 6 inches.
- B. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.10 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials
 - 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 32 inches o.c. horizontally.

3.11 MOVEMENT JOINTS

- A. General: Install control joints in unit masonry where indicated. Build in related items as the masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
 1. Form open joint of not less than 3/8 inch and insert nonmetallic compressible joint filler in width equal to actual width of concrete masonry units, less 3/8 inch for installation of backer rod and sealant by Section 07 92 00 "Joint Sealants".
 2. Where backer rod and sealant will be installed on both sides of masonry units, install joint filler in width equal to actual width of unit masonry, less 3/4 inch.

3.12 LINTELS

- A. Install steel lintels where indicated, and wherever openings of more than 2 feet for block size units are shown.
- B. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.13 FLASHING / WEEP HOLES

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.
- B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with adhesive/sealant/tape as recommended by flashing manufacturer before covering with mortar.
- C. Install flashings as follows:
 1. At lintels and shelf angles, extend flashing a minimum of 8 inches into masonry at each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4 inches, and through the inner wythe to within 1/2 inches of the interior face of the wall in exposed masonry. Where

- interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches, unless otherwise indicated.
2. At heads and sills, extend flashing as specified above unless otherwise indicated but turn up ends not less than 2 inches to form a pan.
 3. Cut off flashing flush with face of wall after masonry wall construction is completed.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashings and as follows:
1. Form weep holes with product specified in Part 2 of this Section.
 2. Space weep holes 24 inches o.c.
 3. In insulated cavities/air spaces cover cavity/air space side of open weep holes with copper or plastic insect screening to maintain drainage.
- E. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.14 INSTALLATION OF REINFORCED UNIT MASONRY

- A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.
- B. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
- C. Install vertical reinforcing and secure with positioning ties before grout is placed.

3.15 FIELD QUALITY CONTROL

- A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
 1. Mortar properties will be tested per property specification of ASTM C 270.
 2. Mortar composition and properties will be evaluated per ASTM C 780.
 3. Grout compressive strength will be sampled and tested per ASTM C 1019.
- B. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory

if results from construction quality control tests comply with minimum requirements indicated.

END OF SECTION 04 20 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. City of Stamford General Conditions and Division 01, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs the Work. Note also all Addenda.

1.2 SUMMARY

- A. Section Includes:

- 1. Structural steel.

- B. Related Sections:

- 1. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Section 033000 "Cast-In-Place Concrete" for materials and installation of expansion and adhesive anchors.
 - 3. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
 - 4. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.
 - 5. Section 055100 "Metal Stairs."

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC, "Code of Standard Practice for Steel Buildings and Bridges," unless otherwise noted.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and Specification for Structural Steel Buildings.
 - 2. Use ASD; data are given at service-load level.

B. Moment Connections: Type FR, fully restrained.

C. Construction: Braced frame.

1.5 ACTION SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 01 Specification Sections.

B. Shop drawings shall be reviewed and "checked" by the Fabricator prior to being submitted to the Engineer. Unchecked shop drawings shall be rejected and returned to the Contractor.

C. Contractor to provide a detailed submittal schedule identifying all submittals and the date they are to be received by BVH Integrated Services, P.C. Submittal schedule to be submitted two weeks prior to the start of the submittal process and updated every two weeks.

D. Product Data: For each type of product indicated.

E. Applicable shop standards for the following:

1. All gravity connection details with capacities.
2. Bracing connection details.
3. Moment connection details.

F. Sample calculations for the following:

1. Simple shear connections including seated connections and skewed connections shall include checks for bolt shear, block shear, web bearing, shear on net section of connection material, bending on net section of connection material, and weld stress as applicable.
2. Bracing connections including checks for bolt shear, block shear, web bearing, tension yield on gross section of connection material, tension rupture or net section of connection material, compression buckling of gusset plate, and weld stress as applicable.
3. Beam web stiffeners including checks for compression buckling, crippling, sideways web buckling, local web yielding, and local flange bending as applicable.
4. Column web stiffeners including checks for compression buckling, local web yielding, and local flange bending as applicable.
5. Moment connections including checks for weld strength, column web shear, local web yielding, compression web buckling, web crippling, and local flange bending as applicable.
6. Other design calculations for connections, as requested by the Engineer.

7. The above referenced standards and calculations must be submitted and approved at least two weeks prior to submitting detailed shop drawings. Shop drawings will not be reviewed until standards and calculations have been approved.

G. LEED Submittals:

1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
2. Laboratory Test Reports for Credit IEQ 4: For primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Shop Drawings: Show fabrication of structural-steel components.

1. Erection drawings showing weights and locations of all structural steel members shall be submitted for review prior to the submission of detail drawings. These erection drawings shall include large scale sections through all conditions to indicated suspended lintels, braces and field welding. No detail drawings shall be submitted prior to the review of shop standards and erection drawings.
2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
3. Include embedment drawings.
4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
6. Indicate working point locations and brace working lines on braced frame beam drawings.
7. Identify members and connections of the seismic-load-resisting system.
8. Indicate locations and dimensions of protected zones.
9. Identify demand critical welds.
10. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- I. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.
- J. Fabricator Certificate of Compliance: At the completion of fabrication, the certified fabricator shall submit a Certificate of Compliance to the Building Official stating that the work was performed in accordance with the approved Construction Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified firms and persons specified in the "Quality Assurance" article who demonstrated their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Architects and Owners, and other information specified.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.

1.7 QUALITY ASSURANCE

- A. No fabrication is to proceed until the Testing Agency has visited the fabrication plant and coordinated all testing and inspection requirements with the fabrication schedule. A minimum of seven days prior to the start of fabrication, the Fabricator is to provide written notice to the Engineer of Record and the Owner's Testing Agency indicating the date fabrication procedures will start. Any fabrication that occurs prior to the coordination visit will be rejected at no cost to the Owner.

- B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- C. Detailer Qualifications: A qualified detailer with a minimum of five years experience in structural steel detailing of similar projects.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welded processes involved, and if pertinent, has undergone recertification.
 - 2. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.

3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
 1. W-Shapes: 60 percent.
 2. Channels, Angles[, M] [, S]-Shapes: 60 percent.
 3. Plate and Bar: 25 percent.
 4. Cold-Formed Hollow Structural Sections: 25 percent.
 5. Steel Pipe: 25 percent.
 6. All Other Steel Materials: 25 percent.
- C. W-Shapes: ASTM A 992/A 992M, Grade 50.
- D. Channels, Angles[, M] [, S]-Shapes: ASTM A 36/A 36M.
- E. Plate and Bar: ASTM A 36/A 36M.
- F. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- G. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.
- H. Steel Pipe: ASTM A 53, Type E or S, Grade B.
 1. Weight Class: As indicated.

2. Finish: As indicated.

I. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Galvanized Finish: Hot-dip zinc-coating, ASTM A 153. Class C, where indicated. Retap nuts in accordance with ASTM A385.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Galvanized Finish: Hot-dip zinc-coating, ASTM A 153. Class C, where indicated. Retap nuts in accordance with ASTM A 385.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554.

1. Configuration: As indicated.

2. Grade: As indicated.

3. Nuts: ASTM A 563 hex carbon steel.

4. Plate Washers: ASTM A 36 carbon steel.

5. Washers: ASTM F 436, Type 1, hardened carbon steel.

6. Finish: Plain.

7. Galvanized Finish: Hot-dip zinc-coating, ASTM A 153. Class C, where indicated. Retap nuts in accordance with ASTM A 385.

E. Threaded Rods: ASTM A 36.

1. Nuts: ASTM A 563 hex carbon steel.

2. Washers: ASTM F 436, Type 1, hardened carbon steel.

3. Finish: Plain.

2.3 PRIMER

A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664. Tnemec Series 88HS or approved equivalent.

- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.
- C. Primer for Exterior Exposed Steel: Tnemec Series 90-97 Tnemec-zinc or approved equivalent.

2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Steel Buildings."
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6 and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Architecturally Exposed Structural Steel: All structural steel exposed to the view of the building's occupants or the general public in the finished structure shall be considered "Architecturally Exposed Structural Steel," unless otherwise noted and shall comply with Section 10 of the AISC's "Code of Standard Practice."
 - 1. Comply with fabrication requirements, including tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel identified as architecturally exposed structural steel.
 - 2. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, seam marks, roller marks, rolled trade names, and roughness.
 - 3. Remove blemishes by filling or grinding, or by welding and grinding, before cleaning, treating, and shop priming.
 - 4. Where welding is noted on the drawings, provide welds of a uniform size and profile.
 - 5. At locations where welding is on the far side of and an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.
 - 6. Seal weld open ends of round and rectangular hollow structural sections with 1/4" closure plates. Provide continuous, sealed welds at brace to gusset-plate connections.

- C. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- D. Bolt Holes: Drill or punch standard bolt holes perpendicular to metal surfaces.
- E. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- F. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."
- G. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- H. Holes: Provide holes required for securing other work to structural steel.
 - 1. Drill or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Design of end connections shall be in accordance with the AISC's "Manual of Steel Construction." Field connections may be bolted using 3/4-inch diameter bolts minimum, except where noted welded. A minimum of two bolts per member connection is required.
- C. Beam end connections shall be selected and detailed for 1.25 times the reactions indicated. A minimum connection capacity of 6k shall be provided. Reactions governed by the 6k minimum are designated as such on plan, and need not be increased by the factor of 1.25. For the purpose of bidding only, connections where no end reactions are indicated may be estimated for reaction equal to one-half the allowable uniform load for the beam span.

Connections for composite beams with no end reaction indicated may be estimated for 1.5 times one-half the allowable uniform load for the beam span. For design purposes, the Fabricator shall submit a RFI to the Engineer to request values for any reactions that are not indicated.

- D. Connections shall be consistent with Type 2 construction as described in the AISC Specifications, unless otherwise indicated on the Structural Drawings.
- E. All column ends scheduled to receive cap and base plates shall be milled or sawn to ensure full bearing. All surfaces to be welded shall be free from loose scale, rust, grease, paint or other foreign material, except that mill scale which resists vigorous brushing may remain. Joint surfaces shall be free from fins or tears.
- F. Install flexible masonry anchors as required in Division 04.
- G. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.6 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Beam flanges where shear connectors are installed.
 - 4. Top flanges of beams to receive shear connectors.
 - 5. Surfaces to be high-strength bolted with slip-critical connections.
 - 6. Surfaces to receive sprayed fire-resistive materials (applied fireproofing). Steel receiving intumescent paint fire protection shall be primed; coordinate priming requirements with the intumescent paint manufacturer's recommendations.
 - 7. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning." Provide where standard shop primer is specified.

2. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Provide where steel is exposed.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Priming for Exposed Steel: Immediately after surface preparation, apply primer according to manufacturer's instructions and at a rate recommended by SSPC to provide a dry film thickness of not less than 3.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123. All zinc material shall meet the chemical requirements for High Grade Zinc according to ASTM B6.
 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 1. Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 2. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

- D. Shop Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Shop Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1.
- F. Shop-welded connections will be tested and inspected according to AWS D1.1 and the inspection procedures listed below:
 - 1. Inspect and test shop fillet welds as follows:
 - a. Visually inspect 100 percent of all fillet welds prior to the application of a shop primer.
 - b. Witness the actual welding procedures and perform magnetic particle tests on a minimum of 5 percent of fillet welds.
 - c. Witness the actual welding procedures of all multi-pass fillet welds and single pass fillet welds greater than 5/16 inch.
 - d. Welds that do not pass visual inspection are to be tested again using either magnetic particle or dye penetration test methods.
 - 2. Witness the welding procedure and perform ultrasonic testing (ASTM E 164) on 100 percent of all full and partial penetration welds.
- G. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
 - 1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before details proceed, verify the existing elevations, locations and dimensions required.
- B. Before erection proceeds, verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice" and AISC's "Specification for Structural Steel Buildings."
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members where indicated and as required to comply with OSHA requirements.

- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.
- I. The Contractor shall accept full responsibility for design strength, safety and adequacy of all temporary bracing and sequencing of structural steel erection to brace the structure. Provide all temporary braces, guys, connections and work platforms required to safely resist all loads, including storms, to which the structure may be subjected.
- J. The Contractor shall guy, plumb and align framing in accordance with limits defined in the AISC's "Code of Standard Practice."
- K. Any corrections required in the field to make members fit shall be brought to the attention of the Engineer for approval.
- L. Provide angle frames for all openings in composite steel floor deck and steel roof deck larger than 12 inches.
- M. Provide angle frames to support all roof drain sump pans.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Design and end connections shall be in accordance with the AISC's "Manual of Steel Construction." A minimum of two bolts per member connection is required. Field connections may be bolted using 3/4 inch diameter bolts minimum, except where noted welded.
- C. Beam end connections shall be selected and detailed for 1.25 times the reactions indicated. A minimum connection capacity of 6k shall be provided. Reactions governed by the 6k minimum are designated as such on plans, and need not be increased by the factor of 1.25. For the purpose of bidding only, connections where no end reactions are indicated may be estimated for a reaction equal to one-half the allowable uniform load for the beam span. Connections for composite beams with no end reaction indicated may be estimated for 1.5 times one-half the allowable uniform load for the beam span.

For design purposes, the Fabricator shall submit a RFI to the Engineer to request values for any reactions that are not indicated.

- D. Connections shall be consistent with Type 2 construction as described in the AISC Specifications, unless otherwise indicated on the Structural Drawings.
- E. Weld Connections: Comply with AWS D1.1 and AWS D1.8 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.
- B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of correct work with specified requirements.
- D. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Welded Connections: Field welds will be visually inspected according to AWS D1.1 and the inspection procedures listed below:
 - 1. Inspect and test field fillet welds as follows:
 - a. Visually inspect 100 percent of all fillet welds.
 - b. Witness the actual welding procedures and perform magnetic particle test on a minimum of 15 percent of all fillet welds.
 - c. Witness the actual welding procedures of all multi-pass fillet welds and single pass fillet welds greater than 5/16 inch.
 - d. Welds that do not pass visual inspection are to be tested again using either magnetic particle or dye penetration test methods.

2. Witness the welding procedures and perform ultrasonic testing (ASTM E 164) on 100 percent of all full and partial penetration welds.
- F. The Fabricator and Erector are to provide the testing and inspection agency and the Special Inspector safe access to the site throughout the duration of the steel erection. The Fabricator is to notify the testing agency and the Special Inspector a minimum of 48 hours prior to the start of erection.
- G. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.
- H. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780. Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 05 12 00

08/17/2016

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 01, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs the Work. Note also all Addenda.

1.2 SUMMARY

- A. Section Includes:

- 1. Roof deck.
 - 2. Composite floor deck.
 - 3. Welds and mechanical fastener types, sizes and patterns.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
 - 2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors and for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop drawings shall be reviewed and "checked" by the Fabricator prior to being submitted to the Engineer. Unchecked shop drawings shall be rejected and returned to the Contractor.
- C. Contractor to provide a detailed submittal schedule identifying all submittals and the date they are to be received by BVH Integrated Services, P.C. A submittal schedule is to be submitted two weeks prior to the start of the submittal process and updated every two weeks.
- D. Shop Drawings:
 - 1. Include layout and types of deck panels, clearly indicate span condition, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Evaluation Reports: Evidence of steel deck compliance with building code in effect for project, from a model code organization acceptable to authorities having jurisdiction.
- D. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experience installer who has completed steel deck similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- D. Direct fastening powder-actuated system operators shall be trained and licensed by a manufacturer's representative. When requested by the Engineer, the contractor shall require operators to be retested by the manufacturer's representative. The manufacturer's representative shall be capable of training and licensing operators on the project site.
- E. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and applicable windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
- C. Store weld studs, weld electrode, mechanical fasteners, side lap connectors and powder-actuated cartridges in original packages in a cool, dry location until final installation. Comply with all project and national safety regulations

regarding handling of welding equipment and powder-actuated fastening systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK

- A. Manufacturers: Subject to compliance with requirements.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Deck Profile: As indicated.
 - 3. Profile Depth: As indicated.
 - 4. Design Uncoated-Steel Thickness: As indicated.
 - 5. Span Condition: Three-span minimum, unless otherwise indicated.
 - 6. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements.
- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
 - 2. Profile Depth: As indicated.

3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Three-span minimum, unless otherwise indicated.

2.4 MECHANICAL FASTENERS

- A. Powder-actuated mechanical fasteners for roof and floor deck applications shall have minimum 1/2 inch diameter steel washers, knurled shanks, ballistic points, and electro-plated zinc coating conforming to ASTM B 633, SC 1, Type III. Powder-actuated mechanical fasteners shall be recognized by ICC-ES AC43, SDI listed, and approved by Factory Mutual and Underwriter's Laboratories for wind uplift. Powder-actuated mechanical fasteners shall also be listed by Underwriter's Laboratories for fire-resistive steel roof deck assemblies in accordance with TLSX and TGKX designs.

2.5 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- C. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth, minimum 14 gage.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- H. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and [level] [sloped] recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- I. Galvanizing Repair Paint: ASTM A 780.

- J. Shear Connectors: ASTM A 108, Grades 1010 through 1020 headed stud type, cold-finished carbon steel, AWS D1.1, Type B, with arch shields.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or equivalent strength mechanical fasteners.

1. Arc Spot (Puddle) Welds:
 - a. Weld Diameter: 3/4 inch, nominal.
 - b. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart within 10'-0" minimum of the perimeter and corners, based on roof area definitions of FM Loss Prevention Data Sheet 1-28. In corner areas, provide two welds in each rib. Corner regions shall be "L" shaped with the outer dimensions of the "L" defined by two times "a". Where "a" is the width of the corner pressure coefficient zone per Code. If the recommended field of roof wind rating exceeds Class 1-90, provide two welds in each rib in the perimeter and corner areas.
2. Weld Washers: Install weld washers at each weld location, if required.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding 24 inches on center in the field of the roof, and no more than 12 inches on center in the perimeter and corners, and as follows:
 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws at side laps.
 2. Match spacing of side laps and fasten with 3/4 inch diameter puddle welds at perimeter edge, unless otherwise noted.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 1. End Joints: Lapped 2 inches minimum.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.
 1. Install reinforcing channels or zees in ribs to span between supports and weld.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

- A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or equivalent strength mechanical fasteners.
 - 1. Arc Spot (Puddle) Welds:
 - a. Weld Diameter: 3/4 inch, nominal.
 - b. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
 - c. Weld Washers: Install weld washers at each weld location, as required.
 - 2. Mechanical Fasteners:
 - a. Bring steel deck units into direct contact with structural steel supporting members or steel bar joists prior to and during powder-actuated mechanical fastening. Moisture may be present on deck surface during powder-actuated mechanical fastening.
 - b. Fasten steel deck units to structural steel supports or steel bar joists as noted on the drawings. Powder-actuated mechanical fasteners shall achieve adequate penetration of the steel deck and supporting member in accordance with manufacturer's instructions. Powder-actuated mechanical fasteners shall be appropriately gauged to the base material thickness and hardness prior to final fastening. Mechanical shear connectors placed on mechanical fastener locations may be considered to replace those fasteners.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
 - 2. Match spacing of side laps and fasten with 3/4 inch diameter puddle welds at perimeter edge, unless otherwise noted.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of [1-1/2 inches], with end joints as follows:

1. End Joints: Butted.
- D. Shear Connectors: Weld shear connectors through deck to supporting frame according to AWS D1.1 and manufacturer's written instructions. Butt end joints of deck panels; do not overlap. Remove and discard arc shields after welding shear connectors.
- E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- F. Design of gravity structural framing is based on "un-shored" construction, unless otherwise noted.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Mechanical fasteners will be subject to inspection.
- D. Visually inspect mechanical or weld patterns, side-lap connections, and perimeter edge connections to confirm conformance with Specifications and Contract Documents.
- E. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:
 1. Shear connector stud welds will be visually inspected.
 2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repair to any shear connector stud.
 3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.
- F. Testing agency will report inspection results promptly and in writing to Contractor, Structural Engineer and Architect.
- G. Remove and replace work that does not comply with specified requirements.
- H. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

08/17/2016

05 50 00 METAL FABRICATIONS

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.3 SUMMARY

- A. This Section includes furnishing and installing the following metal fabrications as described herein and indicated on the drawings:
 - 1. Loose steel lintels
 - 2. Straight run, steel framed stairs and landings
 - 3. Steel pipe handrails and railing systems attached to metal stairs
 - 4. Steel pipe handrails attached to walls adjacent to metal stairs
 - 5. Miscellaneous framing and supports for the following:
 - a. Elevator subsill angles, hoisting beam, sump pit frames and diamond plate cover, and pit ladder for Section 14 24 00 – Hydraulic Elevators.
 - 6. Continuous galvanized steel angles and anchorage at all overhead coiling door sills.
 - 7. Areaway grates and frames
 - 8. Relocation, modifications, and erection of Owner's existing gasoline canopy steel structure including, but not limited to, columns, canopy, metal roofing, and existing accessories.
 - 9. Miscellaneous brackets, pipe sleeves to support new work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 03 30 00 "Cast in Place Concrete" for installation of concrete fill and reinforcing materials.
 - 2. Section 04 20 00 "Unit Masonry" for installation of loose lintels in masonry work and furnishing and installing metal clip angles associated with masonry wall construction.
 - 3. Section 05 12 00 "Structural Steel" for structural steel framing system components.
 - 4. Section 14 24 00 – "Hydraulic Elevators" for hydraulically operated passenger elevators.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop drawings detailing fabrication and erection of each metal fabrication and metal stair indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
 - 1. For installed steel stairs indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer, registered in the State of Connecticut, who was responsible for their preparation.
- C. Product data for prefilled metal pan stair treads, steel floor plate, paint products, and grout.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

1.5 PERFORMANCE REQUIREMENTS

Structural Performance: Engineer, fabricate, and install steel stairs to withstand the following structural live loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of steel stairs.

- 1. Treads of Steel Stairs: Capable of withstanding a uniform load of 100 lb. per sq. ft. or a concentrated load of 300 lb. on a area of 4 sq. inches located in the center of the tread, whichever produces the greater stress.
 - 2. Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lb. per sq. ft.
 - 3. Stair Framing: Capable of withstanding stresses resulting from loads specified above as well as stresses resulting from railing system loads.
- B. Structural Performance: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without

exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each of the respective components of each metal fabrication.

1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lb. applied at any point and in any direction.
 - b. Uniform load of 50 lb. per linear foot applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.
2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
 - a. Concentrated load of 200 lb. applied at any point and in any direction.
 - b. Uniform load of 50 lb. per linear foot applied in any direction.
 - c. Concentrated and uniform loads above need not be assumed to act concurrently.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification.
- C. Installer Qualifications: Arrange for steel fabrication installation specified in this Section by the same firm that fabricated them.
- D. Engineer Qualifications: A professional engineer legally authorized to practice in the Commonwealth of Massachusetts and experienced in providing engineering services of the kind indicated that have resulted in the installation of metal stairs (including handrails and railing systems)

similar to this Project in material, design, and extent and that have a record of successful in-service performance.

- E. Manufacturer: Provide metal fabrications as complete units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting at no additional cost to the Owner.

1.8 SEQUENCING AND SCHEDULING

- A. Sequence and coordinate installation of wall handrails as follows:
 - 1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

- D. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.
- E. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

2.3 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro-deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 - 1. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

2.4 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Nonshrink, Nonmetallic Grouts:
 - a. Five Star Grout; Five Star Products.
 - b. Masterflow 928 and 713; Master Builders Technologies, Inc.
 - c. Sealtight 588 Grout; W. R. Meadows, Inc.
 - d. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.
- C. Erosion-Resistant Anchoring Cement: Factory-prepackaged, nonshrink, nonstaining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.
- D. Products: Subject to compliance with requirements, provide the following:
 - 1. Erosion-Resistant Anchoring Cement:
 - 2. "Super Por-Rok"; Division, Minwax Construction Products

2.5 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- E. Remove sharp or rough areas on exposed traffic surfaces.
- F. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
 - 1. Include brackets, clips, miscellaneous fittings and anchors for interconnection and attachment of metal fabrications to other work.
 - 2. Furnish inserts, sleeves and other devices for connecting metal fabrications to concrete or masonry work.
- I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels as indicated on Contract Documents.
- D. **Galvanize all loose lintels located in exterior wall locations.**

2.7 STEEL-FRAMED STAIRS

- A. General: Construct stairs to conform to sizes and arrangements indicated. Join pieces together by welding, unless otherwise indicated. Provide complete stair assemblies, including metal framing, hangers, columns, handrails, railing systems, newels, balusters, struts, clips, brackets, bearing plates, or other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.
 - 1. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for class of stair designated, except where more stringent requirements are indicated.
 - a. Architectural class where indicated.
- B. Stair Framing: Fabricate stringers of structural steel channels, plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; and bolt or weld newels and framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finish surfaces.
 - 1. Where masonry walls support steel stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Risers, Subtreads, and Subplatforms: Shape metal pans for risers and subtreads to conform to configuration shown. Provide thickness of structural steel sheet for metal pans not less than that required, to support total design loading.
 - 1. Form metal pans of uncoated cold-rolled steel sheet, unless otherwise indicated.
 - 2. Attach risers and subtreads to stringers with brackets made of steel angles. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.

3. Provide subplatforms of configuration and construction indicated of same metal as risers and subreads, in thickness required to support design loading. Attach subplatform to platform framing members with welds.
 - a. Smooth Soffit Construction: Construct subplatforms with smooth soffits.

2.8 STEEL PIPE HANDRAILS AND RAILING SYSTEMS

- A. General: Fabricate pipe handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.
 1. Drawing references to Model #'s shall refer to King Architectural Metals, Dallas, TX, catalog of materials.
- B. Interconnect railing and handrail members by butt-welding or welding with internal connectors, at fabricator's option, unless otherwise indicated.
 1. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe to which end is joined, and weld all around.
- C. Form changes in direction of handrails and rails as follows:
 1. By bending.
- D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
- E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.
- F. Close exposed ends of pipe by welding 3/16-inch-thick steel plate in place or with prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inches or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of handrails and railing systems to other work. Furnish inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work.

- H. For galvanized handrails and railing systems, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- I. For non-galvanized steel handrails and railing systems, provide non-galvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

2.9 STEEL LADDERS – (ELEVATOR PIT LADDERS)

- A. General: Fabricate ladders for the locations shown, with dimensions, spacings, details, and anchorages as indicated. Comply with requirements of ANSI A14.3.
- B. Siderails: Continuous, steel tube sections, 1-1/4 inch square, space 18 inches apart.
- C. Bar Rungs: 3/4 inch diameter steel bars, spaced 12 inches o.c. (max).
- D. Fit rungs in centerline of side rails, plug weld and grind smooth on outer rail faces.
- E. Support each ladder at top and bottom and at intermediate points spaced not more than 5 feet o.c. with welded or bolted steel brackets.
 - 1. Size brackets to support design dead loads and to hold centerline of ladder rungs clear of the wall surface by not less than 7 inches.
 - 2. Extend side rails 42 inches above top rung, and return rails to wall or structure unless other secure handholds are provided. If the adjacent structure does not extend above the top rung, goose neck the extended rails back to the structure to provide secure ladder access.

2.10 GASOLINE CANOPY STRUCTURE

- A. General: Relocate, modify column heights, and erect Owner's existing steel gasoline canopy structure at the location indicated on the drawings.
- B. The Owner's existing gasoline canopy is currently erected at an alternate location within the City limits of the City of Stamford. Scope of work shall include the disassembly, handling, and relocation of the existing gasoline canopy from its existing location to the project site.

- C. Contractor to modify the column heights as indicated on the drawings. Scope of work shall include cutting and welding of base plates and repairs to final finishes.
- D. All concrete requirements for relocation of existing gasoline canopy structure shall be by Section 03 30 00 "Cast-in-Place Concrete".

2.11 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
- B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 - 1. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
 - 2. Galvanize miscellaneous metals in the following locations:
 - 1. Exterior locations.
 - 2. Other locations as indicated on the Contract Documents.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
 - 2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 111 for shop painting.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

3.3 INSTALLING STEEL PIPE RAILINGS AND HANDRAILS

- A. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loading. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.
 - 2. Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
 - a. Anchoring Cement.
 - b. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8 inch build-up, sloped away from post. For installations exposed on exterior, or to flow of water, seal anchoring material to comply with grout manufacturer's directions.
 - 3. Anchor handrail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with drilled-in expansion anchors.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:
 - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
 - 2. For concrete and solid masonry anchorage, use drilled-in expansion anchor.
 - 3. For hollow masonry anchorage, use toggle bolts having square heads.

3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Clean and touchup paint of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal.
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05 50 00

07 13 26 - SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. The Work of this Section includes, but is not limited to, furnishing and installing post applied and pre-applied sheet membrane waterproofing to horizontal and vertical below grade concrete surfaces of the cast-in-place concrete and elevator pit construction:
 - 1. Vertical Applications: Self-adhered membrane applied to vertical, below-grade foundation wall surfaces with exposed foundation wall on the interior face, and sealing of cracks and joints
 - 2. Horizontal Applications: Membrane applied on prepared sub-base prior to placement of concrete slabs and elevator pit construction.
 - 3. Waterstops between vertical and horizontal locations where indicated on the drawings.

1.4 SUBMITTALS

- A. Submit manufacturer's product data, installation instructions and membrane samples for approval.
- B. General: Submit in accordance with Section 01300.
- C. Product Data: Submit manufacturer's product literature and installation instructions.
- D. Subcontractor's approval by Manufacturer: Submit document stating manufacturer's acceptance of subcontractor as an Approved Applicator for the specified materials.

1.5 REFERENCE STANDARDS

- A. The following standards and publications are applicable to the extent referenced in the text.
- B. American Society for Testing and Materials (ASTM):
- C
 - 836 Standard Specification for High Solids, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
 - D 412 Standard Test Methods for Rubber Properties in Tension
 - D 570 Standard Test Method for Water Absorption of Plastics
 - D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 - D 1434 Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheet
 - D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
 - D 3767 Standard Practice for Rubber - Measurements of Dimensions
 - D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
 - E 96 Standard Test Methods for Water Vapor Transmission of Materials
 - E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

1.6 QUALITY ASSURANCE

- A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.
- B. Installer: A firm which has at least 3 years experience in work of the type required by this section.
- C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.
- D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to

maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

- E. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's instructions. Protect from damage from weather, excessive temperature and construction operations. Remove and dispose of damaged material in accordance with applicable regulations.
- B. Recommended storage and application temperature is 75 degrees F. Store materials in protected and well ventilated area.

1.8 PROJECT CONDITIONS

- A. Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive sheet membrane waterproofing.
- B. Do not apply membrane if temperature is less than 40 degrees F., if precipitation is imminent or to a damp or frosty surface.
- C. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish daily from the site.

1.9 WARRANTY

- A. Sheet Membrane Waterproofing: Provide written five (5) year material warranty issued by the membrane manufacturer upon completion of work.
- B. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials.

PART 2 — PRODUCTS

2.1 MATERIALS

- A. For horizontal, underslab waterproofing: Furnish and install pre-applied integrally bonded sheet waterproofing membrane: Preprufe 300R Membrane and necessary accessory tapes and sealants for an entirely waterproofed horizontal membrane, by GCP Applied Technologies, or equal.
1. 1.2mm nominal thickness composite sheet membrane comprising 0.4 mm of high density polyethylene film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and permanent bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete. Provide membrane with the following physical properties:

PHYSICAL PROPERTIES FOR PREPRUFE 300R MEMBRANE:

Property	Test Method	Typical Value
Color		White
Thickness	ASTM D 3767 Method A	1.2 mm nominal
Low Temperature Flexibility	ASTM D 1970	Unaffected at -20°C (-10°F)
Elongation	ASTM D 412 Modified ¹	>500%
Crack Cycling at -23°C (-10°F), 100 Cycles	ASTM C 836	Unaffected
Tensile Strength, Film	ASTM D 412	4,000 psi
Peel Adhesion to Concrete	ASTM D 903 Modified ²	880 N/m (5.0 lbs/in.)
Lap Adhesion	ASTM D 1876 Modified ³	5 lbs/in
Resistance to Hydrostatic Head	ASTM D 5385 Modified ⁴	>231 ft
Puncture Resistance	ASTM E 154	221 lbs
Permeance	ASTM E 96 Method B	0.01 perms
Water Absorption	ASTM D 570	<0.5%

Footnotes:

1. Elongation of membrane is run at a rate of 50 mm (2 in.) per minute.
 2. Concrete is cast against the protective coating surface of the membrane and allowed to cure (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 50 mm (2 in.) per minute at room temperature.
 3. The test is conducted 15 minutes after the lap is formed as per manufacturer's instructions and run at a rate of 50 mm (2 in.) per minute at -4°C (25°F).
 4. Hydrostatic head tests are performed by casting concrete against the membrane with a lap. Before the concrete sets a 3 mm (0.125 in.) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to a head of 70 m (231 ft) of water which is the limit of the apparatus.
- B. For vertical waterproofing applied to concrete foundation walls: Furnish and install self-adhered sheet waterproofing membrane: Bituthene 3000 membrane and necessary accessory tapes and sealants for an entirely waterproofed vertical membrane by GCP Applied Technologies, or equal.
1. 1.7 mm nominal thickness composite sheet membrane with a tensile strength of 1150 psi and puncture resistance of 200 lbs.
 2. Primer: Bituthene Primer WP-3000, water based latex primer shall be utilized on all surfaces to receive self-adhered sheet membrane waterproofing.
 3. Protection Board acceptable and suitable for the manufacturer to maintain warranties as specified.
- C. Waterstops: For intersections of horizontal and vertical concrete pours, furnish and install specially engineered and swellable, conformable synthetic waterstop strip that expands when in contact with water.
1. 1" x ½" waterstop strip supplied in roll form equal to Adcor ES by GCP Applied Technologies, or equal.
 2. Utilize a butyl based adhesive for securing waterstop to concrete equal to Adcor ES Adhesive, or equal.

PART 3 — EXECUTION

3.1 EXECUTION

- A. The installer shall examine conditions of substrates and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION, VERTICAL APPLICATIONS

- A. Substrates shall be smooth and sound.
- B. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
 - 1. Apply primer prior to application of self-adhered membrane.
 - 2. Apply succeeding sheets by overlapping the previous sheet 3 in. along the edge of the membrane. Side laps must be firmly rolled to ensure a tight seal.

3.3 INSTALLATION, HORIZONTAL APPLICATIONS

- A. Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Fill gaps or voids greater than 0.5 in. Remove standing water prior to membrane applications.
- B. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:
 - 1. Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.
 - 2. Apply succeeding sheets by overlapping the previous sheet 3 in. along the uncoated edge of the membrane. Lap area must be firmly rolled to ensure a tight seal.
 - 3. Overlap the ends of the membrane a minimum of 3 in. and apply Preprufe Tape centered over the lap and roll firmly to ensure a tight seal.

3.4 PROTECTION

- A. Protect membrane in accordance with manufacturer's recommendations until placement of concrete. Inspect for damage just prior to placement of concrete and make repairs in accordance with manufacturer's recommendations.

END OF SECTION 07 13 26

07 81-00 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

1.2 SUMMARY

- A. This Section includes furnishing and installing the following:
 - 1. Furnish and install sprayed-on fireproofing as indicated on the drawings for columns, beams, and underside of metal deck to provide for a 2-hour fire rating as indicated. Extent of fire separation area is indicated on the Code Reference Plans.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 07 84 00 "Firestopping" for through-penetration firestop systems.
 - 2. Section 09 29 00, "Gypsum Board Assemblies" for gypsum-board-based fire-rated assemblies.

1.3 DEFINITIONS

- A. Concealed sprayed-on fireproofing refers to applications where sprayed-on materials are applied to surfaces that are concealed from view behind other construction when the Work is completed.
- B. Exposed sprayed-on fireproofing refers to applications where sprayed-on materials are applied to surfaces that are exposed to view when the Work is completed.

1.4 SUBMITTALS

- A. Product data for each sprayed-on fireproofing product indicated.
- B. Submittal data indicating the following:
 - 1. Where and what kinds of surface preparations are required before applying fireproofing.

2. Extent of sprayed-on fireproofing for each different construction and fire-resistance rating including the following:
 - a. Applicable fire -resistive design designations of inspecting and testing agency acceptable to authorities having jurisdiction.
 - b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
 3. Treatment of fireproofing after its application.
- C. Product certificates from fireproofing manufacturers that each sprayed-on fireproofing product indicated for Project complies with specified requirements including those for fire-test-response characteristics and compatibility with adhesives, primers, and other surface coatings on substrates indicated to receive fireproofing.
- D. Results from tests and inspections performed by owner-employed independent testing agency will be reported promptly to Architect and Contractor.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and owners, and other information specified.
- F. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction showing that sprayed-on fireproofing products comply with building code in effect for Project.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide sprayed-on fireproofing products identical to those used in assemblies tested for the following fire-test-response characteristics, per test method indicated below, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify packages (bags) containing fireproofing with appropriate classification markings of applicable testing and inspecting agency.
1. Fire-Resistance Ratings: As indicated by reference to fire-resistive designs listed in UL "Fire Resistance Directory," for fire-resistive assemblies where sprayed-on fireproofing serves as direct-applied protection, tested per ASTM E 119.
 2. Surface-Burning Characteristics: As indicated for each sprayed-on fireproofing product required, tested per ASTM E 84.

- B. Installer Qualifications: Engage an experienced Installer certified, licensed, or otherwise qualified by the sprayed-on fireproofing manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its sprayed-on fireproofing products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
- C. Single-Source Responsibility: Obtain sprayed-on fireproofing materials from a single manufacturer for each different product required.
- D. Owner will employ and pay a qualified independent testing agency to perform field quality-control testing services specified in Part 3 of this Section.
- E. Provide fireproofing products containing no detectable asbestos as determined according to the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers, labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.
- B. Use materials with limited shelf life within period indicated. Remove from Project site and discard any materials whose shelf life has expired.
- C. Store sprayed-on fireproofing materials inside, under cover, above ground, so they are kept dry until ready for use. Remove from Project site and discard any materials that have deteriorated.

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40 deg F (4.4 deg C) and falling, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after applying sprayed-on fireproofing.
- B. Ventilation: Ventilate sprayed-on fireproofing by natural means or, where this is inadequate, forced-air circulation during and after application until fireproofing dries thoroughly.

1.8 SEQUENCING

- A. Sequence and coordinate application of sprayed-on fireproofing with other related work specified in other Sections to comply with the following requirements:
 - 1. Provide temporary enclosures to prevent deterioration of sprayed-on fireproofing for interior applications due to exposure to unfavorable environmental conditions.
 - 2. Avoid unnecessary exposure of sprayed-on fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.
 - 3. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 4. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until fireproofing is installed.
 - 5. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, tested, and corrections have been made to any defective fireproofing.

1.9 WARRANTY

- A. General: The warranty specified in this Article shall not deprive the Owner of other rights the owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Warranty: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed-on fireproofing that has failed within the specified warranty period. Failures include but are not limited to the following:
 - 1. Cracking, flaking, eroding in excess of specified requirements, peeling, and delaminating of sprayed-on fireproofing from substrates due to defective materials and workmanship within the specified warranty period.
 - 2. Not covered under the warranty are failures attributable to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and to other causes not reasonably foreseeable under conditions of normal use.
- C. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SPRAYED-ON FIREPROOFING MATERIALS

- A. General: For concealed applications of sprayed-on fireproofing provide manufacturer's standard low density cementitious fireproofing products complying with requirements indicated in this article for material composition and physical properties representative of installed products. For exposed applications of sprayed-on fireproofing provide manufacturer's standard medium density cementitious fireproofing products complying with requirements indicated in this article for material composition and physical properties representative of installed products.
- B. Material Composition: Provide composition indicated below:
 - 1. Cementitious fireproofing consisting of factory-mixed, dry formulation of gypsum or portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.
- C. Physical Properties: Minimum values, unless otherwise indicated or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed below:
 - 1. Bond Strength: 200 lbs. per sq. ft. as determined per ASTM E 736 under the following conditions:
 - a. Field test sprayed-on fireproofing that is applied to flanges of wide-flange structural steel members on surfaces matching those that will exist for remainder of steel receiving fireproofing.
 - b. If surfaces of structural steel receiving sprayed-on fireproofing are primed or otherwise painted, perform series of bond tests specified in UL "Fire Resistance Directory" for coating materials.
 - c. Minimum sprayed-on fireproofing thickness tested in laboratory shall be 0.75 inch.
 - 2. Compressive Strength: 1200 lbs. per sq. ft. as determined in the laboratory per ASTM E 161. Minimum sprayed-on fireproofing thickness tested shall be 0.75 inch and the minimum dry density shall be as specified, but not less than 15 pcf.
 - 3. Corrosion Resistance: No evidence of corrosion as determined per ASTM E 937.
 - 4. Deflection: No cracking, spalling, delamination or the like as determined per ASTM E 759.
 - 5. Effect of Impact on Bonding: No cracking, spalling, delamination or the like as determined per ASTM E 760.
 - 6. Air Erosion: Maximum weight loss of 0.025 gram per sq. ft. in 24 hours as determined per ASTM E 859. For laboratory tests, the minimum sprayed-on fireproofing thickness is 0.75 inch, the

maximum dry density is 15 pcf, test specimens are not prepared by mechanically induced air velocities, and tests are terminated after 24 hours.

7. Dry Density: 15 pcf for average and individual densities for concealed or inaccessible fireproofing and 22 pcf for fireproofing on exposed steel members within 7'-0" off regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, as determined per ASTM E 605 or Appendix A "Alternate Method for Density Determination" of AWC Technical Manual 12-A.
 8. Thickness: Provide minimum average thickness required for fire-resistive design indicated according to the following criteria, but not less than 0.375 inch, as determined per ASTM E 605.
 - a. Where the referenced fire-resistive design lists a thickness of one inch or greater, the minimum allowable individual sprayed-on fireproofing thickness is the design thickness minus 0.25 inch.
 - b. Where the referenced fire-resistive design lists a thickness of less than one inch but more than 0.375 inch, the minimum allowable individual sprayed-on fireproofing thickness is the greater of 0.375 inch or 75 percent of the design thickness.
 - c. No reduction in average thickness is permitted for those fire-resistive designs whose fire resistance ratings were established at densities of less than 15 pcf.
 9. Surface-Burning Characteristics: Maximum flame-spread value of 0 and smoke-developed value of 0.
- D. Products: Subject to compliance with requirements, provide one of the following:
1. Low Density Cementitious Fireproofing:
 - a. Monokote Type MK-6/s, Construction Products Div., W.R. Grace & Co.
 - b. Monokote Type MK-6/HY, Construction Products Div., W.R. Grace & Co.
 - c. Cafco 300, Isolatek International Corp.
 2. Medium Density Cementitious Fireproofing:
 - a. Monokote Type Z-106, Construction Products Div., W.R. Grace & Co.
 - b. Monokote Type Z-146, Construction Products Div., W.R. Grace & Co.
 - c. Cafco 400, Isolatek International Corp.

2.2 AUXILIARY FIREPROOFING MATERIALS

- A. General: Provide auxiliary fireproofing materials that are compatible with sprayed-on fireproofing products and substrates and are approved by UL having f or use in the fire-resistive designs indicated.
- B. Substrate Primers: For use on each different substrate and with each different sprayed-on fireproofing product, provide primer that complies with one or more of the following requirements:
 - 1. Primer's bond strength complies with requirements specified in UL "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM 8 736.
 - 2. Primer is identical to those used in assemblies tested for the fire-test-response characteristics of sprayed-on fireproofing, per ASTM E 119, by UL.
- C. Adhesive for Bonding Fireproofing: Product approved by manufacturer of sprayed-on fireproofing.
- D. Reinforcing Fabric: Glass-fiber fabric of type, weight, and form required to comply with fire-resistive designs indicated, approved by manufacturer of intumescent mastic fireproofing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates with Installer present to determine if they are in satisfactory condition to receive sprayed-on fireproofing. A substrate is in satisfactory condition if it complies with the following:
 - 1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
 - 2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
 - 3. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying the fireproofing.
- B. Conduct tests according to sprayed-on fireproofing manufacturer's recommendations to verify that substrates are free of oil, rolling

compounds, and other substances capable of interfering with bond where there is any doubt as to their presence.

- C. Do not proceed with installation of fireproofing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances that could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.
- B. Prime substrates where recommended by fireproofing manufacturer, except where compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- C. For exposed sprayed-on fireproofing applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished fireproofing surface. Remove minor projections and fill voids that would telegraph through fireproofing after application.
- D. Cover other work subject to damage from fall-out or overspray of fireproofing materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintaining adequate ambient conditions for temperature and ventilation.

3.3 INSTALLATION, GENERAL

- A. Comply with fireproofing manufacturer's instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fireproofing materials; as applicable to the particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- B. Apply sprayed-on fireproofing that is identical to products tested as specified in Part 1 under "Test Reports" in "Submittals" article, with respect to rate of application, use of sealers, topcoats, tamping, troweling, water overspray, or other materials and procedures affecting test results.
- C. Coat substrates with adhesive prior to applying fireproofing where required to achieve fire-resistance rating or as recommended by fireproofing manufacturer for material and application indicated.
- D. Extend fireproofing in full thickness over entire area of each substrate to be protected. Unless otherwise recommended by fireproofing manufacturer, install body of fireproof covering in a single course.

- E. Apply cement-aggregate cementitious fireproofing materials by sprayed-on method to produce the following finish:
 - 1. Spray textured finish with no further treatment.
- F. Apply fireproofing materials by sprayed-on method to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended by manufacturer.

3.4 INSTALLING CONCEALED FIREPROOFING

- A. Apply concealed fireproofing in thicknesses and densities indicated but not less than those required to achieve fire-resistance ratings designated for each condition and comply with requirements for thickness specified in Part 2 "Concealed Fireproofing" article.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: A qualified independent testing agency employed and paid by owner will perform field quality-control testing.
- B. Extent and Testing Methodology: Testing of completed fireproofing will take place in successive stages in areas of extent described below; do not proceed with fireproofing of next area until test results for previously completed fireproofing show compliance with requirements.
 - 1. Within each area, testing agency will randomly select one structural member of each type (primary beam, secondary beam, joist, truss, steel deck, and column) and test fireproofing as follows:
 - a. For cohesion and adhesion per ASTM E 736.
 - b. For thickness per ASTM E 605.
 - c. Lower flanges and webs of beams, column webs, column flanges, and floor deck for density per ASTM E 605 or Appendix A "Alternate Method for Density Determination" of AWC Technical Manual 12-A.
 - d. When testing discovers fireproofing not in compliance with requirements, testing agency will perform additional random testing to determine extent of noncompliance.
- C. Testing agency will report test results promptly and in writing to Contractor, Owner's Representative and Architect.
- D. Remove and replace fireproofing where test results indicate that it does not comply with specified requirements for cohesion and adhesion or for density or both.

- E. Apply additional fireproofing per manufacturer's directions where test results indicate that the thickness does not comply with specified requirements.
- F. Additional Testing: Where fireproofing is removed and replaced or repaired, additional testing will be performed to determine compliance with specified requirements.

3.6 CLEANING, REPAIR, AND PROTECTION

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material over-spray and fall-out from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Cure exposed cementitious fireproofing materials according to fireproofing manufacturer's recommendations to prevent premature drying.
- C. Protect fireproofing, according to advice of fireproofing manufacturer and Installer, from damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of Substantial Completion.
- D. Coordinate installation of fireproofing with other construction to minimize the need to cut or remove fireproofing. As installation of other construction proceeds, inspect fireproofing and patch any areas where fireproofing was removed or damaged.
- E. Repair or replace work that has not been successfully protected.

END OF SECTION 07 81 00

SECTION 31 20 01 - BUILDING EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. City of Stamford General Conditions and Division 01, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs the Work. Note also all Addenda.
- B. State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction Form 816, latest edition.
- C. American Society for Testing and Materials (ASTM) Standards:
 - 1. ASTM C136 - Method of sieve analysis of fine and coarse aggregates.
 - 2. ASTM C117 - Standard test method for materials finer than No. 200 sieve in mineral aggregate washing.
 - 3. ASTM D422 - Standard test method for particle size analysis of soils.
 - 4. ASTM D1140 - Test for amount of material in soils finer than the No. 200 sieve.
 - 5. ASTM D1556 - Test method for density of soil in place by the sand cone method.
 - 6. ASTM D1557 - Test methods for moisture-density relations of soils and soil aggregate mixtures using 10 lb. hammer and 18 inch drop. AASHTO Standard T-180 may be substituted for ASTM D1557.
 - 7. ASTM D2922 - Test methods for density of soil and soil-aggregate in place by nuclear methods (shallow depth).
 - 8. ASTM D4318 - Test method for liquid limit, plastic limit and plasticity index of soils.
- D. Specification Sections 01 22 00 – Unit Prices, 01 21 00 Allowances and 31 23 16 Rock Removal.

1.2 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slabs-on-grade.
 - 2. Excavating and backfilling for buildings, walls, site walls and structures.
 - 3. Drainage course for concrete slabs-on-grade.
 - 4. Subsurface drainage backfill for walls and trenches.
 - 5. Excavating and backfilling for utility trenches within the building excavation limits.
 - 6. Excavation and off-site disposal of all unsuitable and excess materials and stockpiling of all suitable onsite materials required for reuse.

7. Provision, transportation and placement of all required fill and backfill materials.
8. Drainage and dewatering required to perform work in the dry.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices for earth moving specified in Division 01 Section "Unit Prices."
- B. Quantity allowances for earth moving are included in Division 01 Section "Allowances."
- C. Rock Measurement: Volume of rock actually removed, measured in original position. See specification section Rock Removal 312316 for additional information.

1.4 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
- B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- D. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by geotechnical engineer and the owner's agent. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 2. Bulk Excavation: Excavation more than 10 feet in width.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by geotechnical engineer and the owner's agent. Unauthorized excavation, as well as remedial work directed by geotechnical engineer and the owner's agent, shall be without additional compensation.
- E. Fill: Soil materials used to raise existing grades.
- F. Rock: See specification section Rock Removal 312316 for additional information.

- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface within the building limits.
- H. Subbase Course: Aggregate layer placed between the subgrade and base course.
- I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase.
- J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Warning tapes.
 - 2. Subsurface drainage geotextile.
- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. 12 by 12-inch sample of drainage geotextile with specification analysis.
- C. Qualification Data: For qualified testing agency.
- D. Earth Material Samples: Contractor shall be responsible for obtaining samples (50 lb. minimum) of earthwork materials proposed to be used and transporting them to the site seven calendar days in advance of the time planned for incorporating them into the work. Use of proposed materials by the Contractor prior to testing and approval or rejection shall be at the Contractor's risk. The following information shall be submitted with the samples.
 - 1. Location of borrow source site.
 - 2. Present and past usage of the source site and material.
 - 3. Any previously existing report(s) associated with an assessment of the source site, as relates to the presence of oil or hazardous material.
 - 4. Location within the source site from which the material will be obtained.
- E. Up to three test series (gradation and laboratory compaction) will be completed by the geotechnical engineer or owner's agent for off-site borrow sources for each category of earth materials defined in Part 2 of this Section at the owner's cost. Testing of additional samples or sources shall be at the Contractor's cost.

1. Sieve analysis to be based on washed sieve analysis in accordance with appropriate ASTM Standard.
 - F. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 1. Classification according to ASTM D 2487.
 2. Laboratory compaction curve according to ASTM D 1557.
 3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.
 - G. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.
 - H. Flowable Fill Mix Design: Submit mix design with admixture information for review and approval a minimum of 15 days prior to start of Work.
- 1.6 QUALITY ASSURANCE
- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.
 - B. Earthwork Observation and Testing:
 1. The owner and/or owner's agent will retain a qualified geotechnical engineer and/or testing agency to perform onsite observation and testing during work under this and related sections and as indicated in the "Schedule of Special Inspections." The services of the geotechnical engineer/testing agency may include, but not be limited to, the following:
 - a. Observation during excavation, subgrade preparation and backfill for footings, slabs-on-grade, and subsurface drainage construction, etc.
 - b. Determination of requirements for additional excavation to remove unsuitable materials.
 - c. Observation and testing during placement and compaction of fill and backfill.
 - d. Laboratory testing and analysis of fill materials specified.
 - e. Review of submittals.
 2. During the course of construction the geotechnical engineer/testing agency shall advise the owner's agent, in writing, with a copy to the Architect and Contractor, if at any time, in his opinion, the work is not in substantial conformity with the plans and specifications. The geotechnical engineer's and/or testing agency's presence does not include supervision

of direction of the actual work by the Contractor, his employees, subcontractors or agents. Neither the presence of the geotechnical engineer and/or testing agency, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.

3. Testing equipment will be provided by and testing performed by the geotechnical engineer and/or testing agency, except as otherwise provided by contract. Upon request by the owner's agent, the Contractor shall provide such auxiliary personnel and services as needed to accomplish testing work and to repair damage caused thereby to permanent work.
4. References herein to observations, testing and determinations by the "Engineer" include services to be provided by the geotechnical engineer and/or testing agency when appropriate and when so authorized by the engineer or owner.

C. Preexcavation Conference: Conduct conference at Project site.

1. Before commencing earthwork, meet with representatives of the governing authorities, owner, architect, engineer, consultants, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least three working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Existing Utilities:

1. Notify utility locator service for area where project is located before site clearing or excavating. Hire private utility markout service for areas not marked by utility companies. See the "General Conditions" of the construction contract.
2. Before starting excavation, establish location and extent of any underground utilities occurring in work area. Make arrangements with appropriate utility company for removal and relocation of lines which are in

the way of excavation. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

3. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for direction. Cooperate with owner, owner's agent, and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
 4. Inactive or abandoned utilities encountered during construction operations shall be removed, plugged or capped. The location of such utilities shall be noted on record drawings and reported in writing to owner's agent. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff services if lines are active.
 5. Do not interrupt existing utilities serving facilities occupied and used by owner or others, during occupied hours, except when permitted in writing by owner's agency and then only after arranging to provide acceptable temporary utility services. Provide minimum of 48 hours notice to owner's agent and receive written notice to proceed before interrupting any utility. Do not proceed with utility interruptions without owner's written permission.
 6. When in the course of the work it is necessary to connect a utility to a main in a public way, all the requirements of both the authorities governing the utility and those governing the public way shall be met. Pavement shall be temporarily and permanently replaced as directed by these authorities at no additional cost to the owner.
- C. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.
- D. Site Information:
1. Information in the contract plans and in the Specifications relating to subsurface conditions, existing utilities and structures is from the best sources presently available. Such information is furnished only for the information and convenience of the Contractor, and the accuracy and completeness of this information is not guaranteed. The opinions expressed in this report are those of the geotechnical engineer and represent interpretations of the subsoil conditions, tests and results of analyses conducted by the geotechnical engineer. The owner will not be responsible for interpretations or conclusions drawn from this data by the Contractor.
 2. Refer to Division 01 "Supplemental Information - Geotechnical Report" for available subsurface data. The report is not part of the Contract Documents. The Contractor may, at his own expense and upon

application to the owner, conduct additional subsurface explorations and testing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations. All rock and soil materials furnished for use as fill or backfill shall be free of grease, soil, solvents, pesticides, herbicides or other hazardous or deleterious materials and/or contaminants. All rock and soil materials specified in this Section shall also be free from ice, snow, trash, debris, stumps, roots and organic material.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups symbols shall not be used as fill or backfill except where impervious fill is specified or detailed Satisfactory soils which have been rendered excessively wet, such that the Contractor cannot establish a stable soil mass compacted as specified in this Section, also shall not be used as fill or backfill.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.
- E. 3/4 Inch Crushed Stone: Crushed stone shall be a quarry product or washed gravel stone obtained from offsite sources for use as detailed on the drawings. Crushed stone shall consist of durable crushed rock or gravel stone essentially free of silt, clay, loam or other deleterious materials and shall conform to the following gradation requirements for the nominal size indicated.

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 1 Inch	100
Pass 3/4 Inch	90 - 100
Pass 1/2 Inch	20 - 55
Pass 3/8 Inch	0 - 15
Pass No. 4	0 - 5

- F. Sand-Gravel Fill: Naturally or artificially graded non-plastic mixture of durable, sound coarse and fine aggregate and obtained from suitable excavated onsite

soils or offsite sources. Mixture to be free of debris, waste, frozen materials, and organics, and shall be well graded within the following limits:

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 2-1/4 Inch	100
Pass 2 Inch	95 - 100
Pass 3/4 Inch	50 - 75
Pass 1/4 Inch	25 - 45
Pass No. 40	5 - 20
Pass No. 100	2 - 12

- G. Bedding Material: Sand or sandy soil free of debris, waste, frozen materials and organics with 100 percent passing a 3/8-inch sieve and not more than 10 percent passing a No. 200 sieve.
- H. Granular Fill (Also Termed "Structural Fill"): Granular fill shall be obtained from suitable excavated onsite soil or offsite borrow sources for use as fill and backfill below and interior to building areas except where other materials are specified or detailed, and as detailed on the drawings. Granular fill shall consist of non-plastic naturally or artificially graded mixture of sound coarse and fine aggregates free of debris, waste, frozen materials and organics and conforming to the following gradation:

SQUARE MESH SIEVES	PERCENT FINER BY WEIGHT
Pass 3-1/2 Inch	100
Pass 1-1/2 Inch	55 - 100
Pass 1/4 Inch	25 - 60
Pass No. 10	15 - 45
Pass No. 40	5 - 25
Pass No. 100	0 - 10
Pass No. 200	0 - 5

- I. General Fill: Clean, sound mixture of material free of debris, waste, frozen materials and organics with 5 inch maximum size aggregate and not more than 12 percent passing the No. 200 sieve.
- J. Sand: ASTM C 33; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- L. Flowable Fill: Mixture of cement, GranCem, sand, water and admixtures to produce a flowable fill with a 100 psi minimum, 28 day minimum compressive strength.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Grab Tensile Strength: 157 lbf (minimum); ASTM D 4632.
 2. Sewn Seam Strength: 142 lbf (minimum); ASTM D 4632.
 3. Tear Strength: 56 lbf (minimum); ASTM D 4533.
 4. Puncture Strength: 56 lbf (minimum); ASTM D 4833.
 5. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
 6. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 7. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- B. Underslab and Footing Drainage Pipe: Perforated and solid pipe for subsurface drains shall be heavy-duty corrugated polyethylene tubing conforming to ASTM F 405. Pipe and fittings shall be made of polyethylene compounds that meet or exceed the requirements of Type III, Category 4 or 5, Grade P33 or P34, Class C per ASTM D 1248. The pipe and fittings shall be free of foreign inclusions, cracks, creases, unpigmented or nonuniformly pigmented areas, or other visible defects. Fittings and/or couplings shall be split and/or screw-on with corrugations to match the pipe corrugations. Fittings supplied by manufacturers other than the manufacturer of the pipe shall not be used.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Provide protective construction fence around all landscaping in work area to remain.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades and foundation soils from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. The Contractor shall grade and ditch the site as necessary to direct surface runoff away from open excavations. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. The Contractor shall provide, at his own expense, adequate pumping and drainage facilities to keep all excavations and work sufficiently dry from groundwater and/or surface runoff so as not to adversely affect construction product or procedures nor cause excessive disturbance of underlying natural ground or footing and slab subgrades. Contractor shall similarly control water entering the excavation as a result of construction operations, such as washing of concrete equipment and tools and the like.
 - 3. Water from trenches and excavations shall be disposed of in such a manner as will not cause injury to public health, nor damage to public or private property, existing work, or work in progress, nor to the surface of roads, walks and streets, nor cause any undue interference with the use of the same by the public. The Contractor shall comply with all applicable environmental protection and/or sediment/erosion control regulations.

4. Under no circumstances place concrete or fill, or lay piping or install appurtenances in excavations containing free water. Keep utility trenches free from water until pipe joint material has hardened.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not disintegrate or excavate rock until it has been classified and cross sectioned by the geotechnical engineer and/or owner's agent. The Contract Sum will be adjusted for rock excavation according to contract provisions for changes in the Work. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.
 - a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.
2. Rock excavation includes removal and disposal of rock and includes replacement with approved materials.
 - a. Uncover and expose all rock surfaces to be removed.
 - b. Notify owner in writing before rock removal proceeds.
 - c. The owner will engage a registered land surveyor to cross section the top of rock and determine the quantity of rock for payment. Measurements for payment will be based on in place cubic yards of rock removed to paylines, as defined:
 - 1) For Walls or Piers with Footings: The measurements will be taken horizontally parallel to and 12 inches outside of the edges of the concrete footings and vertically 12 inches below bottom of footing elevation as indicated in the Contract Documents.
 - 2) For Walls or Piers without Footings: The measurements will be taken horizontally parallel to and 12 inches outside of the edges of the concrete limits and vertically 12 inches below bottom of concrete elevation as indicated in the Contract Documents.
 - 3) For Slabs-on-Grade: The measurement will be taken vertically 12 inches below slab subgrade elevation as indicated in the Contract Documents.

- 4) For Utility Trenches: The measurement will be taken vertically 6 inches below bottom of pipe and horizontally 24 inches wider than the nominal diameter of pipe/conduit as indicated in the Contract Documents.
- 5) For Tanks, Vaults, Manholes, Pits, Etc.: The measurement will be taken horizontally 24 inches greater in both length and width or diameter than the actual exterior dimensions of the structures and vertically 12 inches below the bottom elevation of structure as indicated in the Contract Documents.

- d. No payment will be made for overblasted rock and/or shattered layers below paylimits, associated removal and replacement with suitable fill material.

B. Dimensions:

1. Excavate to elevations and dimensions indicated on the drawings or as otherwise required for the work. Do all necessary excavation, including but not limited to, excavation for structures, footings, foundations, grade beams, walls and slabs below grade, paving, utility lines, mechanical work, mechanical and drainage structures, drains, and other below grade work. Excavate sufficient material so as to allow ample space for construction operations including placing and removal of forms, installation of waterproofing, dampproofing or utilities and inspection of excavated areas.
2. Side forms will be required for all concrete work unless omission of forms is requested by the Contractor, in writing, to the engineer. Where omission of forms is requested by the Contractor, and accepted by the engineer, the Contractor shall bear the cost of any additional concrete volume required beyond the minimum profiles and dimensions of the footing, wall, pier as detailed.

C. Disposition of Excavated Material:

1. Sort and stockpile excavated material according to its suitability for reuse and job requirements. Onsite stockpile room will be limited and the contractor shall plan his operations to facilitate prompt reuse of excavated material or provide off-site stockpile locations as required.
2. Stockpile soil materials without intermixing. Place, grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
4. Offsite Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash and debris and legally dispose of it off owner's property.

- D. **Unauthorized Excavation:** Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the engineer or owner's agent. Unauthorized excavation, as well as remedial work specified by the engineer, shall be at the Contractor's expense.
1. In areas below structures, pavements and walks, backfill unauthorized excavation with granular fill placed and compacted in accordance with this Section, unless otherwise directed by the engineer.
 2. Elsewhere, backfill and compact unauthorized excavations with general fill, compacted to the requirements of this Section.
 3. Where the excavation of otherwise suitable materials is required due to these materials being rendered unsuitable due to disturbance, construction activity, freezing or lack of protection from the elements, the Contractor shall excavate these materials and provide remedial work as specified above at no additional cost to the owner.
- E. **Authorized Additional Excavation:** In the case that unsuitable materials, as determined by the engineer, are encountered at the specified subgrade elevation, the engineer may direct the removal of the unsuitable material and refill with granular fill placed and compacted in accordance with the requirements of this Section. Authorized additional excavation with granular fill backfill will be paid for according to contract provisions for changes in the Work.
- F. **Backfilling Prior to Acceptance of Work Installed:**
1. Do not allow or cause the work performed or installed to be covered up or enclosed by work of this Section prior to all required inspections, tests and acceptances.
 2. Should any of the work be so enclosed or covered up before it has been accepted, uncover all such work at no additional cost to the owner.
 3. After the work has been completed, tested, inspected and accepted, make all repairs and replacements necessary to restore the work to the condition in which it was found at the time of uncovering, all at no additional cost to the owner.
- G. **Sheeting, Shoring and Bracing:**
1. Provide sheeting, shoring and/or bracing at excavations as required to assure safety against collapse of earth or rock at sides of excavations; as required for support of adjacent structures, streets or utilities; or as required to comply with federal, state or local regulations, codes or ordinances.
 2. Provide materials for sheeting, shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period

excavations will be open. Carry down sheeting, shoring and bracing as excavation progresses.

3. All sheeting and bracing not ordered left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities or property whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand and rammed with tools especially adapted to that purpose or otherwise compacted as directed to achieve the required density.
4. Wood sheeting shall not be completely withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than one foot above the top of pipe.
5. Refer to the *Related Requirements* in Section 315000 "Excavation Support and Protection."

H. Dust and Erosion Control:

1. The Contractor shall take all necessary measures and provide equipment and/or materials to minimize dust from rising and blowing across the site and also to control surface water throughout the operation so that it does not run onto paved ways without being filtered. In addition, the Contractor shall control all dust created by construction operations and movement of construction vehicles, both on the site and on paved ways.
2. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and performance of other work on the site.
3. Repair any broken or damaged sections of hay bales or other erosion and siltation control measures damaged during excavation and grading operations and install any additional sections necessary for proper control.

I. Frost Protection and Snow Removal:

1. The Contractor shall, at his own expense, keep the operations under this contract clear and free of accumulations of snow or as required to carry out the Work.
2. Do not excavate to full indicated depth when freezing temperatures may be expected, unless footings or slabs can be cast immediately after excavation has been completed. Protect the excavation from frost if placing of concrete is delayed. Do not cast concrete on frozen ground.
3. Completed foundations which have not been backfilled or which have less than 42 inches of earth cover above the bottom of the foundation shall be protected from freezing by temporary additional earth cover, insulating blankets, heaters or other methods. See Section 033000 "Cast-In-Place Concrete" for additional requirements.

J. Protection of Persons and Property:

1. The Work shall be executed in such a manner as to prevent any damage to adjacent property and any other property and existing improvements, such as but not limited to, streets, curbs, paving, service utility lines, structures, monuments, bench marks and other public and private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout, vibration and other hazards created by earthwork operations.
2. In the case of any damage or injury caused in the performance of the Work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of and without cost to the owner. Existing roads, sidewalks and curbs damaged during the project work shall be repaired or replaced to their original condition at the commencement of operations. The Contractor shall replace, at his own expense, existing bench marks, monuments and other reference points which are disturbed or destroyed.
3. Barricade open excavations occurring as part of this Work and post with warning lights. Operate warning lights during hours from dusk to dawn each day and otherwise as required.
4. Buried structures, utility lines, etc., including those which project less than 18 inches above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard.
5. Provide protective construction fence around all landscaping in work area to remain.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. General: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Preparation of Building Area for Foundations:
 1. The Contractor's bid is to include the costs to excavate and legally dispose of from the site all materials within the building footprint to the subgrade elevations indicated on the drawings, including stripping of topsoil. The Contractor's bid is also to include all excavation of the area of proposed footings plus 2 feet horizontally (minimum) beyond the area of all footings as well as excavation of necessary transitional slopes per OSHA requirements, and backfill with compacted granular fill. Additionally the Contractor's bid is to include the costs to furnish and place compacted

- granular fill and base materials to the slab subgrade elevations indicated on the drawings.
2. Additional excavation and backfill beyond the limits indicated must be approved by the owner's agent. Compensation for the approved additional excavation with granular fill backfill will be calculated using the contract unit prices and allowances. The Contractor is responsible to hire an independent registered land surveyor approved by the owner to survey, record and determine the quantity of additional excavation (as defined by the geotechnical engineer) for payment.
 3. Excavation of Unsuitable Material within the Influence of the Building Foundations: Additional excavation to remove existing fill or other unsuitable material from within the areas of influence of the foundations and below slabs-on-grade shall be conducted when so directed by the geotechnical engineer. The horizontal limits of excavation below footing level shall be one foot beyond the outside perimeter of the footing plus an additional one foot for every foot of depth below the footing, unless otherwise directed by the engineer. See Section [3.5 B.2] for additional requirements.

C. Spread Footing Subgrades:

1. Spread footing foundations shall bear on natural inorganic soil or compacted granular fill overlying natural inorganic soils. The compacted granular fill shall extend at least one foot horizontally beyond the limits of the footing. See drawing [S-XXX] for additional requirements.
2. Footing subgrades shall be prepared by excavating all existing material to the specified bottom of the footing elevation, 4 feet below existing grades, or as indicated on the Contract Documents, whichever is lower. Allow the geotechnical engineer to view the excavated subgrade at this level. The geotechnical engineer shall determine whether authorized additional excavation is required to remove unsuitable material. Remove and replace such unsuitable material in accordance with paragraph [3.5 B.2 and 3.5 B.3] of this section or as otherwise directed by the engineer.
3. The Contractor shall take every precaution to minimize the disturbance of excavated subgrades in the natural soils. Such precautions shall include, but not be limited to, using excavation buckets without teeth and/or accomplishing excavation to final subgrade with hand tools. All materials disturbed during excavation shall be removed to undisturbed natural soils or re-compacted as directed by the engineer.
4. Refill excavation to the specified bottom of the footing elevation with granular fill placed and compacted in accordance with the requirements of this Section.
5. Proof compact the final footing subgrade with at least two passes of a vibratory plate compactor immediately prior to placing forms and reinforcing.

D. Subgrade for Slabs-on-Grade:

1. Slabs-on-grade shall be supported on subbase/base course(s) as indicated on the drawings.
2. Remove and replace excessively wet, disturbed or unstable material and proof compact the subgrade for the slab subbase/base course with at least six passes of a vibratory plate or vibratory roller compactor immediately prior to placement of slab base course material unless otherwise directed.
3. The final surface of the subgrade for the moisture retarder membrane and/or slabs-on-grade shall be proof rolled with at least four passes of an approved vibratory plate or vibratory drum compactor immediately prior to placing the membrane, reinforcing or concrete (as may be applicable).

E. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe, conduit or ductbank. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe, conduit or ductbank unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit unless otherwise indicated.

C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevation, unless otherwise indicated on Construction Documents, to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots.

Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

- A. Notify Architect, geotechnical engineer and owner's agent when excavations have reached required subgrade.
- B. If geotechnical engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed and in accordance with paragraphs [3.5 B.2 and 3.5 B.3] of this section.
- C. Unforeseen additional excavation and replacement material will be paid for according to contract provisions for changes in the Work.
- D. Proof-roll subgrade as directed by the geotechnical engineer and /or owner's agent.
- E. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices.
- F. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by geotechnical engineer, without additional compensation.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 PLACEMENT AND COMPACTION OF FILL AND BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for Record Documents.

3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Unless otherwise specified or indicated on the drawings, the products specified in Part 2 of this Section shall be employed in the various fill and backfill applications indicated in that part. Place and compact fill material in layers to required elevations as follows:
1. Under steps and ramps, use granular fill material.
 2. Under building slabs-on-grade, use granular fill, crushed stone and sand-gravel material. See Contract Documents for additional information.
 3. Under footings and foundations, use granular fill.
 4. Against the interior face of foundation walls, use granular fill material. Use granular fill material to 3'-0" beyond the outside face of foundation walls. Use general fill beyond the 3 feet of granular fill.
 5. Under utilities, use either bedding material or crushed stone (see drawings).
 6. Under equipment pads, use crushed stone.
- D. All vegetation, peat, organic topsoil or subsoil, trash, debris, roots, stumps, and any compressible or otherwise deleterious materials shall be stripped from the existing ground surface and removed from excavations prior to placement of fill or backfill.
- E. All fill and backfill materials shall be placed in horizontal layers. Each layer shall be spread evenly and thoroughly mixed during spreading to ensure uniformity of material in each layer. Layer thickness shall not exceed that specified in paragraph [3.11 L] of this Section.
- F. Where horizontal fill layers meet a natural or excavated slope, the layer shall be keyed into the slope by cutting a bench. The surface of benches shall be compacted to the same requirements as apply to the area being filled.
- G. In no instance place fill over materials that were permitted to freeze prior to compaction or over ice or snow. Removal of such materials will be required as directed by the engineer. In no case will frozen material be allowed for use in fill or backfill.
- H. No fill shall be placed or compacted during unfavorable weather conditions. When work is interrupted by heavy rains or snow, fill operations shall not be

resumed until the moisture content and density of previously placed fill are as specified hereinafter.

- I. Allow the geotechnical engineer sufficient time to make necessary observations and tests. The degree of compaction shall be based on a maximum dry density as determined by ASTM Standard D1557 or AASHTO Standard T180. All fill and backfill placed in various areas shall be compacted in individual layers to minimum dry densities as follows:
 1. Under Structures, within Building Foundation Backfill Limits, Equipment Pads, Building Slabs, Steps and Pavements: 95 percent.
 2. Under Walkways: 92 percent.
 3. Under Lawn or Unpaved Areas: 90 percent.
 4. Uniformly graded crushed stone materials which are not suited to field density testing shall be compacted in accordance with the minimum compactive effort indicated in paragraph [3.5 K] of this Section.
- J. The term "under," as applied to building, structures and paved areas, shall be construed to include all materials immediately below the plan area of the building, as well as those materials within a line sloping at one vertical to one horizontal drawn downward and outward from the exterior of building foundation, structure foundation or paved area.
- K. Compaction shall be by mechanical means designed specifically for compaction and approved by the engineer. The engineer reserves the right to disapprove any device of inadequate capacity or of type unsuited to the character of the material being compacted. In areas which are too restricted to permit the use of mechanical compactors, fill may be placed in 3 inch layers and compacted by hand rammer or pneumatic tools.
- L. In addition to the stated degree of compaction, all fill and backfill shall receive at least the compactive effort given in the following table. Lift thickness shall not exceed that shown for the compaction method selected, except that the first lift of fill or backfill placed over natural ground in wet conditions may be as much as 12 inches thick. Application of the minimum compactive effort does not relieve the contractor from his requirement to achieve the specified degree of compaction.

Compaction Method	Maximum Stone Size	Maximum Loose Lift Thickness		Minimum Number of Passes	
		Below Structures and Pavement	Less Critical Areas	Below Structures and Pavement	Less Critical Areas

Hand-operated vibratory plate or light roller in confined areas	4"	6"	8"	6	4
Hand-operated vibratory drum rollers weighting at least 1,000#	6"	8"	10"	6	4
Light vibratory drum roller, minimum dynamic force 3,000# per ft. of drum width	6"	10"	14"	6	4
Medium vibratory drum roller, minimum dynamic force 5,000# per ft. of drum width	8"	12"	18"	6	4
Large vibratory drum roller, minimum dynamic force 8,000# per ft. of drum width	10"	16"	24"	6	4

M. Moisture Control:

1. Water shall be added to fill material which does not contain sufficient moisture to be compacted to the specified densities. Fill and backfill material containing excess moisture shall be required to dry prior to or during compaction to a moisture content not greater than two percentage points above optimum except that material which displays pronounced elasticity or deformation underfoot or under load shall be required to dry to optimum moisture content before it is placed and compacted, if that is required to achieve specified compaction. At the Contractor's option, material which is too wet may be removed and replaced with satisfactory material at no additional cost to the owner.
2. The Contractor is alerted to the potential silty nature of the onsite soil which renders them sensitive to moisture. Onsite silty soils are difficult to handle and compact and are easily disturbed when wet. The Contractor shall plan and conduct his excavation and filling operations considering the nature of the onsite materials.

- N. Where the engineer determines that fill or backfill does not conform to the compacted density specified, or did not receive the minimum compactive effort specified, such fill shall be removed and replaced with conforming materials at the Contractor's own cost.

O. Backfilling of Walls:

1. Do not backfill against walls until completion of slabs-on-grade, structural framing and suspended slabs which provide lateral support to these walls. In placing backfill, take special care to prevent any wedge action, eccentric loading or overloading by equipment used in backfilling and compaction. See Contract Documents for additional requirements.
2. Do not use equipment weighing more than 5,000 lbs. within 10 feet of all walls. Equipment weighing more than 5,000 lbs. shall not be used adjacent to walls, except as expressly approved by the engineer.
3. Backfill shall be placed concurrently on all sides of shafts, tunnel, and freestanding walls, each lift being compacted on all sides before successive lifts are placed. See Contract Documents for additional requirements.
4. Prevent damage to wall waterproofing or dampproofing when backfilling.

3.10 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION

- A. The Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations. Methods of excavation and filling shall be revised as necessary to avoid disturbance of the subgrade, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures. The Contractor shall cooperate with the engineer to modify his operations as necessary to mitigate disturbance and protect bearing soils, based on the engineer's observations.
- B. All excavated or filled areas disturbed during construction; damaged by freezing temperatures, frost, rain, accumulated water, or construction activities; all loose or saturated soil, and other areas that do not meet compaction requirements as specified herein shall be removed and replaced with the compacted fill materials specified. Costs of removal of disturbed material and refill with compacted fill shall be borne by the Contractor.

3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits and ductbanks.
- C. Backfill voids with satisfactory soil while removing shoring and bracing.
- D. Place and compact initial backfill of [gravel fill], free of particles larger than 1 inch in any dimension, to the building slab subgrade elevation.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Coordinate backfilling with utilities testing.
- G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.13 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified above.
- B. Subsurface Drain: Drainage pipe to be surrounded by stone and wrapped with filter fabric as shown on the Construction Documents.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material and maximum lift thickness comply with requirements.
 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, each soil stratum will be verified by a geotechnical engineer to confirm subgrade preparation and ability to support design bearing capacities.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable.
 - 1. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
 - 2. When field in-place density tests are performed using nuclear methods, make calibration checks for both density and moisture gages at the beginning of work, on each different type of material encountered and at intervals as directed by the engineer.
 - 3. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 - 4. Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests along a wall face.
 - 5. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.15 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by geotechnical engineer and/or owner's agent; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

08/17/2016

SECTION 333100 – SANITARY SEWAGE SYSTEMS**1. PART 1 - GENERAL****1.1. RELATED DOCUMENTS**

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 General Requirements of this Specification, and the Drawings are collectively applicable to this Section.
- B. All construction shall comply with City of Stamford requirements, OSHA, the State of Connecticut Basic Building Code, and the Connecticut Guidelines for Soil Erosion and Sediment Control.
- C. CONN-DOT FORM 816 latest edition
- D. The Connecticut Public Health Code Regulations and Technical Standards for Subsurface Sewage Disposal Systems latest edition
- E. Construction Drawings
- F. If a conflict is identified between this Technical Specifications and the Plans, the Site Engineer designated by the owner shall be notified to determine which shall govern.

1.2. DESCRIPTION

- A. Connection of building sanitary sewage system to existing sewer main

1.3. REGULATORY REQUIREMENTS

- A. Conform to applicable codes and requirements of authority having jurisdiction for materials and installation of the Work of this Section.
- B. Contractor shall coordinate with the surveyor to as-built the sewer main and laterals. Laterals may be required to be surveyed prior to backfilling

1.4. RELATIVE WORK

- A. Section 312000 "Earth Moving"
- B. Section 312513 "Erosion and Sedimentation Control"

1.5. DEFINITIONS

- A. Sanitary Sewage Piping: System of sewer pipe, fittings, and appurtenances for gravity flow of sanitary sewage effluent.

1.6. PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.7. SUBMITTALS

- A. Submit under provisions of Division 1-Submittal.

- B. Product Data: Submit manufacturer's product data for materials used. Allow a 5 day review period.
- C. Letter of Certification that system has been:
 - 1. Installed per plans.
 - 2. Cleaned and is ready for use.
- D. Shop drawings for pipes. Allow for five (5) working days for shop review.
- E. Coordination drawings showing structures, pipe sizes, locations, and elevations. Include details of underground structures and connections.
- F. Coordinate profile drawings showing systems piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 30 feet and vertical scale of not less than 1 inch equals 6 feet. Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utility crossing system piping. Include drawings for the sanitary sewage piping laterals to existing building foundations.
- G. At project closeout, submit record drawings of installed sanitary sewage system, piping etc...
- H. Submit maintenance data and parts lists for sanitary sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.
- I. Submit when approved by the Engineer, manufacturer's recommended installation procedures which will become the basis for accepting or rejecting actual installation procedures used for the work.

1.8 QUALITY ASSURANCE

- A. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components.
- B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- C. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects with sanitary sewage work similar to that required for project. Installer shall be licensed in the State of Connecticut.
- D. Repair to the satisfaction of the Architect/Engineer and its Owner any surface or subsurface improvements both on and off site which are damaged during the course of the work (unless such improvements are shown to be abandoned or removed), whether or not such improvements are shown on the Drawings.
- E. Agency Standards:
 - 1. American Society for Testing Materials (ASTM).
 - 2. American Association of State Highway and Transportation Officials (AASHTO).

3. State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, CONN-DOT FORM 816 latest edition.
4. City of Stamford and the State of Connecticut Department of Public Health.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic pipe or fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle structures according to manufacturer's rigging instructions.

1.10 PROJECT CONDITIONS

- A. Verify existing utility locations.
- B. Locate existing structures and piping to be closed, abandoned, reused, and removed.
- C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
 1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without receiving Architect's written permission.
- D. Refer to Mechanical Engineers drawings for connections into buildings.

2. PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. All Poly Vinyl Chloride Pipe (PVCP) shall be diameter as specified on drawings, SCH 40, with solvent weld joints.

2.2 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Gasket-Type Pipe Couplings: Rubber or elastomeric compression gasket, made to match outside diameter of smaller pipe and inside diameter or hub of adjoining larger pipe, for nonpressure joints.
 1. Gaskets for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
 2. Gaskets for Plastic Pipe: ASTM F 477, elastomeric seal.

2.3 FITTINGS AND SADDLES

- A. Fitting: Fitting to be Fernco Fitting, or equivalent, with stainless steel bands as per the City of Stamford requirements.
- B. Saddle: Cast iron saddle with stainless steel bands as per the City of Stamford Engineering Bureau and Water Pollution Control Authority requirements.

3. PART 3: EXECUTION**3.1 EXCAVATING, TRENCHING, BEDDING, AND BACKFILLING**

- A. Excavate and trench for sanitary sewage system in accordance with pertinent provisions of Section 312000 "Excavation and Backfilling" and drawings.
- B. Underground utilities include the storm system, sanitary sewer system, gas, electric, water, cable, and telephone services shall be protected against settlement. Utility and structures shall be protected from settlement by removal of organic material or installation of piles. Contractor shall remove organic material if any underneath all proposed underground utilities and structures as deemed practical for removal. Where it is not practical to remove organic material all underground utilities and structures shall be supported by piles. Pipes and structures shall be protected from settlement under the supervision and recommendation of the geotechnical engineer. Organic material may be required to be replaced with granular fill as recommended by the geotechnical engineer. Refer to earth moving written specification Section 31 20 00.
- C. Provide a bedding surface and backfill as shown on the Drawings for the sanitary sewage system and the requirements set forth by the Connecticut Public Health Code and drawings. Provide a sample of the bedding material for analysis. Contractor shall allow three (3) to five (5) days for processing.
- D. Install bedding material and compact to 95% density. Testing agency to verify the compaction every 100' of pipe run and at least once (1) for every pipe run less than 100'. Site engineer to inspect areas not tested prior to continue with backfilling operations.
 - 1. For required densities, reference to ASTM D1557
 - 2. For density testing, reference to ASTM D2822
- E. Provide sample of the initial backfill material for analysis. Contractor shall allow three (3) to five (5) days for processing.
- F. Install initial backfill and compact to 95% density. Testing agency to verify the compaction every 100' of pipe run and at least once (1) for every pipe run less than 100'. Site engineer to inspect areas not tested prior to continue with backfilling operations
- G. Movement of construction machinery:
 - 1. Use means necessary to avoid displacement of, and injury to, pipe and structures while compacting by rolling or operating equipment parallel to the pipe.
 - 2. Movement of construction machinery over an unprotected sanitary sewage system at any stage of construction is not allowed.

3.2 SANITARY SEWAGE MANHOLES AND PIPING APPLICATIONS

- A. Construct as per the Drawings.

3.3 INSTALLATION, GENERAL

- A. Install piping as indicated on the drawings, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed
- B. Install gravity-flow-systems piping at constant slope between points and elevations indicated on the Drawings. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated on the Drawings.
- C. Extend sanitary sewage piping and connect to building's sanitary sewage pipe, of sizes and in locations indicated. Terminate piping as indicated on the Drawings.
- D. During the excavation, it is anticipated that existing utilities and sewers be exposed. The Contractor shall provide protection and support of these facilities and repair any damage caused by the work in manner satisfactory to the Owner. The condition of the existing facilities shall be observed by the Owner's Representative who shall determine if the facilities shall be replaced. Replacement of the facilities shall be done in a manner satisfactory to the Owner and in compliance with applicable Codes.
- E. Excavation for pipes, or concrete pavement repair will require either a braced excavation or open cut designed according to the requirements of OSHA, 29 CFR Part 1926. The lateral support systems and slopes should also be designed such that building footings, slabs on grade, adjacent pavement and existing utilities are protected and supported and not allowed to settle. The Contractor shall be responsible for having a Professional Engineer, registered in the State of Connecticut design the excavation support method. The designs shall be submitted to the Owner or his Geotechnical Engineer for review. The Contractor shall submit plans showing the type, limits, design and sequence of construction for the lateral support system.
- F. All pipes shall be installed straight and at the vertical and horizontal alignment as shown on the Drawings. Pipes shall have a uniform slope as specified on the Drawings.
- G. Sanitary cleanouts shall be installed within five feet (5') of buildings as specified on the Drawings.
- H. Minimum cover on all pipes shall be two feet (2') unless otherwise specified on the Drawings.
- I. The storm and sanitary sewer shall be encased in concrete for a distance of 10 feet on either side of any intersection between the new sanitary service line and storm sewer. Where concrete encasement is required, temporarily support the pipes in place. Use sufficient

concrete to encase piping not less than 6 inches at all points. It shall also be concrete encased in areas shown on the drawings.

- J. Where pipes are to enter an existing manhole the manhole shall be repaired such that it is water tight and painted with heavy bitumastic material.

3.6 REMOVING EXISTING SANITARY SEWAGE SYSTEM

- A. Remove pipes and sanitary sewage system that are to be replaced in conformance to the Public Health Code, local and State Health Department and applicable regulations.
- B. Refer to Environmental Consultant for removal of any hazard material.

3.7 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as the work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and whenever work stops.
 - 3. Flush piping between manholes and other structures, if required by authorities having jurisdiction, to remove collected debris.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of the Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visual between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of a ball or cylinder of a size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
 - 4. Re-inspect and repeat procedure until results are satisfactory.
- C. Test new piping systems for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - a. New sanitary sewer laterals shall be Low Pressure Air Tested, at the expense of the contractor; Testing to be in accordance

with the recommended procedure in "Unibell's"

"Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe" UNI B-6. The minimum starting pressure for the test is 3.5 P.S.I. (in excess of the groundwater pressure at the top of the pipe) and there shall be no more than 0.5 P.S.I. drop in five (5) minutes. Manholes shall be visually inspected. Lateral plugs shall be airtight to allow proper testing. Inspecting Engineer and the Town Engineering Department shall be informed of testing schedule three (3) days in advance so they can witness the testing. Testing procedures shall follow the Connecticut Public Health Code Regulations and Technical Standards for Subsurface Sewage Disposal Systems latest edition.

3. Schedule tests, and there inspections by authorities having jurisdiction, with at least 48hours in advance notice.
 4. Submit separate reports for each test.
 5. Perform a visual inspection for consistency with the plans and verification of any water leaks.
 6. Leaks and loss in test pressure constitute defects that must be repaired.
 7. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.
- D. Prior to final acceptance of sanitary sewage systems, the contractor shall provide complete "Record Drawings" showing location of sanitary sewage system, elevations and inverts.
- E. Contractor shall notify CT licensed Surveyor to prepare an as-built and CT licensed Professional Engineer to perform a site walk to verify compliance with the drawings. Corrective measures shall be done at no cost to the owner. Contractor shall allow three (3) to four (4) weeks for a Site Engineer and Surveyor to prepare all necessary documentation for project close-out. Contractor shall allow sufficient time to address all punch list items prior to Site Engineer certification to the City of Stamford.
- F. Once the site is fully stabilized, the Contractor is responsible to remove all the silt formed in the structures at no additional cost to the Owner.

END OF SECTION 333100 – SANITARY SEWAGE SYSTEMS

SECTION 334100 - STORM DRAINAGE SYSTEMS**1. PART 1 - GENERAL****1.1. RELATED DOCUMENTS**

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 General Requirements of this Specification, and the Drawings are collectively applicable to this Section.
- B. All construction shall comply with City of Stamford requirements, OSHA, the State of Connecticut Basic Building Code, and the Connecticut Guidelines for Soil Erosion and Sediment Control.
- C. CONN-DOT FORM 816 latest edition
- D. Construction Drawings
- E. If a conflict is identified between this Technical Specifications and the Plans, the Site Engineer designated by the owner shall be notified to determine which shall govern.

1.2. DESCRIPTION

- A. Storm drainage piping, fittings, and accessories
- B. Catch basins, area drains, frames and grates
- C. Manholes and Covers

1.3. REGULATORY REQUIREMENTS

- A. Conform to applicable codes and requirements of authority having jurisdiction for materials and installation of the Work of this Section.

1.4. RELATIVE WORK

- A. Section 312000 "Earth Moving"
- B. Section 312513 "Erosion and Sedimentation Control"

1.5. DEFINITIONS

- A. Drainage Piping: System of sewer pipe, fittings, and appurtenances for gravity flow of storm drainage.

1.6. PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.7. SUBMITTALS

- A. Submit under provisions of Division 1-Submittal.
- B. Product Data: Submit manufacturer's product data for materials used.
- C. Letter of Certification that system has been:
 - 1. Installed per plans.
 - 2. Cleaned and is ready for use.

- D. Shop drawings for precast concrete manholes and other structures such as, but not limited to, catch basins, area drains, piping system, etc. Include structures, frames, covers, and grates. Allow for five (5) working days for shop review.
- E. Coordination drawings showing manholes and other structures, pipe sizes, locations, and elevations. Include details of underground structures and connections. Show other piping in same trench and clearances from sewerage system and water piping. Indicate interface and spatial relationship between piping and proximate structures. Contractor shall coordinate with the CT Licensed Surveyor to as-built the drainage system.
- F. Coordinate profile drawings showing systems piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 30 feet and vertical scale of not less than 1 inch equals 6 feet. Indicate underground structures and pipe. Show types, sizes, materials, and elevations of other utility crossing system piping. Include drawings for the storm drainage piping systems.
- G. At project closeout, submit record drawings of installed storm sewage piping and products.
- H. Submit maintenance data and parts lists for storm drainage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.
- I. Submit when approved by the Engineer, manufacturer's recommended installation procedures which will become the basis for accepting or rejecting actual installation procedures used for the work.

1.8 QUALITY ASSURANCE

- A. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components.
- B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of storm sewage system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- C. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects with storm sewage work similar to that required for project.
- D. Repair to the satisfaction of the Architect/Engineer and its Owner any surface or subsurface improvements both on and off site which are damaged during the course of the work (unless such improvements are shown to be abandoned or removed), whether or not such improvements are shown on the Drawings.
- E. Agency Standards:
 - 1. American Society for Testing Materials (ASTM)
 - 2. American Association of State Highway and Transportation Officials (AASHTO)

3. State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, CONN-DOT FORM 816 latest edition
4. City of Stamford applicable standards for roads, sewers and utilities
- F. Site Engineer shall conduct site observations during construction. This includes as-built review. Site Engineer may require review prior to backfilling.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures in direct sunlight.
- B. Do not store plastic pipe or fittings in direct sunlight.
- C. Protect pipe, pipe fittings, and seals from dirt and damage.
- D. Handle precast concrete manholes and other structures according to manufacturer's rigging instructions.

1.10 PROJECT CONDITIONS

- A. Verify existing utility locations.
- B. Locate existing structures and piping to be closed, abandoned, and removed.
- C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted under the following conditions and then only after arranging to provide acceptable temporary utility services.
 1. Notify Architect not less than 48 hours in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without receiving Architect's written permission.

2. PART 2 - PRODUCTS

2.1. PIPE AND FITTINGS

- A. All Poly Vinyl Chloride Pipe (PVCP) shall be SDR 35, with rubber gasketed joints and meet the requirements of ASTM D3034 and D3212.
- B. All RCP to be Class V, Wall B in accordance with ASTM C-76 as specified in drawings. Joints shall be push-on rubber gasket type.

2.2. SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Gasket-Type Pipe Couplings: Rubber or elastomeric compression gasket, made to match outside diameter of smaller pipe and inside diameter or hub of adjoining larger pipe, for nonpressure joints.
 1. Gaskets for Concrete Pipe: ASTM C 443 (ASTM C 443M), rubber.
 2. Gaskets for Plastic Pipe: ASTM F 477, elastomeric seal.

2.3. MANHOLES

- A. Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated and mortar ship lap joint for storm manholes.
 - 1. Gaskets: ASTM C 443 (ASTM C 443M), rubber.
 - 2. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch (152- to 229-mm) total thickness, that match a 24-inch- (610mm-) diameter frame and cover.
 - 3. Steps: ASTM C 478 (ASTM C 478M) individual steps or ladder. Omit steps for manholes less than 48 inches (1500mm) deep.
 - 4. Pipe Connectors: ASTM C 923 (ASTM C 923M), resilient, of size required, for each pipe connecting to base section.
- B. Manhole Covers:
 - 1. For storm drainage system, cover shall be labeled: DRAIN.

2.4. CONCRETE MANHOLE INVERTS

- A. Structure Channels and Benches: Concrete to be Class 'A' as per CONN-DOT FORM 816 latest edition, Section M.03. Factory or field formed from concrete. Portland-cement design mix, 4000 psi (27.6MPa) minimum, with 0.45 maximum water-cement ratio.
 - 1. Include channels and benches in manholes.
 - a. Manhole Channels: Concrete invert, formed to same width as connected piping, with height of the vertical sides equal to the pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - b. Manhole Benches: Concrete, sloped to drain into channel.
 - 1) Slope: 1 inch per foot (1:12).

2.5. CATCH BASINS

- A. Precast Concrete Catch Basins: ASTM C 478 (ASTM C 478M), precast, reinforced concrete, of depth indicated.
 - 1. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch (152- to 229-mm) total thickness, that match a 24-inch (610mm-) diameter frame and grate.
 - 2. Steps: ASTM C 478 (ASTM C 478M) individual steps or ladder. Omit steps for catch basins less than 48 inches (1500mm) deep.
 - 3. Frames and Grates as per the Drawings.
 - 4. Structure shall have a 2 foot interior sump.

2.6. AREA DRAINS

- A. As specified on the Drawings.
 - 1. Frames and grates as per the Drawings.
 - 2. Structure shall have a 2 foot sump.

2.7. OIL/GRIT SEPARATOR

- A. As specified on the Drawings.

2.8. CLEANOUTS

- A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping. Cleanout cap shall be metal for detection.

2.9. PROTECTIVE COATINGS

- A. General: Include factory- or field-applied protective coatings to structures and appurtenances according to the Drawings.

2.10. MATERIAL

- A. Refer to Section 312000 – Earthwork.
- B. Refer to drawings, and details for fill material and requirements.

3. PART 3 - EXECUTION**3.1. EXCAVATING, TRENCHING, BEDDING, AND BACKFILLING**

- A. Excavate and trench for storm drainage system in accordance with pertinent provisions of Section 312000 “Excavation and Backfilling” and drawings.
- B. Underground utilities include the storm system, sanitary sewer system, gas, electric, water, cable, and telephone services shall be protected against settlement. Utility and structures shall be protected from settlement by removal of organic material or installation of piles. Contractor shall remove organic material if any underneath all proposed underground utilities and structures as deemed practical for removal. Where it is not practical to remove organic material all underground utilities and structures shall be supported by piles. Pipes and structures shall be protected from settlement under the supervision and recommendation of the geotechnical engineer. Organic material may be required to be replaced with granular fill as recommended by the geotechnical engineer. Refer to earth moving written specification Section 31 20 00.
- C. Provide a bedding surface and backfill as shown on the Drawings for the storm drainage system and the requirements set forth by Form 816 Code and drawings. Provide a sample of the bedding material for analysis. Contractor shall allow three (3) to five (5) days for processing.
- D. Install bedding material and compact to 95% density. Testing agency to verify the compaction every 100’ of pipe run and at least once (1) for every pipe run less than 100’. Site engineer to inspect areas not tested prior to continue with backfilling operations.
 - 1. For required densities, reference to ASTM D1557
 - 2. For density testing, reference to ASTM D2822
- E. Provide sample of the initial backfill material for analysis. Contractor shall allow three (3) to five (5) days for processing.

- F. Install initial backfill and compact to 95% density. Testing agency to verify the compaction every 100' of pipe run and at least once (1) for every pipe run less than 100'. Site engineer to inspect areas not tested prior to continue with backfilling operations
- G. Movement of construction machinery:
 - 1. Use means necessary to avoid displacement of, and injury to, pipe and structures while compacting by rolling or operating equipment parallel to the pipe.
 - 2. Movement of construction machinery over an unprotected sanitary sewage system at any stage of construction is not allowed.

3.2. IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 – Earthwork. Arrange for installation of green warning tapes a minimum of 1 foot below finished grade and a minimum of 1 foot over the piping and at outside edges of underground structures.
 - 1. Use utility pipe identification as specified on the drawings.

3.3. DRAINAGE PIPING APPLICATIONS

- A. Construct as per the Drawings.

3.4. INSTALLATION, GENERAL

- A. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's recommendations for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line and pull past each joint as it is completed.
- B. Use manholes for changes in direction, except where fittings are indicated. Use fittings for branch connections, except where direct tap into existing sewer is indicated on the Drawings.
- C. Use proper size increasers, reducers, and couplings, where different sizes or materials of pipes and fittings are connected. Reduction of the size of piping in the direction of flow is prohibited.
- D. Install gravity-flow-systems piping at constant slope between points and elevations indicated on the Drawings. Install straight piping runs at constant slope, not less than that specified, where slope is not indicated on the Drawings.
- E. Extend drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated on the Drawings.
- F. During the excavation, it is anticipated that existing utilities and sewers be exposed. The Contractor shall provide protection and support of these facilities and repair any damage caused by the work in manner satisfactory to the Owner. The condition of the existing facilities shall be observed by the Owner's Representative who shall determine if the

facilities shall be replaced. Replacement of the facilities shall be done in a manner satisfactory to the Owner and in compliance with applicable Codes.

- G. Excavation for pipes, or concrete pavement repair will require either a braced excavation or open cut designed according to the requirements of OSHA, 29 CFR Part 1926. The lateral support systems and slopes should also be designed such that building footings, slabs on grade, adjacent pavement and existing utilities are protected and supported and not allowed to settle. The Contractor shall be responsible for having a Professional Engineer, registered in the State of Connecticut design the excavation support method. The designs shall be submitted to the Owner or his Geotechnical Engineer for review. The Contractor shall submit plans showing the type, limits, design and sequence of construction for the lateral support system.
- H. All pipes shall be installed straight and at the vertical and horizontal alignment as shown on the Drawings. Pipes shall have a uniform slope as specified on the Drawings.
- I. Minimum cover on all pipes shall be two feet (2') unless otherwise specified on the Drawings. Pipes with less than 2' of cover shall be concrete encased with a minimum of 6" of concrete.
- J. The storm and sanitary sewer shall be encased in concrete for a distance of 10 feet on either side of any intersection between the new sanitary service line and storm sewer. Where concrete encasement is required, temporarily support the pipes in place. Use sufficient concrete to encase piping not less than 6 inches at all points.

3.5. PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. Construct as per the Drawings.
- B. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and fit both systems' materials and dimensions.
- C. Install per manufacturers recommendation.

3.6. MANHOLE INSTALLATION

- A. General: Install manholes, complete with accessories, as indicated on the Drawings.
- B. Form continuous concrete channels and benches between inlets and outlet.
- C. Set tops of frames and covers flush with finished surface.

3.7. CATCH BASIN INSTALLATION

- A. Construct area drains to sizes and shapes indicated on the Drawings.
- B. Set frames and grates to elevations indicated and/or flush with finished grade.

3.8. AREA DRAIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated on the Drawings.
- B. Set frames and grates to elevations indicated and or flush with finished grade.

3.9. CLEANOUT INSTALLATION

- B. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use PVC pipe fittings for cleanouts and PVC pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 - 1. Use heavy-duty, top-loading classification cleanouts.
- C. Set cleanout frames and covers 6" below finished grade.
 - 1. Cleanout cap shall be metal for detection.

3.10. CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318, ACI 350R, and as indicated on the Drawings.

3.11. OIL/GRIT SEPARATOR

- A. Install as per the Drawings and manufactures recommendations.

3.12. TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished work conforms as nearly as practical to requirements specified for new work.
- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye fitting plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of 3000-psi (20.7-MPa), 28-day, compressive-strength concrete.
- C. Make branch connections from side into existing piping, sizes 4 to 20 inches (100 to 500 mm) by removing a section of existing pipe and installing a wye fitting into existing piping. Encase entire wye with not less than 6 inches (150 mm) of 3000-psi (20.7-MPa), 28-day, compressive-strength concrete.
- D. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.13. REMOVING STORM DRAINAGE SYSTEMS

- A. Remove pipes indicated on the drawings and use the following procedure:
 - 1. Remove pipe.
 - 2. Backfill to grade according to Section 312000 – "Excavation and Backfilling."

- B. Structures to be removed (e.g., existing catch basin): Excavate around structure as required and use the following procedure:
 - 1. Remove structure.
 - 2. Backfill to grade according to Section 312000 "Excavation and Backfilling."

3.14. CONNECTIONS

- A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Section 221413 "Facility Storm Drainage Piping."
- B. Connect force-main piping to building's storm drainage force mains specified in Section 221413 "Facility Storm Drainage Piping." Terminate piping where indicated.
- C. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- D. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."

- E. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
 - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
 - a. Unshielded flexible couplings for same or minor difference OD pipes
 - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD
 - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation
 - 2. Use pressure-type pipe couplings for force-main joints.

3.15.CLOSING ABANDONED STORM DRAINAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 8-inch- (203-mm) thick, brick masonry bulkheads.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Manholes and Structures: Excavate around manholes and structures as required and use one procedure below:
 - 1. Remove manhole or structure and close open ends of remaining piping.
 - 2. Remove top of manhole or structure down to at least 36 inches (915 mm) below final grade. Fill to within 12 inches (300 mm) of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
- C. Backfill to grade according to Section 312000 "Earth Moving."

3.16.FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as the work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and whenever work stops.
 - 3. Flush piping between manholes and other structures, if required by authorities having jurisdiction, to remove collected debris.

- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) of backfill is in place, and again at completion of the Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visual between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of a ball or cylinder of a size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems and parts of existing systems that have been altered, extended, or repaired for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - 3. Schedule tests, and their inspections by authorities having jurisdiction, with at least 48 hours in advance notice.
 - 4. Submit separate reports for each test.
 - 5. Manholes, Catch Basins, and Area Drains: Perform a visual inspection for consistency with the plans and verification of any water leaks.
 - 6. Leaks and loss in test pressure constitute defects that must be repaired.
 - 7. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.
- D. Prior to final acceptance of drainage system, the contractor shall provide complete "Record Drawings" showing location of drainage system, elevations and inverts.
- E. Contractor shall notify CT licensed Surveyor to prepare an as-built and CT licensed Professional Engineer to perform a site walk to verify compliance with the drawings. Corrective measures shall be done at no cost to the owner. Contractor shall allow three (3) to four (4) weeks for a Site Engineer and Surveyor to prepare all necessary documentation for project close-out. Contractor shall allow sufficient time to address all punch list items prior to Site Engineer certification to the City of Stamford.
- F. Once the site is fully stabilized, the Contractor is responsible to remove all the silt formed in the Storm Drainage System at no additional cost to the Owner.

- G. Clean interior of piping, sumps etc. of dirt and superfluous materials, flush with potable water.

END OF SECTION 334110 - STORM DRAINAGE SYSTEMS

SECTION 337119 - UNDERGROUND DUCTS AND UTILITY STRUCTURES

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and the Drawings are collectively applicable to this Section.
- B. All construction shall comply with City of Stamford requirements, OSHA, the State of Connecticut Basic Building Code, and the Connecticut Guidelines for Soil Erosion and Sediment Control.
- C. Americans with Disabilities Act (ADA) latest editions
- D. CONN-DOT FORM 816 latest edition
- E. Construction Drawings
- F. If a conflict is identified between this Technical Specifications and the Plans, the Site Engineer designated by the owner shall be notified to determine which shall govern.
- G. Drawings and specifications by project Mechanical and Electrical Engineer for equipment and cables.
- H. Applicable Utility Company regulations and requirements

1.2. DESCRIPTION

- A. This Section includes underground conduits and ducts, duct banks, pull boxes and handholes, manholes, and other underground utility structures.
- B. Underground Ducts for Electrical Utility Service: Plastic conduit as shown on drawings.
- C. Underground Ducts for Telephone Utility Service: Plastic conduit as shown on drawings.
- D. Underground Ducts for Cable Television: Plastic underground conduit as shown on the drawings.
- E. Manholes & Handholes: Underground precast concrete utility structures.
- F. Provide other utility pull boxes and accessories as required by the utility company.
- G. Provide all labor, materials and equipment and perform all operations to mark all underground pipe using detector tape in accordance with the City of Stamford and Utility Company Standards

1.3. SUMMARY

- A. This Section includes the following:
 - 1. Ducts in direct-buried duct banks
 - 2. Handholes and handhole accessories

3. Manholes and manhole accessories

1.4. RELATIVE WORK

A. Section 312000 "Earth Moving"

B. Section 260526 "Grounding and Bonding" for grounding electrodes, counterpoise conductors, clamps and connectors for grounding metallic manhole and handhole accessories, and testing of grounds.

1.5. SUBMITTALS

A. Product Data: For the following:

1. Manhole and handhole hardware
2. Conduit and ducts, including elbows, bell ends, bends, fittings, and solvent cement
3. Duct-bank materials, including spacers and miscellaneous components
4. Warning tape

B. Shop Drawings: Show fabrication and installation details for underground ducts and utility structures and include the following:

1. For manholes:
 - a. Duct sizes and locations of duct entries.
 - b. Reinforcement details
 - c. Manhole cover design
 - d. Step details
 - e. Grounding details
 - f. Dimensioned locations of cable rack inserts, pulling-in irons, and sumps.
2. For precast manholes and handholes, Shop Drawings shall be signed and sealed by a qualified professional engineer, and shall show the following:
 - a. Construction of individual segments
 - b. Joint details
 - c. Design calculations

C. Coordination Drawings: Show duct profiles pursuant to test pit verification and coordination with other utilities and underground structures. Include plans and sections drawn to scale, and show all bends and location of expansion fittings. Contractor shall also coordinate with a CT Licensed Land Surveyor to as-built the installed conduits.

1. At project closeout, submit record drawings of installed ducts layout and products, in accordance with requirements of Division 1. Show dimensioned locations of underground ducts, handholes, and manholes.
2. Submit when approved by the Engineer, manufacturer's recommended installation procedures which will become the basis for accepting or rejecting actual installation procedures used for the Work.

- D. Product Certificates: For concrete and steel used in underground precast manholes, according to ASTM C 858.
- E. Product Test Reports: Indicate compliance of manholes with ASTM C 857 and ASTM C 858, based on factory inspection.

1.6. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories (Including Ducts for Communications and Telephone Service): 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 ANSI C2.
- C. Comply with NFPA 70.
- D. Product Options: Drawings indicate sizes, profiles, connections, and dimensional requirements of system components.
- E. Manufacturer's Qualifications: Firms regularly engaged in manufacture of duct products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- F. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects with duct layout similar to that required for project.
- G. Repair to the satisfaction of the Architect/Engineer and its Owner any surface or subsurface improvements both on and off site which are damaged during the course of the work (unless such improvements are shown to be abandoned or removed), whether or not such improvements are shown on the Drawings.
- H. Agency Standards:
 - 1. Comply with ANSI C2 and NFPA 70.
 - 2. City of Stamford applicable standards for roads, sewers and utilities

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.
- B. Store precast concrete units at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.
- C. Lift and support precast concrete units only at designated lifting or supporting points.

1.8. PROJECT CONDITIONS

- A. Existing Utilities: 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. Notify Architect at least five days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.

1.9. COORDINATION

- A. Coordinate layout and installation of ducts, manholes, and handholes with final arrangement of other utilities and site grading, as determined in the field.
- B. Coordinate elevations of ducts and duct-bank entrances into manholes and handholes with final profiles of conduits as determined by coordination with other utilities and underground obstructions. Revise locations and elevations from those indicated as required to suit field conditions and to ensure duct runs drain to manholes and handholes, and as approved by Architect.

1.10. REGULATORY REQUIREMENTS

- A. Conform to applicable codes and requirements of authority having jurisdiction for materials and installation of the Work of this Section.
- B. Conform to Specifications and installation per the utility company requirements. Drawings are subject to change until contractor completes final utility coordination with utility company.
- C. Installation of conduits and structures shall meet the requirements of the utility company. Prior to any construction contractor shall obtain final approval from the utility company of conduit and utility layout. Layouts shown on the Drawings are subject to change per final utility company coordination prior to installation. Contractor shall obtain written approval from the utility companies.

1.11. TESTING PROCEDURES

- A. Excavate the trench to the elevations indicated in the detail and on the drawings.
- B. Provide a sample of the bedding material for analysis. Contractor to allow three (3) to five (5) days for processing.
- C. Install bedding material and compact to 95% density. Testing agency to verify the compaction every 100' of pipe run and at least once (1) for every pipe run less than 100'. Site engineer to inspect areas not tested prior to continue with backfilling operations. For density testing,

reference to ASTM D2822. For required densities, reference to ASTM D1557.

- D. Provide sample of the initial backfill material for analysis. Contractor to allow three (3) to five (5) days for processing.
- E. Install initial backfill and compact to 95% density. Testing agency to verify the compaction every 100' of pipe run and at least once (1) for every pipe run less than 100'. Site engineer to inspect areas not tested prior to continue with backfilling operations.
- F. Install remaining backfill and compact as described in the details and drawings. Testing agency to verify the compaction every 100' of pipe run and at least once (1) for every pipe run less than 100'. Site engineer to inspect areas not tested prior to continuing with backfilling operations.

2. PART 2 – PRODUCTS

2.1. PRODUCTS AND 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:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Frames and Covers: as specified in the drawings and if not specified as directed by the utility company.
- C. Provide other utility pull boxes and accessories as required by the utility company. Contractor shall be responsible for complete installation.

2.2. CONDUIT

- A. Conduit and fittings as specified in the Drawings and Division 16 Section "Raceways and Boxes."

2.3. DUCTS

- A. Rigid Nonmetallic Conduit: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
- B. Rigid Nonmetallic Conduit: NEMA TC 2, Type EPC-80-PVC, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
- C. Plastic Utilities Duct: NEMA TC 6, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 9.
- D. Plastic Utilities Duct: NEMA TC 6, Type DB-60-PVC, ASTM F 512, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 9.

- E. Plastic Utilities Duct: NEMA TC 8, Type EB-35-PVC, ASTM F 512, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 9.
- F. Plastic Utilities Duct: NEMA TC 8, Type DB-120-PVC, ASTM F 512, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 9.

2.4. HANDHOLES

- A. Precast Handholes: Reinforced concrete, monolithically poured walls and bottom, with steel frame and access door assembly as the top of hand-hole. Duct entrances and windows shall be located near corners to facilitate racking. Pulling-in irons and other built-in items shall be installed before pouring concrete. Cover shall have nonskid finish and legend. Unit, when buried, shall be designed to support AASHTO H20 loading. Shall meet utility company standards
- B. Fiberglass Handholes: Molded fiberglass, with 6-inch- square cable entrance at each side and weatherproof cover with nonskid finish and legend. Unit, when buried, shall be designed to support AASHTO H20 loading. Shall meet utility company standards
- C. Cover Legend: "ELECTRIC."

2.5. PRECAST MANHOLES

- A. Precast Units: ASTM 478, with interlocking mating sections, complete with accessories, hardware, and features as indicated. Include concrete knockout panels for conduit entrance and sleeve for ground rod. Shall meet utility company standards
- B. Design and fabricate structure according to ASTM C 858.
- C. Structural Design Loading: ASTM C 857, Class A-16
- D. Joint Sealant: Continuous extrusion of asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.
- E. Source Quality Control: Inspect structures according to ASTM C 1037.

2.6. ACCESSORIES

- A. Duct Spacers: Rigid PVC interlocking spacers, selected to provide minimum duct spacing and cover depths indicated while supporting ducts during concreting and backfilling; produced by the same manufacturer as the ducts.
- B. Manhole Frames and Covers: Comply with AASHTO loading specified for manhole.
 - 1. Provide cast covers with cast-in legend:

- a. "ELECTRIC-LV" for duct systems with power wires and cables for systems operating at 600 V and less.
 - b. "ELECTRIC-HV" for duct systems with medium-voltage cables.
 - c. "SIGNAL" for communications, data, and telephone duct systems.
2. Cast iron with cast-in legend "ELECTRIC" as indicated. Milled cover-to-frame bearing surfaces
3. Manhole Frames and Covers: ASTM A 48; Class 30B gray iron, 30-inch size, machine-finished with flat bearing surfaces.
4. Special Covers: Recess on cover designed to accept finish material in paved areas.
- C. Sump Frame and Grate: ASTM A 48, Class 30B gray cast iron.
- D. Pulling Eyes in Walls: Eyebolt with reinforcing-bar fastening insert 2-inch-diameter eye and 1-by-4-inch bolt.
 1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.
- E. Pulling and Lifting Irons in Floor: 7/8-inch- diameter, hot-dip-galvanized, bent steel rod; stress relieved after forming; and fastened to reinforced rod. Exposed triangular opening.
 1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.
- F. Bolting Inserts for Cable Stanchions: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.
 1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.
- G. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.
- H. Cable Stanchions: Hot-rolled, hot-dip-galvanized, T-section steel; 2-1/4-inch size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.
- I. Cable Arms: 3/16-inch- thick, hot-rolled, hot-dip-galvanized, steel sheet pressed to channel shape; 12 inches wide by 14 inches long and arranged for secure mounting in horizontal position at any location on cable stanchions.
- J. Cable-Support Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.
- K. Grounding Materials: Comply with Division 16 Section "Grounding and Bonding."
- L. Ladder: UL-listed, heavy-duty wood specifically designed for electrical manhole use. Minimum length equal to distance from deepest manhole floor to grade plus 36 inches.

- M. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and of adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.
- N. Warning Tape: Underground-line warning tape specified in Division 2 Section "2505."
- O. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.
1. Color: Red dye added to concrete during batching.
 2. Mark each plank with "ELECTRIC" in 2-inch- high, 3/8-inch- deep letters.
- P. Pull boxes and Additional Accessories: as required by the utility company. Contractor shall be responsible for all materials and installation of said utilities.

2.7. CONSTRUCTION MATERIALS

- A. Dampproofing: Comply with Division 7 Section "Dampproofing."
- B. Mortar: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. ft. where packaged mix complying with ASTM C 387, Type M, may be used.
- C. Brick for Manhole Chimney: Sewer and manhole brick, ASTM C 32, Grade MS. shall meet utility company standards may require precast rings.
- D. Concrete: Use 3000-psi- minimum, 28-day compressive strength and 3/8-inch maximum aggregate size. Concrete and reinforcement are specified in Division 3 Section "Cast-in-Place Concrete."
- E. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored detectable tape, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide X 4 mils thick.
- F. Underground-Type Plastic Line Marker: Manufacturer's standard permanent, bright-colored detectable tape, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide X 4 mils thick.
1. Manufacturer: Subject to compliance with requirements, provide identification markers of one of the following (or approved equal):
 - a. Allen Systems Inc.
 - b. Seton Name Plate Corp.
 2. Tape color codes and labels shall be as follows:

High Voltage - 600 Volts & above	Red	Conc. N/A
-------------------------------------	-----	-----------

Low Voltage - 600 Volts & below	Red	Caution Electric Line Buried Below
Telephone & Control/Cable	Orange	Caution Telephone Line Buried Below
Natural Gas	Yellow	Caution Gas Line Buried Below
Water Systems	Blue	Caution Water Line Buried Below
Fire Protection Systems	Blue	Caution Fire Line Buried Below
Sprinkler Mains	Blue	Caution Sprinkler Line Buried Below
Sewer Systems	Green	Caution Sewer Line Buried Below
IS & S Communication Conduit	Orange	Conc. N/A

3. PART 3 – EXECUTION

3.1. APPLICATION

- A. Underground Ducts for Electrical Cables Higher than 600 V: Type EPC-40-PVC, direct-buried duct bank, except use Type EPC-80-PVC when crossing roads.
- B. Underground Ducts for Electrical Feeders: Type EB-20-PVC, direct-buried duct bank, except use Type EPC-80-PVC when crossing roads
- C. Underground Ducts for Electrical Branch Circuits: Type DB-60-PVC, direct-buried duct bank.
- D. Underground Ducts for Telephone Utility Service: Type EPC-40-PVC, direct-buried duct bank, except use Type EPC-80-PVC when crossing roads and railroads.
- E. Underground Ducts for Communication Circuits: Type EPC-40-PVC, direct-buried duct bank, except use Type EPC-80-PVC when crossing roads
- F. Manholes: Underground precast concrete utility structures.

3.2. EARTHWORK

- A. Excavation and Backfill: Comply with Division 2 Section "Earthwork" but do not use heavy-duty, hydraulic-operated, compaction equipment.
- B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

- C. Restore all areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Division 2.
- D. Restore disturbed pavement.
- E. Underground utilities include the storm system, sanitary sewer system, gas, electric, water, cable, and telephone services shall be protected against settlement. Utility and structures shall be protected from settlement by removal of organic material or installation of piles. Contractor shall remove organic material if any underneath all proposed underground utilities and structures as deemed practical for removal. Where it is not practical to remove organic material all underground utilities and structures shall be supported by piles. Pipes and structures shall be protected from settlement under the supervision and recommendation of the geotechnical engineer. Organic material may be required to be replaced with granular fill as recommended by the geotechnical engineer. Refer to earth moving written specification Section 31 20 00.
- F. Structures shall be stabilized by piles.
- G. Form excavations to required elevations.
- H. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction

3.3. CONDUIT AND DUCT INSTALLATION

- A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.
- B. Curves and Bends: Use manufactured elbows for stub-ups at equipment and at building entrances. Use manufactured long sweep bends with a minimum radius of 25 feet where feasible, use two foot radius sweeps at other locations.
- C. Use solvent-cement joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.
- D. Duct Entrances to Manholes and Handholes: Space end bells approximately 8 inches o.c. for 4-inch ducts and vary proportionately for other duct sizes. Change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line. Grout end bells into manhole walls from both sides to provide watertight entrances.
- E. Building Entrances: Follow the appropriate installation instructions below:
 - 1. Concrete-Encased Ducts: Install reinforcement in duct banks passing through disturbed earth near buildings and other excavations. Coordi-

- nate duct bank with structural design to support duct bank at wall without reducing structural or watertight integrity of building wall.
2. Direct-Buried, Nonencased Ducts at Nonwaterproofed Wall Penetrations: refer to Structural Engineers specifications.
 3. Waterproofed Wall and Floor Penetrations: Install a watertight entrance-sealing device with sealing gland assembly on the inside. Anchor device into masonry construction with one or more integral flanges. Secure membrane waterproofing to the device to make permanently watertight.
- F. Direct-Buried Ducts: Support ducts on duct spacers, spaced as recommended by manufacturer and coordinated with duct size, duct spacing, and outdoor temperature. Install as follows:
1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts.
 2. Install expansion fittings as shown on Shop Drawings.
 3. Trench Bottom: Continuous, firm, and uniform support for duct bank. Prepare trench bottoms as specified in "Earthwork" for pipes less than 6 inches in nominal diameter.
 4. Backfill: Install backfill as specified in "Earthwork." After installing first tier of ducts, backfill and compact. Repeat backfilling after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, complete backfilling normally.
 5. Minimum Clearances between Ducts: 3 inches between ducts for like services and 6 inches between power and signal ducts.
 6. Depth: Install top of duct bank at least 36 inches below finished grade, unless otherwise indicated.
- G. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank.
- H. Stub-ups: Use rigid steel conduit for stub-ups to equipment. For equipment mounted on outdoor concrete bases, extend steel conduit a minimum of 5 feet from edge of base. Install insulated grounding bushings on terminations. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.
- I. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.
- J. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

3.4. MANHOLE AND HANDHOLE INSTALLATION

- A. Elevation: Install manholes with rooftop at least 15 inches below finished grade. Install handholes with depth as indicated. Where indicated, cast handhole cover frame directly into roof of handhole and set roof surface 1 inch above grade.
- B. Drainage: Install drains in bottom of units where indicated. Coordinate with drainage provisions indicated.
- C. Access: Install cast-iron frame and cover.
 - 1. Install brick chimney to support frame and cover and to connect cover with roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.
 - 2. Install precast collars and rings to support frame and cover and to connect cover with roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.
 - 3. Set frames in paved areas and trafficways flush with finished grade. Set other frames 1 inch above finished grade.
- D. Dampproofing: Apply dampproofing to exterior surfaces of units after concrete has cured at least three days. Apply according to Division 7 Section "Dampproofing." After ducts have been connected and grouted, and before backfilling, dampproof joints and connections and touch up abrasions and scars. Dampproof exterior of manhole and handhole chimneys after brick mortar has cured at least three days.
- E. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.
- F. Field-Installed Bolting Anchors: Do not drill deeper than 3-7/8 inches for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.
- G. Grounding: Install ground rod through floor in each structure with top protruding 4 inches above floor. Seal floor opening against water penetration with waterproof nonshrink grout. Ground exposed metal components and hardware with bare-copper ground conductors. Train conductors neatly around corners. Use cable clamps secured with expansion anchors to attach ground conductors. Install per utility company requirements.
- H. Precast Concrete Manhole & Handhole Installation: Unless otherwise indicated, comply with ASTM C 891.
 - 1. Install units level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances.
 - 2. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

3.5. PIPE IDENTIFICATION INSTALLATION

- A. Detectable Tape shall be used to mark piping listed above.
- B. The identification tape shall be buried at least 6-inches to 10-inches below final grade but no closer than 12-inches to the buried utility piping or service.

3.6. FIELD QUALITY CONTROL

- A. Testing: Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
- B. Grounding: Test manhole grounding to ensure electrical continuity of grounding and bonding connections.
- C. Duct Integrity: Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of the duct. If obstructions are indicated, remove obstructions and retest.
- D. Contractor shall notify CT licensed Surveyor to prepare an as-built and CT licensed Professional Engineer to perform a site walk to verify compliance with the drawings. Corrective measures shall be done at no cost to the owner. Contractor shall allow three (3) to four (4) weeks for a Site Engineer and Surveyor to prepare all necessary documentation for project close-out. Contractor shall allow sufficient time to address all punch list items prior to Site Engineer certification to the City of Stamford.
- E. Correct installations if possible and retest to demonstrate compliance. Remove and replace defective products and retest.

3.7. CLEANING

- A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.
- B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 337119 & 338126