

PROJECT SPECIFICATIONS

165 FORT APARTMENTS

OMAHA, NEBRASKA

RWE PROJECT NO. 0917

**ROBERT W. ENGEL & ASSOCIATES ARCHITECTS
2443 SOUTH 156TH CIRCLE
OMAHA, NEBRASKA 68130-2512**

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FEBRUARY 11, 2019



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COMBINED CONTRACT

165 FORT APARTMENTS

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GENERAL AND SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

GENERAL CONDITIONS

The “General Conditions of the Contract for Construction”, AIA Document A201, 2007 Edition, Articles 1 through 15 inclusive, are hereby made a part of the Contract Documents to the same extent as if herein written out in full. A complete copy may be attained, at no charge, at the office of the Architect.

SUPPLEMENTARY CONDITIONS

The following supplements modify, change, deleted from or add to the “General Conditions of the Contract for Construction, “AIA document A201, 2007 Edition. Where any Article for the General Conditions is modified or any Paragraph, Subparagraph or clause thereof is modified or deleted by the Supplementary conditions, the unaltered provisions of the Article, Paragraph, Subparagraph, or Clause shall remain in effect. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 9; PAYMENTS AND COMPLETION

9.3.1: Add the following sentence to the Subparagraph 9.3.1:

The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet.

Add the following Clause 9.3.1.3 to 9.3.1:

9.3.1.3: Until Substantial Completion, the Owner shall pay 90 percent of the amount due the Contractor on account of progress payments.

ARTICLE 11; INSURANCE AND BONDS

11.1.1.8 Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1. Premises Operations (including X, C, and U coverage as applicable).
2. Independent Contractors’ Protective.
3. Products and Completed Operations.

4. Personal Injury Liability with Employment Exclusion deleted. Contractual, including specified provision for Contractor's obligation under Paragraph 3.18. owned, non-owned and hired motor vehicles.
5. Broad Form Property Damage including Completed Operations.

11.1.1.9 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverage's required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

Add the following Clause 11.1.2.1 to 11.1.2:

11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

1. Workers compensations:
 - a. State: Statutory
 - b. Applicable Federal (e.g. Longshoremen's): Statutory
 - c. Employer's Liability: \$1,000,000 per Accident
 \$1,000,000 Disease, Policy Limit
 \$1,000,000 Disease, Each Employee
2. Comprehensive or Commercial General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form property Damage):
 - a. Bodily Injury:
 \$1,000,000 Each Occurrence
 \$3,000,000 Aggregate
 - b. Property Damage:
 \$1,000,000 Each Occurrence
 \$1,000,000 Aggregate
 - c. Productions and Completed Questionnaires to be Maintained for 1 year after final payment
 - d. Property Damage Liability Insurance shall provide X, C, and U coverage.
 - e. Broad Form Property Damage Coverage shall include Completed Operations.

3. Business Auto and Liability (including owned, non-owned and hired vehicles):
 - a. Bodily Injury:
\$1,000,000 Each person
\$1,000,000 Each Occurrence
 - b. Property Damage:
\$1,000,000 Each Occurrence
4. Umbrella Liability: \$5,000,000 Above and beyond all other coverages
5. Owner named as additional insured.

11.1.3 Add the following sentence to Subparagraph 11.1.3:

If this insurance is written on the Comprehensive General Liability policy form, the Certificates shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACORD form 25S will be acceptable.

Delete sub-paragraph 11.3.1 and replace with the following:

11.3.1 The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities, who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no persons or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interest of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the work.

Delete clause 11.3.1.2 and replace with the following:

11.3.1.2 The form of policy for this coverage shall be “completed value”.

Delete clause 11.3.1.3 and replace with the following:

11.3.1.3 The maximum deductible amount for the property insurance coverage shall be \$1,000 per occurrence. The Contractor shall be responsible for payment of the amount of the deductible in the event of a paid claim.

Delete clause 11.3.1.4

Delete Subparagraph 11.3.6 and substitute the following:

- 11.3.6 Before an exposure to loss may occur, the Contractor shall file with the Owner two certified copies of the policy or policies providing this Property Insurance coverage, each containing those endorsements specifically related to the Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days prior written notice has been given to the Contractor.

11.3.8: Delete subparagraph 11.3.8 and replace with the following:

- 11.3.8 A loss insured under Contractor's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner

11.4 Performance Bond and Payment Bond

Delete Subparagraph 11.4.1 and substitute the following:

- 11.4.1 The Contractor shall furnish bond covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

- 11.4.1.1 The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

- 11.4.1.2 The Contractor shall require the attorney-in-fact who executed the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

STANDARD FORMS

The following standard forms by the American Institute of Architects shall be used in the execution of a contract with the successful bidder:

Standard Form of agreement Between Owner and Contractor,
(Stipulated Sum, AIA Document A101, latest edition
Performance Bond, AIA document A311, latest edition
Labor and Material Payment Bond, AIA document A311, latest edition
Certificate of Insurance, AIA document G705, latest edition

The above documents may be purchased from the American Institute of Architects, Washington, D.C.; or any State AIA Office.

INSTRUCTION FOR PREPARATION OF PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND.

1. The name of the Principal shall be shown exactly as it appears in the contract.
2. The penal sum shall not be less than required by the Specifications.
3. If the Principals are partners, or joint venture's each member shall execute the bond as an individual, and state his place of residence.
4. If the Principal is a corporation, the bond shall be executed under its corporate seal. If the corporation has no corporate seal it shall so state and affix a scroll or adhesive seal following the corporate name.
5. The official character and authority of the person(s) executing the bond for the Principal, if a corporation, shall be certified by the Secretary or Assistant Secretary seal.
6. The current Power-of-Attorney of the Attorney-in-Fact signing for the surety company must be attached to the bond.
7. The date of the bond shall not be prior to the date of the contract.
8. The signature of a witness shall appear in the appropriate place, attesting to the signature of each party of the bond.
9. Type or print the name underneath each signature appearing on the bond.
10. An executed copy of the bond must be attached to each copy of the contract (original counterpart) intended for signing.
11. All Performance Payment bonds shall be in accordance with the latest State Statutes.

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY OF WORK

- A. Project Identification: As follows:
 - 1. Project: 165 Fort Apartments, Omaha, NE
 - 2. Owner: 165 Fort LLC, 1886 S. 126th Street, Omaha, NE 68144
- B. Contract Documents dated February 11, 2019 were prepared by Robert W. Engel & Associates Architects, 2443 South 156th Circle, Omaha, NE 68130-2512.
- C. The Work consists of all material, labor, tools, expendable equipment, utility and transportation services necessary to perform and complete, in a workmanlike manner, the work required for this contract, as described in the Contract Documents.

1.2 WORK RESTRICTIONS

- A. Contractor's Use of Premises: During construction, Contractor shall have full use of site indicated. Contractor's use of premises is limited only by Owner's right to perform work or employ other contractors on portions of project.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01100

SECTION 01200 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 ALLOWANCES

- A. Include the following allowances in Contract Sum:
 - 1. Brick Veneer Allowance: Allow the sum of \$460 per 1000 for the purchase and delivery of Face Brick Veneer.
- B. Obtain proposal for each allowance and submit to Architect with recommendations. Purchase products selected by Architect.
- C. Advise Architect of the date when selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- D. Submit invoices to show cost of products furnished under each allowance. Reconciliation of Allowance amounts with actual costs will be by Change Order.

1.2 CONTRACT MODIFICATION PROCEDURES

- A. On Owner's approval of a proposal from Contractor, Architect will issue a Change Order on AIA Document G701, for all changes to Contract Sum or Contract Time.
- B. When Owner and Contractor disagree on the terms of a proposal, Architect may issue a Construction Change Directive on AIA Document G714, instructing Contractor to proceed with the change. Construction Change Directive will contain a description of the change and designate the method to be followed to determine changes to Contract Sum or Contract Time.

1.3 PAYMENT PROCEDURES

- A. Submit a Schedule of Values at least 10 days before the first Application for Payment. In Schedule of Values, break down Contract Sum into at least one line item for each Specification Section. Correlate the Schedule of Values with Contractor's Construction Schedule.
- B. Submit 3 copies of each application for payment on AIA Document G702/703, according to the schedule established in Owner/Contractor Agreement.
 - 1. For the second Application for Payment through the Application for Payment submitted at Substantial Completion, submit partial releases of liens from each subcontractor or supplier for whom amounts were requisitioned in the previous Application for Payment.
 - 2. Submit final Application for Payment after completion of Project closeout procedures with release of liens and supporting documentation. Include consent of surety to final payment and insurance certificates.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01300 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 PROJECT MANAGEMENT AND COORDINATION

- A. Verify layout information shown on Drawings, in relation to property survey and existing benchmarks, before laying out the Work.
- B. Coordinate construction to ensure efficient and orderly execution of each part of the Work.
- C. Progress meetings will be held at Project site every month. Notify Owner and Architect of meeting dates. Each subcontractor or other entity concerned with current progress or involved with planning or coordination of future activities, shall attend.
 1. Prepare minutes of each meeting and distribute to parties present.

1.2 CONSTRUCTION SCHEDULE

- A. Prepare a horizontal bar-chart construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first workday of each week. Use same breakdown of Work indicated in the Schedule of Values. As Work progresses, mark each bar to indicate actual completion.
 1. Submit within 10 days after date established for Commencement of the Work.
 2. Coordinate each element with other activities. Show each activity in proper sequence. Indicate sequences necessary for completion of related Work.
 3. Indicate Substantial Completion and allow time for Architect's procedures necessary for certifying Substantial Completion.
 4. Schedule Distribution: Distribute copies to Owner, Architect, subcontractors, and parties required to comply with dates.
 5. Updating: Revise the schedule after each meeting or activity where revisions have been made. Distribute revised copies to Owner, Architect, subcontractors, and parties required to comply with dates.

1.3 SUBMITTAL PROCEDURES

- A. Coordinate submittal preparation with construction schedule, fabrication lead-times, other submittals, and activities that require sequential operations.
 1. No extension of Contract Time will be authorized due to failure to transmit submittals in time to permit processing sufficiently in advance of when materials are required in the Work.
 2. Architect will not accept submittals from sources other than Contractor.
- B. Prepare submittals by placing a permanent label on each for identification. Provide a **4- by 5-inch (100-mm by 125-mm)** space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label:
 1. Project name.
 2. Date.
 3. Name and address of Contractor.

4. Name and address of subcontractor or supplier.
 5. Number and title of appropriate Specification Section.
 6. Contractor's certification that materials comply with specified requirements.
- C. Coordinate each submittal with other submittals and with work that does not require submittals.
- D. Product Data: Mark each copy to show applicable choices and options. Include the following:
1. Data indicating compliance with specified standards and requirements.
 2. Notation of coordination requirements.
 3. For equipment data, include rated capacities, dimensions, weights, required clearances, and furnished specialties and accessories.
- E. Shop Drawings: Contractor shall utilize digital submittal service such as Submittal Exchange by Oracle or equal. Submit newly prepared information drawn to scale. Do not reproduce Contract Documents or copy standard information. Submit 1 pdf copy through digital submittal service showing the following.
1. Dimensions, profiles, methods of attachment, coordination with adjoining work, large scale details, and other information, as appropriate for the Work.
 2. Identification of products and materials.
 3. Notation of coordination requirements.
 4. Notation of dimensions established by field measurement.
 5. Identification of deviations from Contract Documents.
 6. Provide Archive of digital service contents to Architect and Owner upon completion of project.
 7. Cost of digital submittal service, if any, shall be the responsibility of the contractor.
- F. Samples: Submit Samples finished as specified and identical with the material proposed. Where variations are inherent in the material, submit sufficient units to show limits of the variations. Include product name or name of the manufacturer.
- G. Architect will review each submittal, with mark ups as appropriate to indicate action taken, and return digital copy for distribution by digital service. Compliance with specified requirements remains Contractor's responsibility.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01300

SECTION 01340 - SUBMITTALS

PART 1 - GENERAL

SUBMITTAL PROCEDURES:

Coordination: Coordinate the preparation and processing of submittals with performance of the work. Submittals received from sources other than the Contractor will be returned "without action".

Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals.

Transmittal Form: The form required to be used for transmittal of submittals is attached at the end of this section. Sequentially number each transmittal for identification.

SPECIFIC SUBMITTAL REQUIREMENTS:

Shop Drawings: Information required on shop drawings includes, dimensions, identification of specific products and materials which are included in the work, compliance with specified standards and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Indicate deviations from the contract documents on the shop drawings.

Shop Drawing Submittal: Provide one correctable translucent reproducible print and two blue-line or black-line prints; the reproducible print will be returned.

Product Data Submittal: Submit 4 copies of each required product data submittal.

Samples: Submit (2) two samples.

ARCHITECT/ENGINEER'S ACTION:

Action Stamp: The Architect/Engineer will stamp each submittal to indicate action taken.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

Submittals are required in all sections. See requirements for each Section.

ROBERT W. ENGEL & ASSOCIATES,
2443 SOUTH 156TH CIRCLE
OMAHA, NE 68130-2512

165 FORT APARTMENTS
RWE PROJECT NO. 0917

SHOP DRAWING TRANSMITTAL

CONTRACTOR: _____ TRANSMITTAL NO. _____
BY: _____ DATE: _____ RESUBMITTAL NO. _____

SECTION NO.	DESCRIPTION	MANUFACTURER	DRWG. NO.	NO. OF COPIES	ACTION
Architect to Consultant			Consultant to Architect		
Date _____ Copies _____ By _____			Date _____ Copies _____ By _____		
The above drawings are returned with action as designated above in accordance with the following legend:			Architect to Contractor		
A. No Exception Taken			Date _____ Copies _____ By _____		
B. Make Corrections Noted			Remarks:		
C. Revise & Resubmit					
D. Rejected					
E. Submit Specified Item					

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Quality-control services include inspections, tests, and related actions including reports. Quality-control services are further specified in other Sections of these Specifications and shall be performed by independent testing agencies provided by Contractor as specified.
 - 1. Unless otherwise indicated, quality-control services required by authorities having jurisdiction will be provided by Contractor.
- B. Contractor is responsible for scheduling inspections and tests.
- C. Retesting: Contractor shall pay for retesting where results of inspections and tests prove unsatisfactory and indicate noncompliance with requirements.
- D. Auxiliary Services: Cooperate with agencies performing inspections and tests. Provide auxiliary services as requested. Notify agency in advance of operations requiring tests or inspections, to permit assignment of personnel. Auxiliary services include the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities to assist inspections and tests.
 - 3. Adequate quantities of materials that require testing, and assisting in taking samples.
 - 4. Facilities for storage and curing of test samples.
 - 5. Security and protection of samples and test equipment.
- E. Duties of Testing Agency: Testing agency shall cooperate with Architect and Contractor in performing its duties. Agency shall provide qualified personnel to perform inspections and tests.
 - 1. Agency shall promptly notify Architect and Contractor of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Agency shall not release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
 - 3. Agency shall not perform duties of Contractor.
- F. Submittals: Testing agency shall submit a certified written report of each inspection and test to the following:
 - 1. Owner.
 - 2. Architect.
 - 3. Contractor.
 - 4. Structural engineer.
 - 5. Authorities having jurisdiction, when authorities so direct.
- G. Report Data: Reports of each inspection, test, or similar service shall include at least the following:
 - 1. Name, address, and telephone number of testing agency.
 - 2. Project title and testing agency's project number.
 - 3. Designation (number) and date of report.
 - 4. Dates and locations where samples were taken or inspections and field tests made.

5. Names of individuals taking the sample or making the inspection or test.
 6. Designation of the product and test method.
 7. Complete inspection or test data including an interpretation of test results.
 8. Ambient conditions at the time of sample taking and testing.
 9. Comments or professional opinion on whether inspected or tested Work complies with requirements.
 10. Recommendations on retesting or reinspection.
 11. Name and signature of laboratory inspector.
- H. Testing Agency Qualifications: Engage inspection and testing agencies that are prequalified as complying with the American Council of Independent Laboratories' "Quality Assurance Manual" and that specialize in the types of inspections and tests to be performed.
- I. Each testing agency shall be authorized by authorities having jurisdiction to operate in the state where Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Standards: Comply with NFPA 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations"; ANSI A10 Series standards for "Safety Requirements for Construction and Demolition"; and NECA Electrical Design Library's "Temporary Electrical Facilities."
 - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. At the earliest possible time, when acceptable to Owner, change over from use of temporary utility services to use of permanent utilities.
- C. Remove temporary facilities and controls before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TEMPORARY UTILITIES

- A. Provide temporary utility services to Project site for use during construction. Arrange for and coordinate utility services with local utility companies.
 - 1. Contractor shall also pay use charges for temporary utilities.
- B. Provide temporary heat for curing or drying of work, and for protection of new construction from adverse effects of low temperatures. Use of gasoline-burning heaters and open-flame heaters is not permitted.

3.2 CONSTRUCTION FACILITIES

- A. Provide field offices, storage trailers, and other support facilities as necessary for efficient prosecution of the Work.
 - 1. Temporary facilities located within the construction area or within **30 feet (9 m)** of building lines shall be of noncombustible construction.
- B. Provide temporary sanitary facilities. Comply with regulations and health codes for type, number, location, and maintenance of facilities.
- C. Provide temporary enclosures for protection of construction and workers from exposure and inclement weather and for containment of heat.

- D. Install project identification and other signs in locations approved by Owner to inform the public and persons seeking entrance to Project.
- E. Collect waste daily and, when containers are full, legally dispose of waste off-site.
 - 1. Handle hazardous, dangerous, or unsanitary waste materials in separate closed waste containers. Dispose of material according to applicable laws and regulations.

3.3 TEMPORARY CONTROLS

- A. Provide temporary fire protection until permanent systems supply fire-protection needs.
 - 1. Provide adequate numbers and types of fire extinguishers.
 - 2. Store combustible materials in fire-safe containers in fire-safe locations.
 - 3. Prohibit smoking in hazardous fire-exposure areas.
 - 4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- B. Provide temporary barricades, warning signs, and lights to protect the public and construction personnel from construction hazards.
 - 1. Enclose construction areas with fences, to prevent unauthorized access.
- C. Provide temporary environmental controls as required by authorities having jurisdiction including, but not limited to, erosion and sediment control, dust control, noise control, and pollution control.

END OF SECTION 01500

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Provide products of same kind from a single source. The term "product" includes the terms "material," "equipment," "system," and similar terms.
- B. Deliver, store, and handle products according to the manufacturers written instructions, using means and methods that will prevent damage, deterioration, and loss, including theft.
 - 1. Schedule delivery to minimize long-term storage and to prevent overcrowding construction spaces.
 - 2. Deliver in manufacturer's original sealed packaging with labels and written instructions for handling, storing, protecting, and installing.
 - 3. Inspect products at time of delivery for compliance with the Contract Documents and to ensure items are undamaged and properly protected.
 - 4. Store heavy items in a manner that will not endanger supporting construction.
 - 5. Store products subject to damage on platforms or pallets, under cover in a weather tight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required.
- C. Product Substitutions: Reasonable and timely requests for substitutions will be considered. Substitutions include products and methods of construction differing from that required by the Contract Documents and proposed by Contractor after award of Contract.
 - 1. Submit four copies of each request for product substitution. Identify product to be replaced and provide complete documentation showing compliance of proposed substitution with applicable requirements. Include a full comparison with the specified product, a list of changes to other Work required to accommodate the substitution, and any proposed changes in Contract Sum or Contract Time should the substitution be accepted.
 - 2. Submit requests for product substitution in time to permit processing of request and subsequent Submittals, if any, sufficiently in advance of when materials are required in the Work. Do not submit unapproved substitutions on Shop Drawings or other submittals.
 - 3. Architect will review the proposed substitution and notify Contractor of its acceptance or rejection.

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. Provide products that comply with the Contract Documents, are undamaged, and are new at the time of installation.
 - 1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
- B. Do not attach manufacturer's labels or trademarks, except for required nameplates, on surfaces exposed to view in occupied spaces or on the exterior.

C. Select products as follows:

1. Where only a single product or manufacturer is named, provide the item indicated. No substitutions will be permitted.
 2. Where two or more products or manufacturers are named, provide one of the items indicated. No substitutions will be permitted.
 3. Where products or manufacturers are specified by name, accompanied by the term "or equal," provide the named item or comply with provisions concerning "product substitutions" to obtain approval for use of an unnamed product or manufacturer.
 4. Where a product is described with required characteristics, with or without naming a brand or trademark, provide a product that complies with those characteristics and other Contract requirements.
 5. Where compliance with performance requirements is specified, provide products that comply and are recommended in writing by the manufacturer for the application.
 6. Where compliance with codes, regulations, or standards, is specified, select a product that complies with the codes, regulations, or standards referenced.
- D. Unless otherwise indicated, Architect will select color, pattern, and texture of each product from manufacturer's full range of options.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01600

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 CLOSEOUT SUBMITTALS

- A. Record Drawings: Maintain a set of Contract Drawings as Record Drawings. Mark to show installation that varies from the Work originally shown.
- B. Record Specifications: Maintain one copy of the Project Manual, including addenda, as Record Specifications. Mark to show variations in Work performed in comparison with the text of the Specifications and modifications.
- C. Operation and Maintenance Data: Organize data into three-ring binders, with pocket folders for folded sheet information. Mark identification on front and spine of each binder. Include the following:
 - 1. Emergency instructions.
 - 2. Spare parts list.
 - 3. Copies of warranties.
 - 4. Wiring diagrams.
 - 5. Shop Drawings and Product Data.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Examine substrates and conditions for compliance with manufacturer's written requirements including, but not limited to, surfaces that are sound, level, and plumb; substrates within installation tolerances; surfaces that are smooth, clean, and free of deleterious substances; and application conditions within environmental limits. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Prepare substrates and adjoining surfaces according to manufacturer's written instructions, including, but not limited to, filler and primer application.
- C. Where Drawings indicate dimensions of existing construction verify by field measurement. Where fabricated products are to be fitted to other construction verify dimensions by field measurement before fabricating and, when possible, allow for fitting and trimming during installation.

3.2 CUTTING AND PATCHING

- A. Do not cut structural members without prior written approval of Architect.
- B. For patching, provide materials whose installed performance will equal or surpass that of existing materials. For exposed surfaces, provide or finish materials to visually match existing adjacent surfaces to the fullest extent possible.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for installation. Anchor each product securely in place, accurately located and aligned. Clean exposed surfaces and protect from damage. If applicable, prepare surfaces for field finishing.
- B. Comply with NFPA 70 for installation of electrically operated equipment and electrical components and materials.

3.4 FINAL CLEANING

- A. Clean each surface or item as follows before requesting inspection for certification of Substantial Completion:
 1. Remove labels that are not permanent.
 2. Clean transparent materials, including mirrors. Remove excess glazing compounds. Replace chipped or broken glass.
 3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Leave concrete floors broom clean.
 4. Vacuum carpeted surfaces and wax resilient flooring.
 5. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures and lamps.
 6. Clean the site. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface.

3.5 CLOSEOUT PROCEDURES

- A. Request Substantial Completion inspection once the following are complete:
 1. Advise Owner of pending insurance changeover requirements.
 2. Submit Record Drawings, maintenance manuals, warranties, and similar record information.
 3. Deliver spare parts, extra materials, and similar items.
 4. Changeover locks and transmit keys to Owner.
 5. Complete startup testing of systems and instruction of operation and maintenance personnel.
 6. Remove temporary facilities and controls.
 7. Complete final cleanup.
 8. Touch up, repair, and restore marred, exposed finishes.
 9. Obtain final inspections from authorities having jurisdiction.
 10. Obtain certificate of occupancy.
- B. On receipt of a request for inspection, Architect will proceed with inspection or advise Contractor of un-filled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or advise Contractor of items that must be completed or corrected before the certificate will be issued.
- C. Arrange for each installer of equipment that requires operation and maintenance to provide instruction to Owner's personnel. Include a detailed review of the following:
 1. Startup and shutdown.
 2. Emergency operations and safety procedures.
 3. Noise and vibration adjustments.
 4. Maintenance manuals.
 5. Spare parts, tools, and materials.
 6. Lubricants and fuels.

7. Identification systems.
8. Control sequences.
9. Hazards.
10. Warranties and bonds.

D. Request inspection for certification of final acceptance, once the following are complete:

1. Submit a copy of the Substantial Completion inspection list stating that each item has been completed or otherwise resolved for acceptance.
2. Submit final meter readings for utilities, a record of stored fuel, and similar data as of the date of Substantial Completion.

E. Architect will reinspect the Work on receipt of notice that the Work has been completed.

1. On completion of reinspection, Architect will prepare a certificate of final acceptance. If the Work is incomplete, Architect will advise Contractor of the Work that is incomplete or obligations that have not yet been fulfilled.

END OF SECTION 01700

SECTION 01800 GEOTECHNICAL DATA

1.1 INVESTIGATION

- A.** Geotechnical investigations were conducted at the site, the results of which can be found in the report
Thiele Geotech Inc., Thiele Project No: 18244.00, dated June 25, 2018.
- B.** A copy of the report is bound into the Project Manual following this Section.

1.2 INTERPRETATION

- A.** The report is provided only for bidder's information and convenience and is not part of the Contract Documents. Owner and Architect do not warrant the accuracy or extent of the report or locations of the test borings.
- B.** Opinions expressed in the report are those of the Geotechnical Engineer and represent the Geotechnical Engineer's interpretation of subsoil conditions, tests, and results of analyses that the Geotechnical Engineer has conducted.
- C.** The report is based upon the assumption that uniform variation exists in soil properties between borings. Interpretation of the report is bidder's responsibility. Owner and Architect will not be responsible for interpretation of report by bidders.
- D.** Bidders are urged to examine the report and the site.
- E.** Additional soils borings or other exploratory operations may be made by bidders at no additional cost to the Owner, provided such operations are approved by Owner in advance..
- F.** Refer to Conditions of the Contract for additional information.

END OF DOCUMENT



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www.thielegeotech.com

January 31, 2019

Mr. Rob Woodling
165 Fort, LLC
1886 S 126th Street
Omaha, NE 68144

**RE: ADDENDUM LETTER
COPPER VALLEY TOWNHOME DEVELOPMENT, 16505 FORT STREET, OMAHA, NE
TG# 18244.00**

Dear Mr. Woodling:

This addendum letter is intended to provide revised recommendations in regard to the Geotechnical Exploration Report (TG#18244.00) for the above referenced project, dated June 25, 2018.

We understand that development of the property will now consist of constructing two three-story, slab-on-grade apartment buildings with a single-story, slab-on-grade storm shelter situated in-between. A roadway will run along the western portion of the site, with paved parking along the east side of the apartment buildings. Maximum interior wall loads of 5 kips per lineal foot and maximum exterior wall loads of 3 kips per lineal foot have been provided for all structures.

Based on the grading plans prepared by E&A Consulting Group, dated December 15, 2018, significant cuts and fills in the northern and southern portions of the site, respectively, will be required to establish proposed finished grades. To establish finished floor elevations for Building 1, which will range between 1,189.0 and 1,193.0 feet, fills of up to 12 feet and cuts of up 8 feet will be required in the southern and northern portions of the building pad, respectively. Building 2 will have finished floor elevations ranging between 1,178.5 and 1,182.5 feet, which will require 6 to 12 feet of fill be placed across the entire building pad. The storm shelter will require approximately 12 feet of fill across its entire footprint to establish a finished floor elevation of 1,187 feet.

Moderate consolidation of the underlying soils will occur under this added fill weight. We estimate between 0.25 to 0.50 inches of settlement could occur per foot of fill placed. Therefore, after completion of the structural fill placement, we recommend placing a 6 feet surcharge over the portions of the building pads which will receive at least 4 feet of new fill. This will include the southern third of Building 1 and all of Building 2. The surcharge should extend a minimum distance of 10 feet beyond the building footprints on all sides. We anticipate the surcharge will need to be in place for a period of at least 4 to 6 weeks prior to removal and start of foundation construction to allow for approximately 90% of primary consolidation to be achieved.

Utility and pavement installation should also be delayed after grading to allow settlement to occur in the fill areas. We recommend a minimum 3 week delay period upon completion of fill placement for all exterior areas of the project that receive at least 4 feet of fill.

After completion of site stripping and grubbing, we recommend installing at least one settlement plate at the base of the deepest fill in the pad for Building 1 and two settlement plates in the pad for Building 2 to monitor the settlement and determine when foundation construction can commence. Care should be exercised to avoid damaging the monitoring devices during fill placement. If a device is disturbed, it should be repaired or replaced immediately. We recommend that each device be surveyed weekly both during and after fill placement. The above referenced delay periods are estimated from limited laboratory testing and may vary across the site depending on varied drainage paths across the footprints and varied density of the compressible soils.

Per the Site Preparation recommendations provided in the Geotechnical Report, we recommend that the previously backfilled excavation in the far southern extent of the project site be further explored during stripping and grading. As displayed by boring B-7, unsuitable soil conditions are expected in this area due to uncontrolled backfill placement. If unsuitable bearing materials are encountered, we recommend that the proposed building footprint of Building 2 located within this area be undercut down to natural materials to allow for structural fill replacement. This exploration should be conducted prior to the placement of fill in the Building 2 footprint. Additionally, this area of unsuitable fill soil may have long term effects on utilities and pavements. Consideration should be made for extending the undercut and replace into these areas of improvement as well.

The majority of footings will bear directly in the controlled structural fill, with the northern portion of Building 1 likely bearing in the natural Loveland loess. Based on our bearing capacity and settlement analysis, a net allowable bearing pressure of 2,500 pounds per square foot was determined. This allowable bearing pressure may be used to size wall footings. The bearing pressures were calculated based on a safety factor of 3 against bearing failure. If maximum design loads significantly exceed 5 kips per foot for walls, these bearing pressures may not be applicable and should be reevaluated.

Please call if you have any questions.



Respectfully,
Thiele Geotech, Inc.

A handwritten signature in blue ink that appears to read "Heath E. Cutler".

Heath E. Cutler, P.E.
Nebraska License E-16142

Copy: Rob Whorley – Performance Engineering
Bob Engel – RWE and Associates Architects



Geotechnical Exploration Report

Copper Valley Townhome Development

16505 Fort Street
Omaha, Nebraska

Prepared for:
165 Fort, LLC
1886 South 126th Street
Omaha, Nebraska 68144

June 25, 2018
TG Project No. 18244.00



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GEOTECHNICAL ■ MATERIAL ■ ENVIRONMENTAL ■ ENGINEERING

Geotechnical Exploration Report
Copper Valley Townhome Development

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INTRODUCTION

Thiele Geotech, Inc. has completed a geotechnical exploration study for the proposed Copper Valley Townhome Development to be located at 16505 Fort Street in Omaha, Nebraska. The purpose of this study was to identify the general soil and ground water conditions underlying the site; to evaluate engineering properties of the existing soils; to provide earthwork and site preparation recommendations; and to recommend design criteria and parameters for residential subdivision development.

This study included soil borings, laboratory testing, and engineering analysis. A series of eight test borings were spaced across the project site at strategic locations; however, only seven of the test borings were conducted due to access limitations. The field and laboratory data are presented in the Appendix, along with a description of investigative methods.

The drilling and testing performed for this study were conducted solely for geotechnical analysis. No analytical testing or environmental assessment has been conducted. Any statements or observations in this report regarding odors, discoloration, or suspicious conditions are strictly for the information of our client. If an evaluation of environmental conditions is desired, a separate environmental assessment should be conducted. This study did not include biological assessment (e.g. mold, fungi, bacteria) or evaluation of measures for their control.

It should also be noted that this report was prepared for design purposes only, and may not be sufficient for a contractor in bid preparation. Prospective contractors should evaluate potential construction problems on the basis of their own knowledge and experience in the local area and on similar projects, taking into account their own intended construction methods and procedures.

This report is an instrument of service prepared for use by our client on this specific project. The report may be duplicated as necessary and distributed to those directly associated with this project, including members of the design team and prospective contractors. However, the technical approach and report format shall be considered proprietary and confidential, and this report may not be distributed in whole or in part to any third party not directly associated with this project. By using and relying on this report, all other parties agree to the same terms, conditions, and limitations to which the client has agreed.

PROJECT DESCRIPTION

Our understanding of the project is based upon information provided by 165 Fort, LLC.

The project consists of constructing a new townhome development in the approximate 8.7-acre Copper Valley subdivision located at 16505 Fort Street in Omaha, Nebraska. It is anticipated that a total of 15 two-story, slab-on-grade, rowhouse type townhomes will be constructed, consisting of approximately 84 living units. The proposed townhomes are assumed to be wood-framed with a combination of brick/stone veneer.

Minor grading will be required to establish finished grades, specifically on the eastern portion of the site. Grading plans were unavailable at the time of this report. It is anticipated that maximum cuts and fills will near 8 feet in limited areas; however, cuts and fills of 3 feet or less are expected across most areas of the site.

Public improvements to the site are anticipated to include paved concrete drives and streets, sanitary and storm sewer lines, water lines, and other utilities. The primary street will be constructed along the west side of the site and connect Fort Street to Grand Avenue.

According to historical aerial photographs on Google Earth, a previous farmstead was located in the southern extent of the proposed development. These structures have since been demolished. Historical aerial photographs also indicate that a large pit was previously excavated on the south end of the site near the previous farmstead, which has since been backfilled. In addition, soil of varying composition has been stockpiled across large portions of the site.

SURFACE AND SUBSURFACE CONDITIONS

SITE CONDITIONS

The site is located near the southeast corner of the 168th Street and Fort Street intersection in Omaha, Nebraska. It is generally bound on the north by Fort Street, on the west by a farmstead, and on the south and east by residential lots. The site generally slopes to the southeast toward a creek running along the eastern extent, which ultimately empties into the North Branch Papillion Creek. The majority of the site was surfaced with grass at the time of exploration, with numerous large established trees along the creek. Several soil stockpiles were present in the northern and southern portions of the site.

LOCAL GEOLOGY

The surface geology of eastern Nebraska is Pleistocene in age and consists of eolian (wind-blown) deposits of Peoria and Loveland loess. The loess formed in dune-shaped hills along the Missouri River and various tributaries. The Peoria loess typically consists of silty lean clays that are stiff when dry but become softer with increasing moisture content. The Peoria sometimes exhibits low unit weight and is collapse susceptible. The Loveland loess is an older deposit, and typically consists of lean clays. The Loveland generally exhibits higher unit weights and shear strengths than the Peoria. Perched moisture conditions sometimes occur above the Peoria/Loveland interface.

The loess overlies Pleistocene glacial deposits of Kansan and Nebraskan till. The till consists of lean to fat clays mixed with sand, gravel, and occasional cobbles. The glacial deposits are generally fairly deep, but are sometimes near the surface at lower elevations on steep slopes. Cretaceous sandstone or Pennsylvanian limestone and shale form the bedrock unit below the glacial deposits. The depth to bedrock is normally great, and rock is rarely encountered in construction.

Along drainageways, alluvial and colluvial deposits are typically present. These soils were formed by erosion of the adjoining loess-mantled hills. Alluvial deposits are generally present along creeks and in major drainageways. The upper several feet of alluvium are usually stiffer due to the effects of desiccation. Colluvial soils are usually located at the base of steep slopes and in upland draws, and are formed by local creep and sloughing.

SOIL CONDITIONS

The soils encountered in the test borings generally consisted of man-placed fill, Peoria loess, altered Peoria loess, and Loveland loess.

Man-placed fill was encountered at the surface of all borings to depths ranging from 1.5 to 16 feet. The fill was described as a light to dark brown or gray, very moist to moist, hard to soft, lean or fat clay. Based on an assume Standard Proctor, the fill appears to have been compacted to between 86 to over 100 percent of the maximum dry density, (ASTM D698). Trace concrete and brick debris were

encountered in borings B-1 and B-6, respectively. Mottling was also observed in several borings within the fill.

Altered Peoria loess was encountered underlying the fill in borings B-3 and B-7. This is a weathered layer of Peoria loess that has been altered physically and chemically due to the effects of freeze-thaw, exposure, and has become slightly organic from years of vegetative growth. The altered Peoria loess was described as a dark brown, very moist to moist, soft to firm, lean clay.

Peoria loess was encountered underlying the altered Peoria loess in borings B-3 and B-7 and underlying the fill in borings B-4, B-5, and B-6. The Peoria loess extended to the termination depths in borings B-3 and B-4. The Peoria loess was described as a light brown to light gray, very moist to wet, very soft to firm, lean clay.

Loveland loess was encountered underlying the Peoria loess in borings B-5, B-6, and B-7 or underlying the fill in borings B-1 and B-2, extending to the termination depths. The Loveland loess was described as a reddish grey or brown, moist to wet, firm to hard, lean and fat clay.

Ranges of engineering properties from laboratory tests on selected samples are presented in Table 1.

Table 1 – Laboratory Results

Soil Layer	Moisture Content (%)	Dry Unit Weight (pcf)	Unconfined Compressive Strength (tsf)	Classification (LL/PI)
Man-placed Fill	17 to 25	89 to 107	0.6 to 5.5	CL (42/22, 45/29) CH (50/30)
Altered Peoria loess	23 to 28	83 to 94	0.3	CL (visual)
Peoria loess	25 to 34	88 to 100	0.2 to 1.0	CL (visual)
Loveland loess	18 to 27	95 to 105	1.1 to 1.7	CL (41/24) CH (visual)

GROUND WATER OBSERVATIONS

Ground water levels were observed in the borings as presented in Table 2. Note that ground water levels may fluctuate due to seasonal variations and other factors. The materials encountered in the test borings have relatively low permeabilities and observations over an extended period of time through use of piezometers or cased borings would be required to better define current ground water conditions.

Table 2 – Water Level Observations

Boring Number	*Boring Elevation (ft.)	Water Level (ft. below grade)			Ground Water Elevation (ft.)
		During Drilling	End of Drilling	24± Hours After Drilling	
B-3	1,187.5	21.5	24.6	N/E	1,162.9
B-4	1,182.0	15.0	**--	N/E	1,167.0
B-5	1,173.0	12.0	N/E	16.3	1,156.7
B-6	1,185.0	18.5	16.5	14.2	1,170.8
B-7	1,169.0	13.5	14.1	--	1,154.9

N/E = None Encountered
** Elevations interpreted from contours on the Douglas County GIS website.*
*** Boring caved at 15.0'*

ANALYSIS AND RECOMMENDATIONS

GENERAL

The primary geotechnical engineering concerns associated with this project site include fill-induced settlement, the presence of fat clay soils at or near pavement subgrade elevations across areas of the site, demolition of previous structures, and the presence of very moist, poorly-compacted fill in the southern portion of the site. Following the recommendations provided in this report, the site appears suitable to support the proposed townhome development.

Based on the preliminary site plan prepared by E&A Consulting Group, minor grading efforts will be required to establish grades along the eastern portion of the project site. Maximum fills of 8 feet are anticipated in this area, with cuts and fills of 3 feet or less required across the remainder of the site. Site preparation recommendations have been provided in the following section. Thiele Geotech should be provided an opportunity to review the final grading to plan to determine if any additions or modifications to our recommendations are necessary.

A few of the man-placed fill samples collected at or near the existing ground surface in various portions of the site consist of fat clay soil. These fat clay soils have a potential to shrink and swell with slight variations in moisture conditions, which can cause heaving and excessive cracking to overlying pavements. This is primarily a concern as it relates to floor slabs. Typically, the floor subgrade will dry and shrink during construction. After the floor slab is placed, the slab will act as a cap and will trap moisture attempting to migrate out of the soil through capillary action and vapor. This can cause the floor slab to heave and crack, also potentially damaging walls and other improvements that bear on the slab. Due to the inherent nature of the sampling performed, the lateral extent and location of such expansive soils throughout the area is unknown. With that said, a representative of the geotechnical engineer should be provided an opportunity to observe the subgrade conditions within building pads. Any deemed expansive soils should be removed and replaced with low-plasticity fill in accordance with the recommendations provided in the Site Preparation section.

Based on the historical photographs attached to the Appendix of this report, previous farm structures were located on the project site approximately 900 feet south of Fort Street and were demolished sometime between 2016 and 2017. Thiele Geotech did not witness the demolition efforts. It is unknown if the structures were removed completely or if basements or slabs were buried. It should be noted that surficial fill samples in boring B-6 contained trace amounts of brick. In addition, it is possible that any backfill placed was not placed in a structural manner. A representative of the geotechnical engineer should be provided the opportunity to observe the conditions upon completion of stripping, especially in the locations of previous structures. Any rubble or buried waste materials encountered from previous demolition should be removed from the site and lawfully disposed or recycled.

Historical photographs also indicate that an open pit was excavated south of the farmstead structures sometime between 2014 and 2016. Thiele Geotech is not sure of the activities that took place within the open excavation, which has since been backfilled. Based on the historical image from May 2016, it appears lime slurry for soil stabilization was being mixed on-site and transported to an adjacent site. Boring B-7 was conducted within the footprint of this backfilled excavation and displayed a zone of soft, very moist fill with low dry density near the presumed footing elevation. Lime was not noted in the boring; however, the boring was drilled near the northern extent and not near the southeastern extent where the excavation would likely be the deepest due to the access limitations created by stockpiled soils. It is possible that lime is encountered in excavations within this area. Additionally, the low-density soils are not well suited for support of footings and slabs. Site preparation recommendations have been provided in the following section.

Ground water was encountered in 5 of the 7 borings with ground water depths ranging from 14 to 25 feet below existing ground surface. Thiele Geotech is unsure whether ground water may be encountered in excavations due to a lack of final grading plan; however, it should be noted that ground water has a tendency to rise and fall with the season. Encounter of ground water in deeper utility excavation appears to be the most likely scenario for this site.

SITE PREPARATION

We anticipate minor fill induced settlement due to the compressibility of the Peoria loess. Fill induced settlements will vary across the site depending on the thickness of fill necessary to establish finished grades. Based on our settlement analyses, we anticipate 0.25 to 0.50 inches of settlement will occur per vertical foot of fill placed over the Peoria loess. A delay period of 3 to 4 weeks should be provided between fill placement and commencement of foundation construction for all structures which receive fill to allow for approximately 90% of primary consolidation to occur. A delay period of 2 weeks should be provided between fill placement and commencement of infrastructure construction in the areas that receive 3 feet or more of structural fill.

A settlement plate may be installed in schedule sensitive areas. The plate should be surveyed weekly both during and after fill placement. Care should be taken by the grading contractor not to damage the plate. Thiele Geotech should be notified if a plate is damaged so it can be replaced.

Fat clay fill may be encountered at the floor slab subgrade elevation of select townhome structures. If encountered, we recommend conducting a minimum 12-inch undercut of the entire footprint. The undercut should also extend laterally 2 feet outside the footprint. The undercut will allow for an equivalent replacement of low-volume change material. The Peoria loess will be suitable for use as replacement material, and should be placed in accordance with the recommendations in the Earthwork and Excavations section. It should be noted that while this will greatly reduce the potential for floor slab impact from shrink and swell, it may not completely eliminate the potential.

Fat clay soils may also be encountered at the subgrade elevation for exterior pavements. Conducting an undercut and replace of the fat clay in the exterior pavement areas does not appear to be the most economically feasible option. Therefore, we recommend these soils be maintained in a moist condition at all times between completion of subgrade preparation and pavement placement. An increased need for maintenance (i.e. crack repair, panel replacement, etc.) should be anticipated in areas where fat clay is located below pavement.

We recommend that the far southern extent of the project site containing the previously backfilled excavation be explored during stripping and grading. As displayed by boring B-7, unsuitable bearing conditions are expected in this area due to uncontrolled backfill placement. If unsuitable bearing materials are encountered, we recommend any proposed building footprints located within the area be undercut down to natural materials. Additionally, residuals from the presumed lime slurry mixture activities located within proposed footprints should also be removed and replaced with earthen backfill. This will allow footings and slabs to rest on a uniform bearing surface. The soil should be recompacted following guidelines in the Earthwork and Excavations Section of this report.

SEWER INSTALLATION

Soil conditions are generally favorable for pipe support in the higher elevations of the site. Normal pipe bedding is recommended. In the lower elevations of the site, it is possible that deeper utility trenches may encounter soft and very moist soil conditions. Subgrade stabilization with larger sized crushed rock could be used if such soil conditions exist during construction.

Granular bedding material is recommended for all cut and cover pipe installation on this project. Normal bedding thickness include a minimum of 4 inches or 1/8 of the nominal pipe diameter for pipes over 42 inches; however, we expect soft conditions in select areas of the project and bedding thicknesses will need to be adjusted as discussed in the following paragraph. Bedding material should have a nominal size of 1½ inches.

Soft and unstable conditions may be encountered in the bottom of all trench and manhole excavations. An increased bedding thickness will therefore be required. Bedding thicknesses should be field adjusted to accommodate conditions as they change along the project alignment. As a minimum for small pipes with diameters of 24 to 42 inches, an additional 6 to 12 inches of bedding material should be anticipated to support the pipe. This increased bedding material should also have a nominal size of 1½ inches, but may be 3 inch nominal size material if conditions require.

Backfill soils in narrow utility trenches (less than 6 feet wide) below a depth of 5 feet should be compacted to a minimum of 92 percent of the maximum dry density at a moisture content between -3 and +6 percent of optimum (ASTM D698, Standard Proctor). Backfill within the upper 5 feet of narrow trenches, for the full depth of any wider trenches, and around manholes should be compacted to a minimum of 95 percent of the maximum dry density at a moisture content between -3 and +4 percent of

optimum. For trenches more than 5 feet outside of paved areas, backfill should be compacted to a minimum of 90 percent of the maximum dry density at a moisture content that will permit compaction to that level. Lift thicknesses should be appropriately matched to the type of compaction equipment used.

OSHA's Construction Standards for Excavations require that the contractor's excavation activities follow certain worker safety procedures. These include a requirement that excavations over 4 feet deep be sloped back, shored, or shielded. The soils encountered in the test borings generally classify as types B and C soils according to the OSHA standard. The maximum allowable slope for an unbraced excavation in these soils is 1H:1V and 1.5H:1V, respectively, although other provisions and restrictions apply. Excavations over 20 feet deep require specific design by a licensed Professional Engineer. The contractor is solely responsible for site/excavation safety and compliance with OSHA regulations. The geotechnical engineer assumes no responsibility for site safety, and the above information is provided only for consideration by the designers.

EARTHWORK AND EXCAVATIONS

Rubble and waste materials from site clearing and demolition should be removed from the site and lawfully disposed or recycled. Waste materials should not be buried on-site. Where trees are cleared, the stumps should be excavated and removed.

Topsoil and vegetation should be stripped to a depth of 4 to 6 inches in areas to be disturbed during grading, including borrow and fill areas. Surfaces to receive fill should be broken up and recompacted to allow new fill to bond to the existing soil. Slopes steeper than 5H:1V should be benched before placing fill.

With exception to fat clay soils within 2 feet of floor slabs or pavements, the excavated site soils will generally be suitable for reuse as structural fill, although moderate moisture conditioning may be required. Any off-site borrow should be a clean, inorganic silt or lean clay with a liquid limit less than 45 and a plasticity index less than 20. Borrow material should not contain an appreciable amount of roots, rock, or debris, and should not contain any foreign material with a dimension greater than 3 inches.

All fills should be placed and compacted as structural fill. Fill should be placed in thin lifts not to exceed 8 inches loose thickness. Structural fill should be compacted with a sheepfoot type roller to a minimum of 95 percent of the maximum dry density (ASTM D698, Standard Proctor). Moisture content should be controlled to between -3 and +4 percent of optimum.

Quality control testing is an important part of any earthwork operation. It is recommended that a representative of the geotechnical engineer periodically monitor earthwork operations to verify proper compliance with these recommendations, including compaction levels.

SILT BASINS

We understand that silt basins will be located near the eastern and southeastern extents of the site; however, based on the conceptual site plan, we do not anticipate these will encroach on buildable envelopes. Certain precautions are appropriate when abandoning the silt basins to restore the area to conditions conducive to foundation support. Thiele Geotech should be notified if temporary basins will be contained within buildable envelopes.

TOWNHOME CONSTRUCTION

The site conditions identified are favorable for the use of conventional spread foundations to support structural loads. Based on our bearing capacity and settlement analysis, a net allowable bearing pressure range of 1,250 to 2,000 pounds per square foot was determined. The bearing pressures were calculated based on a safety factor of 3 against bearing failure. If maximum design loads significantly exceed 30 kips for columns or 3 kips per foot for walls, these bearing pressures may not be applicable and should be reevaluated.

If soft or unstable conditions are encountered during excavation, footing sizes should be increased appropriately. An undercut and replacement of the soft conditions with moisture conditioned, low volume change structural fill may also be considered if a stable bottom is located below.

It is recommended that column footings be at least 3 feet square and that load bearing wall footings be at least 16 inches wide. For structures that have any areas of concentrated load, it is recommended that footing sizes be increased proportionally in the more heavily loaded area. This is recommended to maintain a relatively uniform contact pressure (even if substantially below the allowable pressure) in order to limit differential settlements. Exterior footings and footings in unheated areas should be founded a minimum of 3.5 feet below adjacent grade to provide reasonable frost protection. It is recommended that all footings be steel reinforced.

As stated earlier, fat clay soils may be encountered at or near subgrade in select areas of the site. Fat clay soils have a potential for shrink and swell with changing moisture content. This can cause heaving and cracking of floor slabs, with potential heaves nearing $\frac{1}{2}$ inch to 1 inch. If encountered, we recommend undercutting the floor slab subgrade in accordance with the Site Preparation section.

The long-term performance of any project is contingent upon keeping the subgrade soils at more or less constant moisture content, and by not allowing surface drainage a path to the subsurface. Positive surface drainage away from structures must be maintained at all times. Landscaped areas should be designed and built such that irrigation and other surface water will be collected and carried away from the structure.

Construction staging and grading should provide for removal of surface water from the site. If prolonged ponding of surface water occurs, removal and replacement of wet or disturbed soils may be necessary.

Temporary grades should be established to prevent runoff from entering excavations or footing trenches. Backfill should be placed as soon as structural strength requirements are met, and should be graded to drain away from the structure.

The final grade of the foundation backfill and any overlying pavements should have a positive slope away from foundation walls on all sides. For grass or landscape covered areas, a minimum slope of 2 inches per foot for 5 to 10 feet away from the building is recommended. A minimum slope of 3 percent is recommended for grassed or landscaped areas of the site away from the building. A minimum slope of 1 percent is recommended for paved areas. Pavements and exterior slabs that abut the structure should be carefully sealed against moisture intrusion at the joint.

SEISMIC SITE CLASS

Seismic structural design requirements are dictated by a site classification based on average soil properties within the top 100 feet. Based on our local experience, the soil profile was estimated below the maximum boring depth. The average undrained shear strength was then estimated based on the actual laboratory testing and on assumed soil properties for the deeper soil profile.

The site classifies as Site Class D (stiff soil profile) according to Table 1613.5.2 of the 2009 International Building Code.

PAVEMENTS

Pavement performance is directly affected by the degree of compaction, uniformity, and stability of the subgrade. This is particularly important where traffic from heavy trucks is anticipated. The final subgrade should be reworked and compacted immediately prior to pavement construction. The subgrade should then be proof rolled, and any unstable areas should be excavated and replaced to create a uniform and stable subgrade.

For concrete pavements, it is recommended that the upper 12 inches of the subgrade be compacted to a minimum of 90 percent of the maximum dry density at a moisture content between -3 and +4 percent of optimum (ASTM D1557, Modified Proctor). Subgrade preparation should extend a minimum of 2 feet laterally beyond the edge of the pavement.

Under sidewalks, the upper 6 inches of the subgrade should be compacted to a minimum of 95 percent of the maximum dry density at a moisture content between -3 and +4 percent of optimum (ASTM D698, Standard Proctor). Subgrade preparation should extend laterally 6 inches beyond the edge of the sidewalk.

Contraction joints are important to control the location of cracks in concrete pavement that result from stresses caused by normal drying shrinkage and thermal effects. A proper jointing system will enhance structural capacity and prolong the life span of a concrete pavement as well as improve ride quality. Contraction joints should be cut to a minimum of $\frac{1}{4}$ of the slab thickness ($\frac{1}{5}$ of the thickness

for early entry saw method). Joints should be cut as soon as practical after the concrete has set sufficiently to support foot traffic, and must be cut before any shrinkage cracks form. Joints should be spaced no more than 24 times the thickness of the slab or 12½ feet maximum. Panels should be kept as square as possible, with the length to width ratio limited to 125 percent. Dowel bars should be used for load transfer across construction joints, and should be considered for contraction joints subjected to heavy truck traffic. Joints should be carefully planned and laid out to meet inlets, drainage structures, reentrant corners, and radii. Joints should be perpendicular to edges and radii, and should not form angles less than 45 degrees or over 225 degrees. Isolation joints should be provided around any structures.

We recommend that joints be sealed to reduce moisture infiltration and to reduce the accumulation of non-compressible materials. Joint sealing should be considered as a two part process, sealing of the exposed sawcut face of the concrete and sealing of the joint itself. Following sawcutting and cleaning the joints with compressed air, a penetrating concrete sealer (Silane, Silicate, or Silicate based) should be spray applied to the joint extending outwards a minimum of 8 inches either side of the sawcut. This penetrating sealer will help to limit moisture infiltration along the sawcut face, helping to mitigate premature joint damage from freeze-thaw cycles. Following the spray applied sealer, a hot pour joint sealer can be used to fill the sawcut. Use of backer rods is not recommended.

Backfill behind curbs and within islands should consist of relatively impervious cohesive soils. Backfill should be compacted to a minimum of 95 percent of the maximum dry density (ASTM D698) to minimize subsidence and to reduce moisture infiltration around the edges of the pavement. Granular soils should not be used for fill in islands as this can increase infiltration into the subgrade. Porous fills, including granular material and loosely placed clay soils, also act as a reservoir that can allow moisture to seep through cracks and joints onto the pavement surface, sometimes long after the water is trapped. This condition is especially pronounced when loose backfill consolidates and allows surface water to pond.

OTHER RECOMMENDATIONS

During detailed design, additional issues may arise and possible conflicts may occur with our recommendations. Such issues and conflicts should be resolved through dialogue between the geotechnical engineer and designers. It is recommended that the geotechnical engineer review the final design, including the plans and specifications, to verify that our recommendations are properly interpreted and incorporated into the design.

If any changes are made in the design of the project, including the nature or location of proposed facilities on the site or significant elevation changes, the analysis and recommendations of this report shall not be considered valid unless the changes are reviewed. The analysis and recommendations of

this report should not be applied to different projects on the same site or to similar projects on different sites.

The analysis and recommendations in this report are based upon borings at specific locations. The nature and extent of variation between boring locations is impossible to predict. Because of this, geotechnical recommendations are preliminary until they have been confirmed through observation of site excavation and earthwork preparation. If variations appear during subsequent exploration or during construction, we may reevaluate our recommendations and modify them, if appropriate. The geotechnical engineer should be retained during construction to observe compliance with the recommendations of this report and to provide quality control testing of earthwork construction. If these services are provided by others, including the contractor, the entity that provides construction phase observation and testing shares responsibility as the geotechnical engineer of record for implementing or modifying these recommendations.

Respectfully submitted,
Thiele Geotech, Inc.

Reviewed by,

Andrew J. Miller, P.E.
Nebraska License E-16419

Prepared by,



Heath E. Cutler, P.E.
Nebraska License E-16142

APPENDIX

Historical Aerials

Subsurface Exploration Methods

Legend of Terms

Boring Location Plan

Boring Logs

Soil Test Summary

Historical Aerial

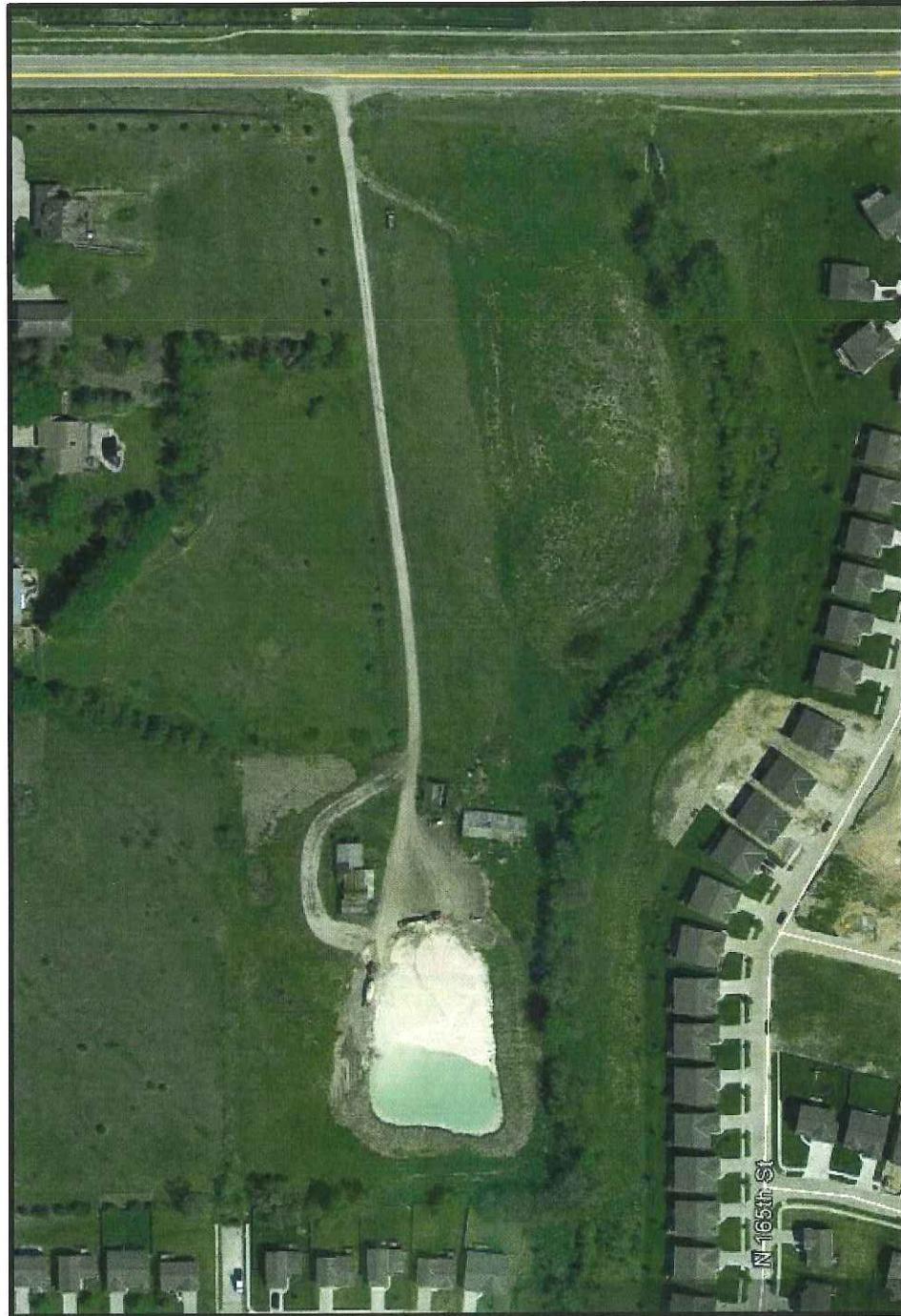
April 2004



North ↑

Historical Aerial

May 2016



North ↑

Historical Aerial

May 2016

(Excavation)

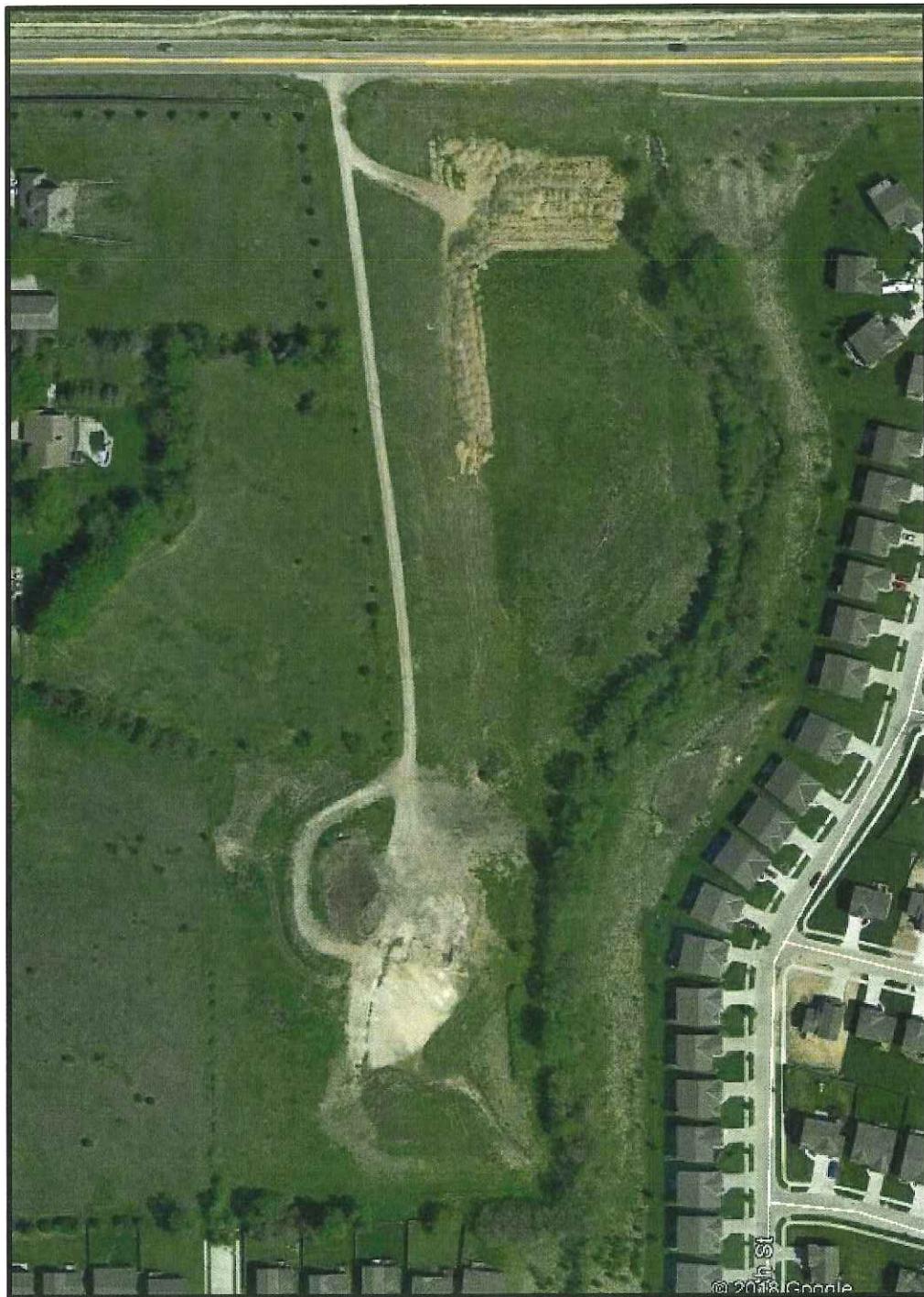


North ↑

Historical Aerial

May 2017

(Current Conditions)



North ↑

SUBSURFACE EXPLORATION METHODS

The fieldwork for this study was conducted on May 24, 2018. The exploratory program consisted of 7 test borings drilled at the approximate locations shown on the Boring Location Plan. Boring locations were selected to provide the desired site coverage and were adjusted to accommodate access conditions. The boring locations were laid out in the field using a handheld GPS and coordinates interpreted from Google Earth. Elevations were interpolated from contours on the Douglas County GIS website. The boring locations and elevations should only be considered accurate to the degree implied by the methods used to define them.

Test borings were advanced using flight augers powered by a truck-mounted drill rig. Soil samples were obtained at selected depths as indicated on the boring logs. A 3-inch nominal diameter thin-walled sampler was hydraulically pushed to obtain undisturbed samples. Disturbed samples were obtained by driving a 2-inch nominal diameter split barrel sampler while conducting standard penetration tests (SPT). The SPT values presented on the boring logs are actual field recorded numbers and have not been corrected for hammer energy or overburden.

The boring logs were prepared based on visual classification of the samples and drill cuttings, and by observation of the drilling characteristics of the subsurface formations. The logs have been supplemented and modified based on the laboratory test results and further examination of the recovered samples. The stratification lines on the boring logs represent the approximate boundary between soil types, but the insitu transition may be gradual.

Water level observations were made at the times stated on the boring logs. The borings were backfilled with drill cuttings at the completion of the fieldwork.

The field boring logs were reviewed to outline the depths, thicknesses, and extent of the soil strata. A laboratory testing program was then developed to further classify the basic soils and to evaluate the engineering properties for use in our analysis.

Laboratory tests to further classify the soils included visual classification, moisture content, dry unit weight, and Atterberg limits. The shear strengths of cohesive samples were evaluated using the unconfined compression test.

The boring logs and related information in this report are indicators of subsurface conditions only at the specific locations and times noted. Subsurface conditions, including ground water levels, at other locations of the site may differ significantly from conditions that exist at the sampling locations. Also note that the passage of time may affect conditions at the sampling locations.

LEGEND OF TERMS

Soil Description Terms

<u>Soil Description Terms</u>	<u>Consistency - Fine Grained</u>	<u>Consistency - Coarse Grained</u>	<u>Moisture Conditions</u>
	Very Soft, Soft, Firm, Hard, Very Hard	Very Loose, Loose, Medium Dense, Dense, Very Dense	Dry, Slightly Moist, Moist Very Moist, Wet (Saturated)

Sample Identification

Sample Identification		
Sample Type	Sample Data	Laboratory Data
U -- Undisturbed (Shelby Tube)	No. -- Number	MC -- Moisture content
S -- Split barrel (disturbed)	SPT -- Standard penetration test	γ_d -- Dry unit weight
C -- Continuous sample	bpf -- blows per foot	qu -- Unconfined compression
A -- Auger cuttings (disturbed)	Rec -- Recovery	LL/PI -- Liquid limit & plasticity index

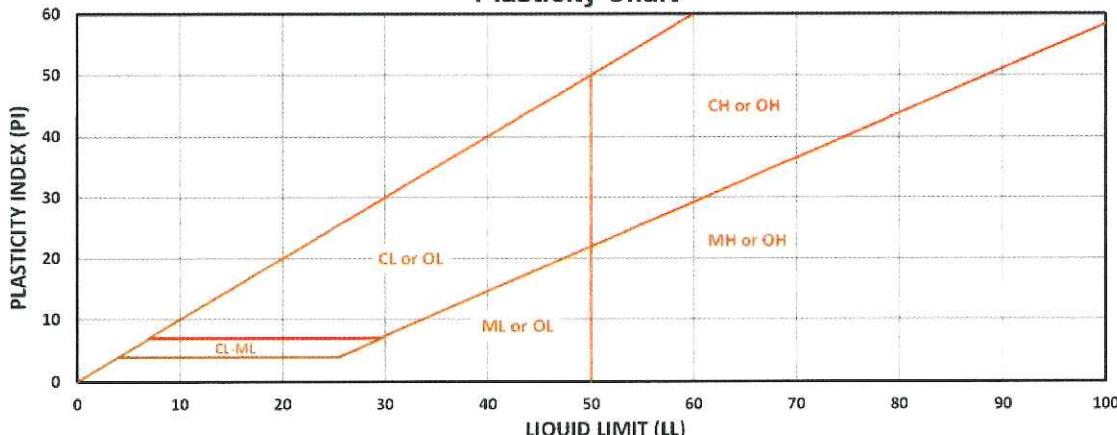
Unified Soil Classification System

Unified Soil Classification System			
Soil Type	ASTM Designation	Soil Properties	Classification
Peat	Pt	Highly organic soils	50% or more smaller than No. 200 sieve
Fat Clay	CH	Clay - Liquid Limit > 50 *	
Elastic Silt	MH	Silt - Liquid Limit > 50 *	
Lean Clay	CL	Clay - Liquid Limit < 50 *	
Silt	ML	Silt - Liquid Limit < 50 *	
Silty Clay	CL-ML	Silty Clay *	
Clayey Sand	SC	Sands with 12 to 50 percent smaller than No. 200 sieve *	More than 50% larger than No. 200 sieve and % sand > % Gravel
Silty Sand	SM	Sands with 5 to 12 percent smaller than No. 200 Sieve *	
Poorly-Graded Sand with Clay	SP-SC	Sands with less than 5 percent smaller than No. 200 sieve *	
Poorly-Graded Sand with Silt	SP-SM	Gravels with 12 to 50 percent smaller than No. 200 Sieve *	
Well-Graded Sand with Clay **	SW-SC	Gravels with 5 to 12 percent smaller than No. 200 sieve *	
Well-Graded Sand with Silt **	SW-SM	Gravels with less than 5 percent smaller than No. 200 sieve *	
Poorly-Graded Sand	SP	Gravels with 12 to 50 percent smaller than No. 200 sieve *	More than 50% larger than No. 200 sieve and % gravel > % sand
Well-Graded Sand **	SW	Gravels with 5 to 12 percent smaller than No. 200 sieve *	
Clayey Gravel	GC	Gravels with less than 5 percent smaller than No. 200 Sieve *	
Silty Gravel	GM	Gravels with 12 to 50 percent smaller than No. 200 Sieve *	
Poorly-Graded Gravel with Clay	GP-GC	Gravels with 5 to 12 percent smaller than No. 200 sieve *	
Poorly-Graded Gravel with Silt	GP-GM	Gravels with less than 5 percent smaller than No. 200 sieve *	
Well-Graded Gravel with Clay **	GW-GC	Gravels with 12 to 50 percent smaller than No. 200 sieve *	
Well-Graded Gravel with Silt **	GW-GM	Gravels with 5 to 12 percent smaller than No. 200 sieve *	
Poorly-Graded Gravel	GP	Gravels with less than 5 percent smaller than No. 200 sieve *	
Well-Graded Gravel **	GW	Gravels with 12 to 50 percent smaller than No. 200 sieve *	

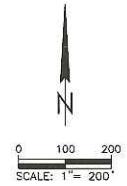
* See Plasticity Chart for definition of silts and clays

** See Criteria for Sands and Gravels for definition of well-graded

Plasticity Chart



Criteria for Sands and Gravels



SCALE: 1" = 200'

LEGEND:

● BORING LOCATION



PROJECT
COPPER VALLEY TOWNHOME DEVELOPMENT
16505 FORT STREET
OMAHA, NE
JOB # 18244.00 DATE: 06/25/18



BORING LOCATION PLAN



Thiele Geotech, Inc.
13478 Chandler Rd
Omaha, NE 68138
Telephone: 402-556-2171

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT 165 Fort LLC

PROJECT NUMBER 18244 00

DRILLING DATE 5/24/18 **SURFACE** Bare Ground

DRILLING METHOD Flight

SURFACE Bare Ground

DRILLER Andrew Cormac

DRILL RIG CME 45E

LOGGED BY Jeremy Kendle

CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

VISUAL

LIMANUAL DESCRIPTION

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1192.5 ft **BORING DEPTH** 20 feet

GROUND WATER LEVELS:

DURING DRILLING None encountered

END OF DRILLING None encountered

AFTER DRILLING Not measured

Bottom of borehole
at 20.0 feet.



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Omaha, NE 68138
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BORING NUMBER B-2

PAGE 1 OF 1

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18

SURFACE Gravel

DRILLING METHOD Flight

HOLE SIZE 6 inches

DRILLER Andrew Cormaci

DRILL RIG CME 45B #145

LOGGED BY Jeremy Kendle

CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1196 ft **BORING DEPTH** 25 feet

GROUND WATER LEVELS:

DURING DRILLING None encountered

END OF DRILLING None encountered

AFTER DRILLING Not measured

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION						SAMPLE TYPE NUMBER	RECOVERY (IN)	ATTERBERG LIMITS		
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN	REMARKS			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0	moist	dark brown	hard	lean clay	fill		blocky, roots	U-1	12			
5		light brown	very hard					U-2	6			
10	moist	reddish brown	hard	lean clay	Loveland Loess			U-3	12			
15								U-4	12			
20		reddish gray					blocky	U-5	12			
25	very moist							U-6	11			



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Omaha, NE 68138
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BORING NUMBER B-3

PAGE 1 OF 2

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18

SURFACE Grass

DRILLING METHOD Flight

HOLE SIZE 6 inches

DRILLER Andrew Cormaci

DRILL RIG CME 45B #145

LOGGED BY Jeremy Kindle

CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1187.5 ft BORING DEPTH 30 feet

GROUND WATER LEVELS:

▽ DURING DRILLING 21.5 ft / Elev 1166.0 ft

▼ END OF DRILLING 24.6 ft / Elev 1162.9 ft

24hrs AFTER DRILLING None encountered

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION					SAMPLE TYPE NUMBER	RECOVERY (IN)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	q_u (tsf)	ATTERBERG LIMITS			FINES CONTENT (%)													
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN								LIMIT	PLASTIC LIMIT	PLASTICITY INDEX														
0		moist	light brown	firm	lean clay	fill																								
			grayish brown	hard																										
5																														
10																														
15																														
20																														
25																														

(Continued Next Page)



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Omaha, NE 68138
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BORING NUMBER B-3

PAGE 2 OF 2

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18

SURFACE Grass

DRILLING METHOD Flight

HOLE SIZE 6 inches

DRILLER Andrew Cormaci

DRILL RIG CME 45B #145

LOGGED BY Jeremy Kindle

CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1187.5 ft BORING DEPTH 30 feet

GROUND WATER LEVELS:

DURING DRILLING 21.5 ft / Elev 1166.0 ft

END OF DRILLING 24.6 ft / Elev 1162.9 ft

24hrs AFTER DRILLING None encountered

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION					SAMPLE TYPE NUMBER	RECOVERY (IN)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	ATTERBERG LIMITS			FINES CONTENT (%)	
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN							q _u (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	
25		wet	light grayish brown	soft	lean clay	Peoria loess				U-7	12						
30												30.5	93.0				

Bottom of borehole
at 30.0 feet.



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BORING NUMBER B-4

PAGE 1 OF 1

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18 SURFACE Grass

DRILLING METHOD Flight HOLE SIZE 6 inches

DRILLER Andrew Cormaci DRILL RIG CME 45B #145

LOGGED BY Jeremy Kindle CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1182 ft BORING DEPTH 25 feet

GROUND WATER LEVELS:

▽ DURING DRILLING 15.0 ft / Elev 1167.0 ft

END OF DRILLING Cave at 15'

24hrs AFTER DRILLING None encountered

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION					SAMPLE TYPE NUMBER	RECOVERY (IN)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	q _u (tsf)	ATTERBERG LIMITS			FINES CONTENT (%)	
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN								LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		moist	light brown	hard	lean clay	fill			U-1 8		23.6	98.6		42	20	22		
			gray		fat clay				U-2 12		22.5	101.3	1.56					
5		very moist	light gray	firm	lean clay	Peoria loess			U-3 12		27.7	95.2	0.99					
				soft					U-4 12		34.0	88.2						
10									U-5 12		33.7	88.6						
15 ▽		wet							U-6 12		26.3	97.4						
20																		
25																		

TG COLUMNS - GINT STD US LAB.GDT - 6/20/18 12:14 - P:18244.00(COPPER VALLEY TOWNHOME DEVELOPMENT.GDT)

Bottom of borehole
at 25.0 feet.



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Omaha, NE 68138
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BORING NUMBER B-5

PAGE 1 OF 1

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18

SURFACE Grass

DRILLING METHOD Flight

HOLE SIZE 6 inches

DRILLER Andrew Cormaci

DRILL RIG CME 45B #145

LOGGED BY Jeremy Kendle

CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1173 ft BORING DEPTH 25 feet

GROUND WATER LEVELS:

▽ DURING DRILLING 12.0 ft / Elev 1161.0 ft

END OF DRILLING None encountered

▼ 24hrs AFTER DRILLING 16.3 ft / Elev 1156.7 ft

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION						SAMPLE TYPE NUMBER	RECOVERY (IN)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	q _u (tsf)	ATTERBERG LIMITS			FINES CONTENT (%)													
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN	REMARKS								LIMIT	PLASTIC LIMIT	PLASTICITY INDEX														
0		very moist	light brown	firm	fat clay	fill	mottled	U-1	8			25.1	95.9	0.81	50	20	30														
		moist	gray	hard				U-2	6																						
		very moist	light brown	firm	lean clay	Peoria loess		U-3	5						24.5	98.4															
5		wet	light brown	firm	lean clay	Peoria loess		U-4	12						31.9	91.4															
		light gray	light gray	firm				U-5	12						26.3	99.7															
		wet	light reddish brown	hard	fat clay	Loveland loess		U-6	6						21.7	105.3															

Bottom of borehole
at 25.0 feet.



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BORING NUMBER B-6

PAGE 1 OF 1

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18 SURFACE Grass

DRILLING METHOD Flight HOLE SIZE 6 inches

DRILLER Andrew Cormaci DRILL RIG CME 45B #145

LOGGED BY Jeremy Kindle CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1185 ft BORING DEPTH 20 feet

GROUND WATER LEVELS:

▽ DURING DRILLING 18.5 ft / Elev 1166.5 ft

▽ END OF DRILLING 16.5 ft / Elev 1168.5 ft

▽ 24hrs AFTER DRILLING 14.2 ft / Elev 1170.8 ft

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION					SAMPLE TYPE NUMBER	RECOVERY (IN)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)	
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN						LIMIT	PLASTIC LIMIT	PLASTICITY INDEX		
0		moist	dark brown	hard	fat clay	fill				S-1						
5			light brown	firm	lean clay					U-2	7					
10		very moist	light gray	soft	lean clay	Peoria loess				U-3	12					
15		wet								U-4	12					
20		wet	reddish gray	firm	lean clay	Loveland loess				U-5	12					

Bottom of borehole
at 20.0 feet.



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BORING NUMBER B-7

PAGE 1 OF 2

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18

SURFACE Bare Ground

DRILLING METHOD Flight

HOLE SIZE 6 inches

DRILLER Seth Yakel

DRILL RIG CME 45B #62

LOGGED BY Tyler Wegner

CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1169 ft BORING DEPTH 30 feet

GROUND WATER LEVELS:

▽ DURING DRILLING 13.5 ft / Elev 1155.5 ft

▼ END OF DRILLING 14.1 ft / Elev 1154.9 ft

AFTER DRILLING Not measured

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION						SAMPLE TYPE NUMBER	RECOVERY (IN)	BLOW COUNTS (N VALUE)	POCKET PEN. (sf)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	q _u (sf)	ATTERBERG LIMITS		
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN	REMARKS								LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0		moist	gray	hard	lean clay	fill	minor gravel	U-1	12								
5		very moist	dark brown	soft				U-2	12								
10		moist	dark brown	soft	lean clay	altered Peoria loess		U-3	12								
15	▽ ▼	very moist wet	light brown	very soft	lean clay	Peoria loess	iron stains	U-4	12								
20								U-5	9								
25			soft					U-6	12								

(Continued Next Page)



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Telephone: 402-556-2171

BORING NUMBER B-7

PAGE 2 OF 2

CLIENT 165 Fort, LLC

PROJECT NUMBER 18244.00

DRILLING DATE 5/24/18 SURFACE Bare Ground

DRILLING METHOD Flight HOLE SIZE 6 inches

DRILLER Seth Yakel DRILL RIG CME 45B #62

LOGGED BY Tyler Wegner CHECKED BY Heath Cutler

NOTES Boring backfilled with cuttings

PROJECT NAME Copper Valley Townhome Development

PROJECT LOCATION 16505 Fort Street, Omaha, NE

GROUND ELEVATION 1169 ft BORING DEPTH 30 feet

GROUND WATER LEVELS:

▽ DURING DRILLING 13.5 ft / Elev 1155.5 ft

▽ END OF DRILLING 14.1 ft / Elev 1154.9 ft

AFTER DRILLING Not measured

DEPTH (ft)	GRAPHIC LOG	VISUAL/MANUAL DESCRIPTION					SAMPLE TYPE NUMBER	RECOVERY (IN)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINE CONTENT (%)
		MOISTURE	COLOR	CONSIST.	SOIL TYPE	GEOLOGIC ORIGIN						LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
25		wet	light brown	soft	lean clay	Peoria loess									
30		wet	light reddish brown	firm	lean clay	Loveland loess		U-7	12		22.3	101.9			

Bottom of borehole
at 30.0 feet.



Thiele Geotech, Inc.
13478 Chandler Rd
Omaha, NE 68138
Telephone: 402-556-2171

SUMMARY OF LABORATORY RESULTS

PAGE 1 OF 1

CLIENT 165 Fort, LLC

PROJECT NAME Copper Valley Townhome Development

PROJECT NUMBER 18244.00

PROJECT LOCATION 16505 Fort Street, Omaha, NE

Boring Number	Sample Number	Depth	Water Content (%)	Unit Weight		Void Ratio	Sat. (%)	Unconfined Compression		Atterberg Limits		%<#200 Sieve	Class.	Other Tests
				Wet Density (pcf)	Dry Density (pcf)			q _u (tsf)	Strain (%)	LL	PI			
B-1	U-1	0.5-2.0'	17.2	128.4	109.5	0.539	86							
	U-2	3.5-5.0'	18.0	120.6	102.2	0.648	75	1.05	2.4	41	24		CL	
	U-3	8.5-10.0'	21.7	124.2	102.1	0.651	90	2.03	3.6					
	U-4	13.5-15.0'	22.2	127.1	104.0	0.619	97							
	U-5	18.5-20.0'	24.0	123.4	99.5	0.693	94							
B-2	U-1	0.5-2.0'	18.9	117.4	98.7	0.707	72	1.57	2.3					
	U-2	3.5-5.0'	19.1	125.1	105.0	0.604	86	5.51	5.7					
	U-3	8.5-10.0'	20.0	123.4	102.8	0.638	84	1.68	3.1					
	U-4	13.5-15.0'	22.0	121.6	99.7	0.690	86							
	U-5	18.5-20.0'	21.1	125.1	103.4	0.630	90							
	U-6	23.5-25.0'	25.6	122.1	97.2	0.733	94							
B-3	U-1	0.5-2.0'	23.6	117.9	95.4	0.766	83	0.83	4.5					
	U-2	3.5-5.0'	24.0	120.0	96.7	0.742	88	0.96	4.8					
	U-3	8.5-10.0'	22.4	125.1	102.2	0.649	93	1.62	14.1					
	U-4	13.5-15.0'	19.9	128.7	107.3	0.570	95	1.77	7.0					
	U-5	18.5-20.0'	27.6	118.2	92.6	0.819	91							
	U-6	23.5-25.0'	31.6	120.1	91.3	0.846	100							
	U-7	28.5-30.0'	30.5	121.3	93.0	0.812	100							
B-4	U-1	0.5-2.0'	23.6	121.8	98.6	0.710	90			42	22		CL	
	U-2	3.5-5.0'	22.5	124.1	101.3	0.663	92	1.56	6.2					
	U-3	8.5-10.0'	27.7	121.6	95.2	0.769	97	0.99	3.7					
	U-4	13.5-15.0'	34.0	118.2	88.2	0.910	100							
	U-5	18.5-20.0'	33.7	118.4	88.6	0.902	100							
	U-6	23.5-25.0'	26.3	123.0	97.4	0.730	97							
B-5	U-1	0.5-2.0'	25.1	119.9	95.9	0.758	89	0.81	10.3	50	30		CH	
	U-2	3.5-5.0'	23.5	124.9	101.2	0.666	95							
	U-3	8.5-10.0'	24.5	122.5	98.4	0.712	93							
	U-4	13.5-15.0'	31.9	120.5	91.4	0.844	100							
	U-5	18.5-20.0'	26.3	125.9	99.7	0.690	100							
	U-6	23.5-25.0'	21.7	128.1	105.3	0.601	97							
B-6	S-1	0.5-2.0'	18.4											
	U-2	3.5-5.0'	20.0	124.9	104.0	0.619	87			45	29		CL	
	U-3	8.5-10.0'	25.6	120.6	96.0	0.754	92	0.68	1.9					
	U-4	13.5-15.0'	21.3	121.3	99.9	0.686	84							
	U-5	18.5-20.0'	26.8	120.9	95.3	0.767	95							
B-7	U-1	0.5-2.0'	19.8	126.1	105.2	0.601	89	1.78	14.9					
	U-2	3.5-5.0'	24.7	110.9	89.0	0.893	75	0.55	1.6					
	U-3	8.5-10.0'	23.1	102.6	83.4	1.021	61	0.25	2.6					
	U-4	13.5-15.0'	30.6	117.5	90.0	0.873	95	0.16	15.0					
	U-5	18.5-20.0'	28.8	118.0	91.6	0.840	93							
	U-6	23.5-25.0'	25.2	122.5	97.9	0.722	94							
	U-7	28.5-30.0'	22.3	124.7	101.9	0.653	92							



SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 QUALITY ASSURANCE

- A. 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.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1.4 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M).

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).
2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- C. 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."

2.4 CONCRETE MATERIALS

- A. Cementitious Materials:
 1. Portland Cement: ASTM C 150/C 150M, Type I/II.
 2. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.
 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. 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. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- E. Water: ASTM C 94/C 94M and potable.

2.5 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III and per engineers approval.
- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 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. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

2.9 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 (ACI 301M).
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing or plasticizing 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.

3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Normal-Weight Concrete:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum W/C Ratio: 0.45.
3. Slump Limit: 4 inches and 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.11 FABRICATING REINFORCEMENT

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

2.12 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), 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 (ACI 117M).
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

- 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.

3.3 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 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 Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- 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.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is 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.
1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- 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 fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces exposed to public view, or to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. 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.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- 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 (6 mm) in one direction.
1. Apply scratch finish 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 restraightening 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 straighten 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 and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset 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.
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.

3.9 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 (ACI 301M) for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching $0.2 \text{ lb/sq. ft.} \times h$ ($1 \text{ kg/sq. m} \times h$) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 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 (300 mm), 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.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall

within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

- a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

SECTION 03330 - UNDER-SLAB VAPOR BARRIER/RETARDER

PART I - GENERAL

1.1 SUMMARY

- A. Products Supplied Under This Section**

 1. Vapor Barrier, seam tape, mastic, pipe boots, detail strip for installation under concrete slabs.

B. RELATED SECTIONS

 1. Section 03300 Cast-in-place Structural Concrete

1.2 REFERENCES

- REFERENCES**

 - A. American Society for Testing and Materials (ASTM)
 - 1. ASTM E 1745-97 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
 - 2. ASTM B 154-88 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
 - 3. ASTM B 96-95 Standard Test Methods for Water Vapor Transmission of Materials
 - 4. ASTM E 1643-98 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
 - B. American Concrete Institute (ACI)
 - 1. ACI 302.1R-96 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick

1.3 SUBMITTALS

- A. Quality Control / Assurance

 1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
 2. Manufacturer's samples, literature.
 3. Manufacturer's installation instructions for placement, seaming and pipe boot installation

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Vapor Barrier (Performance based specification). When the specifications of different sections conflict, the contractor shall perform to the most restrictive provision.

 1. Vapor Barrier membrane must have the following properties.
 - A. Manufactured from prime virgin resins
 - B. Water Vapor Barrier
 - C. Permeance Rating
 - D. Puncture Resistance
 - E. Tensile Strength
 - F. Basis of Design: Stego Wrap 15-mil Vapor Barrier by Stego Industries LLC, 949.493.5460
 - G. Other Acceptable Vapor Barrier Products:
 - a. Preinoulded Membrane with Plasmatic Core, by W.R. Meadows
 - b. Zerb-Perm, by Alumiseal

22 ACCESSORIES

- A. Seam Tape

 1. Tape must have the following qualities:
 - a. Water Vapor Transmission Rate ASTM E 96 0.3 perms or lower
 2. Seam Tape
 - a. Stego Tape by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834
www.stegoindustries.com

- B. Vapor Proofing Mastic

 1. Mastic must have the following qualities:
a. Water Vapor Transmission Rate ASTM B 96 0.3 perms or lower
 2. Mastic
a. Stego Mastic by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834
www.stego-industries.com

- ### C Pine Boots

1. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Ensure that subsoil is approved by architect or geotechnical firm
 1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

- A. Install Vapor Barrier/Retarder:

1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98.
 - a. Unroll Vapor Barrier/Retarder with the longest dimension parallel with the direction of the pour.
 - b. Lap Vapor Barrier/Retarder over footings and seal to foundation walls.
 - c. Overlap joints 6 inches and seal with manufacturer's tape.
 - d. Seal all penetrations (including pipes) per manufacturer's instructions.
 - e. No penetration of the Vapor Barrier/Retarder is allowed except for reinforcing steel and permanent utilities.
 - f. Repair damaged areas by cutting patches of Vapor Barrier/Retarder, overlapping damaged area 6 inches and taping all four sides with tape.

SECTION 03410 - PLANT-PRECAST STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Structural Performance: Engineer, fabricate, and install structural precast concrete units to withstand design loadings indicated.
- B. Calculate fire resistance according to ASTM E 119 and PCI's "Design for Fire Resistance of Precast Prestressed Concrete."
- C. Submittals: Product Data, Shop Drawings, structural analysis data, and calculated fire-resistance requirements] signed and sealed by a qualified professional engineer.
- D. Fabricator must participate in PCI's Plant Certification Program and be designated a PCI-certified plant, Product Group C.
- E. Comply with PCI's "PCI Design Handbook--Precast and Prestressed Concrete," PCI's "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products," AWS D1.1, and AWS D1.4.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Deformed Reinforcing Bars: ASTM A 615, Grade 60 (ASTM A 615M, Grade 420).
- B. Steel Wire: ASTM A 82, plain, cold drawn.
- C. Steel-Welded Wire Fabric: ASTM A 185, plain, cold drawn.
- D. Deformed-Steel-Welded Wire Fabric: ASTM A 497, cold drawn.
- E. Prestressing Strand: ASTM A 416, Grade 250 or 270 (ASTM A 416M, Grade 1725 or 1860), uncoated, 7-wire, low-relaxation strand.
- F. Portland Cement: ASTM C 150, Type I or Type III.
- G. Fly Ash: ASTM C 618, Class C or F.
- H. Silica Fume: ASTM C 1240, amorphous silica.
- I. Normal-Weight Aggregates: ASTM C 33, Class 4S.
- J. Air-Entraining Admixture: ASTM C 260.
- K. Chemical Admixtures: ASTM C 494, water reducing, high-range water reducing, water reducing and accelerating, and water reducing and retarding]. Do not use admixtures containing chlorides.

2.2 ACCESSORIES AND FINISHES

- A. Steel Shapes and Plates: ASTM A 36 (ASTM A 36M).
- B. Bolts and Studs: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Hot-dip galvanize steel items adjacent to or exposed to the exterior according to ASTM A 153.
 - 2. Shop-Primed Finish: Prepare surfaces of steel items according to SSPC-SP 3 and shop apply fast-curing, lead- and chromate-free, VOC-conforming, universal modified-alkyd primer according to SSPC-PA 1.
- C. Bearing Pads: By Korolath
- D. Grout: ASTM C 150, Type I, portland cement, water, and clean, natural sand.

2.3 CONCRETE MIX

- A. Proportion normal-weight concrete mixes to provide the following properties:
 - 1. Compressive Strength: As required by design.
 - 2. Water-Cementitious Materials Ratio: 0.40 maximum.
 - 3. Air Content: 5.5 to 7.5 percent for concrete exposed to freezing and thawing, 2.5 to 4.5 percent elsewhere.
- B. Concrete Mixing: Comply with ASTM C 94.
- C. Finishes: Standard, Scratch finish unformed surfaces to receive concrete topping.
- D. Replace precast concrete units deficient in strength, manufacturing tolerances, and finishes.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install bearing pads true, level, and on uniform bearing surfaces.
- B. Protect precast units and bearing pads from damage during welding.
- C. Install precast units level, plumb, square, and true, within the recommended erection tolerances of PCI's "Recommended Practice for Erection of Precast Concrete."
- D. Shore and brace precast concrete units to maintain location, stability, and alignment until permanent connections are installed.
- E. Grout open spaces at keyways, connections, and joints after precast concrete units have been placed and secured.
- F. Clean exposed surfaces of precast concrete units after erection.

END OF SECTION 03410

SECTION 03650
GYPSUM CONCRETE UNDERLayment

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Liquid applied, gypsum based, self leveling floor underlayment.
 - 2. Sound control mat.
- B. Related Sections:
 - 1. Division 01: Administrative, procedural, and temporary work requirements.

1.2 REFERENCES

- A. ASTM International (ASTM):
 - 1. C472 - Standard Test Method for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
 - 2. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
 - 4. E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine.

1.3 SUBMITTALS

- A. Submittals for Review:
 - 1. Product Data: Manufacturer's mixing and application instructions.

1.4 QUALITY ASSURANCE

- A. System Performance Characteristics:
 - 1. Sound Transmission Class (STC): Minimum [50], tested to ASTM E90.
 - 2. Impact Insulation Class (IIC): Minimum [50], tested to ASTM E492.
 - 3. Fire Hazard Classification: Flame spread/smoke developed rating of [0/0] [__/__], tested to ASTM E84.

1.5 PROJECT CONDITIONS

- A. Environmental Requirements:
 - 1. Perform work at ambient temperatures above 50 degrees F.
 - 2. Provide ventilation to remove excess moisture.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Hacker Industries, Inc. (www.hackerindustries.com)
 - 2. Maxxon Corp. (www.maxxoncorporation.com)
 - 3. United States Gypsum Co. (www.levelrock.com)
- B. Substitutions: [Under provisions of Division 01.] [Not permitted.]

2.2 MATERIALS

- A. Gypsum Concrete Floor Underlayment:
 - 1. Type: Self leveling, gypsum based.

2.3 ACCESSORIES

- A. Sand: Clean, washed, natural or manufactured, graded according to underlayment manufacturer's requirements.
- B. Water: Clean, potable.
- C. Primer: As recommended by underlayment manufacturer.
- D. Joint and Crack Filler: Latex based.

2.4 MIXES

- A. Follow manufacturer's instructions.
- B. Mix to self leveling consistency.
- C. Compressive Strength: Minimum [2500] psi at 28 days, tested to ASTM C472.
- D. Dry Density: Minimum 115 pcf.

PART 3 EXECUTION

3.1 PREPARATION

- A. Fill cracks, voids and joints with joint filler; finish smooth.
- B. Apply primer to surfaces to receive underlayment; follow manufacturer's instructions.

3.2 INSTALLATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Place gypsum underlayment to [3/4] inch thickness.
- C. Spread and float underlayment to smooth, level surface.
- D. Place underlayment continuously without seams except at predetermined joints.
- E. Provide continuous ventilation and heat as required to remove moisture from areas until underlayment sets.
- F. Installation Tolerances:
 - 1. Maximum variation in subfloor surface: Plus or minus [1/8] inch in 10 feet, noncumulative.

END OF SECTION

SECTION 04810 - UNIT MASONRY

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Samples for face brick.
- B. Comply with ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

- A. Concrete Masonry Units: ASTM C 90; Weight Classification, Normal Weight, Type I, moisture-controlled units.
 - 1. Special shapes for lintels, corners, jambs, sash, control joints, and other special conditions.
 - 2. Square-edged units for outside corners, unless otherwise indicated.
 - 3. Decorative 4"x 12"x24" Techture Stone by Anchor Block Company, color selected from manufacturers standard. Locations as show on the drawings
- B. Face Brick: ASTM C 216, Grade SW, Type FBX.
 - 1. Size: King Size
 - 2. Solid brick with exposed surfaces finished for ends of sills and caps.
 - 3. Special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

2.2 MORTAR AND GROUT

- A. Mortar: ASTM C 270, proportion specification
 - 1. Masonry Cement: Do not use masonry cement.
 - 2. Do not use calcium chloride in mortar.
 - 3. For masonry below grade or in contact with earth, use Type S.
 - 4. For reinforced masonry, use Type S.
 - 5. For interior non-load-bearing partitions, and for other applications where another type is not indicated, use Type N.
 - 6. Mortar Color: Mortar for Brick Masonry shall match Brick
- B. Grout: ASTM C 476 with a slump of 8 to 11 inches (200 to 280 mm).

2.3 REINFORCEMENT, TIES, AND ANCHORS

- A. Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 400).
- B. Veneer Anchors: Two-piece adjustable masonry veneer anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to studs, and acceptable to authorities having jurisdiction.

2.4 EMBEDDED FLASHING MATERIALS

- A. Sheet Metal Flashing: Copper, 10-oz./sq. ft. (3-kg/sq. m) weight or 0.0135 inch (0.3 mm) thick for fully concealed flashing, 16-oz./sq. ft. (5-kg/sq. m) weight or 0.0216 inch (0.5 mm) thick elsewhere.
- B. Laminated Flashing: Copper sheet 7 oz./sq. ft. (2 kg/sq. m), bonded with asphalt between 2 layers of glass-fiber cloth.
- C. Rubberized Asphalt Sheet Flashing: Pliable and highly adhesive rubberized asphalt compound, 26 mils (0.7 mm) thick, bonded to a polyethylene film, 4 mils (0.1 mm) thick, to produce an overall thickness of 30 mils (0.8 mm).

2.5 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded strips complying with ASTM D 1056, Grade 2A1.
- B. Weep Vents: Weep Vents shall be by Mortar Net.
- C. Job-Mixed Masonry Cleaner: 1/2-cup (0.14-L) tetrasodium polyphosphate and 1/2-cup (0.14-L) laundry detergent dissolved in 1 gal. (4 L) of water.
- D. Acidic Masonry Cleaner: Submittal required for approval.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cut masonry units with saw. Install with cut surfaces and, where possible, cut edges concealed.
- B. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.
- C. Stopping and Resuming Work: Rack back units; do not tooth.
- D. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

- E. Tool exposed joints slightly concave when thumbprint hard, unless otherwise indicated.
- F. Keep cavities clean of mortar droppings and other materials during construction. Strike joints facing cavities flush.
- G. Install King Size brick on all apartment building.

LINTELS

- A. Install steel lintels where indicated. Steel lintels shall be hot dipped galvanized.
- B. Provide masonry lintels where shown.
- C. Minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.2 FLASHING AND WEEP HOLES

- A. 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. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing before covering with mortar.
 - 1. Extend flashing 4 inches (100 mm) into masonry at each end and turn up 2 inches (50 mm) to form a pan.
- C. Trim wicking material used in weep holes flush with outside face of wall after mortar has set.

3.3 FIELD QUALITY CONTROL

3.4 CLEANING

- A. Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly cured, remove large mortar particles, scrub, and rinse unit masonry.
 - 1. Wet wall surfaces with water before applying acidic cleaner, then remove cleaner promptly by rinsing thoroughly with clear water.

END OF SECTION 04810

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings
- B. Comply with AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design," RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts," and AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL AND ACCESSORIES

- A. Structural-Steel Shapes, Plates, and Bars: ASTM A 572/A 572M, Grade 50, high-strength, low-alloy columbium-vanadium steel.
- B. Cold-Formed Structural-Steel Tubing: ASTM A 500, Grade B.
- C. Anchor Rods, Bolts, Nuts: ASTM A 36/A 36M, unheaded rods
- D. Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); nonhigh-strength carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers, uncoated
- E. Primer: Lead- and chromate-free, nonasphaltic, rust-inhibiting primer.
- F. Grout: ASTM C 1107, nonmetallic, shrinkage resistant, premixed.

2.2 FABRICATION

- A. Fabricate structural steel according to AISC specifications and tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.
- B. Shop Priming: Prepare surfaces according to SSPC-SP 2 or SSPC-SP 3. Shop prime steel to a dry film thickness of at least 1.5 mils (0.038 mm). Do not prime surfaces to be embedded in concrete or mortar or to be field welded.

PART 3 - EXECUTION

3.1 ERECTION

- A. Erect structural steel according to AISC specifications and within erection tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

- B. Set base and bearing plates on wedges, shims, or setting nuts. Tighten anchor bolts, cut off wedges or shims flush with edge of plate, and pack grout solidly between bearing surfaces and plates.
- C. Bolted Connections: Install and tighten nonhigh-strength bolts, unless high-strength bolts are indicated. Snug tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Weld Connections: Comply with AWS D1.1.

END OF SECTION 05120

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings showing details of fabrication and installation.

PART 2 - PRODUCTS

2.1 METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.
- C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), black finish.

2.2 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107; recommended by manufacturer for exterior applications.

2.3 FABRICATION

- A. General: Shear and punch metals cleanly and accurately. Remove burrs and ease exposed edges. Form bent-metal corners to smallest radius possible without impairing work.
- B. Welding: Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. At exposed connections, finish welds and surfaces smooth with contour of welded surface matching those adjacent.
- C. Fabricate ladders for roof access as shown, complying with ANSI A14.3, welded steel construction.
 - 1. For elevator pit ladders, comply with ASME A17.1.
- D. Fabricate loose lintels from steel angles and shapes. Size to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm).
- E. Fabricate steel pipe columns with steel base and top plates drilled for anchor and connection bolts and welded to pipe with continuous fillet weld same size as pipe wall thickness.
 - 1. Provide Base plates and top and bottom as per structural drawings..
- F. Fabricate pipe bollards from Schedule 40 steel pipe.

2.4 STEEL AND IRON FINISHES

- A. Hot-dip galvanize steel fabrications at exterior locations.
- B. Prepare uncoated ferrous metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning," and paint with a rust-inhibitive primer complying with performance requirements of FS TT-P-664.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. 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.
- B. Fit exposed connections accurately together to form hairline joints.
- C. Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.
- D. Anchor bollards in concrete and fill solidly with concrete, mounding top surface.

END OF SECTION 05500

SECTION 05520 - HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Structural Performance: Design, engineer, fabricate, and install handrails and railings to withstand structural loads required by ASCE 7.
- B. Submittals: Shop Drawings

PART 2 - PRODUCTS

2.1 METALS

- A. Steel Pipe: ASTM A 53, Schedule 40.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 OTHER MATERIALS

- A. Wood Handrails and Rails: Hardwood handrails and rails of species and profile indicated.
- B. Aluminum Deck Railings: Provide prefinished aluminum deck railings as shown on exterior building elevations.
- C. Steel Pipe Railings: Provide steel pipe railings around stair openings as shown on the drawings.

2.3 FABRICATION

- A. Form changes in direction of railing members by mitering at elbow bends
- B. Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- C. Provide wall returns at ends of wall-mounted handrails.

2.4 FINISHES

- A. Steel Railings: Cleaned, shop primed, and enamel painted finish.
- B. Wood Railings: Stained and transparent finish.
- C. Aluminum Railings: Powdercoated white.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Set handrails and railings accurately in location, alignment, and elevation and free from rack.
- C. Attach handrails to wall with wall brackets.

END OF SECTION 05520

SECTION 06100- ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Model code evaluation reports for engineered wood products.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Dressed lumber, S4S, 19 percent maximum moisture content for 2-inch (38-mm) thickness or less, marked with grade stamp of inspection agency.

2.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWPA C2 lumber and AWPA C9 plywood, labeled by an inspection agency approved by ALSC's Board of Review. After treatment, kiln-dry lumber and plywood to 19 and 15 percent moisture content, respectively. Treat indicated items and the following:

1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches (460 mm) above grade.
4. Wood floor plates installed over concrete slabs directly in contact with earth.

2.3 LUMBER

- A. Dimension Lumber: The following grades per inspection agency indicated.

1. Non-Load-Bearing Interior Partitions: Spruce, Pine Fir, No. 2 or better
2. Framing Other Than Non-Load-Bearing Partitions: Spruce, Pine, Fir, No. 2 or better.

- B. Timbers 5-Inch Nominal (117-mm Actual) Size and Thicker: Douglas fir-larch, Select Structural per NLGA, WCLIB, or WWPA rules or Southern pine, No. 1 Dense per SPIB rules.

- C. Miscellaneous Lumber: No. 3 or Standard grade of any species for nailers, blocking, and similar members.

- D. Composite Decking: Provide 2 x 6 composite decking for apartment unit decks and common breezeway areas. Provide Trex Decking or approved equal.

2.4 PANEL PRODUCTS

- A. Wood-Based Structural-Use Sheathing: DOC PS 2.
 - 1. Factory mark panels evidencing compliance with grade requirements.
 - 2. Provide panels with span ratings required by support spacing indicated.
 - 3. Subfloor: DOC PS 2, $\frac{3}{4}$ " T & G OSB, Exposure 1.
 - 4. Wall Sheathing main apartment buildings: ZIP Wall Sheathing, 1/2" thickness
 - 5. Roof Sheathing: DOC PS 2, OSB, Exterior Grade.
 - 6. Wall Sheathing Garage Buildings: DOC PS2, OSB, Exterior Grade.

2.5 MISCELLANEOUS PRODUCTS

- A. Fasteners: Size and type indicated. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
 - 1. Power-Driven Fasteners: CABO NER-272.
 - 2. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- B. Metal Framing Anchors: Hot-dip galvanized steel of structural capacity, type, and size indicated.
- C. Sill-Sealer: Glass-fiber insulation, 1-inch (25-mm) thick, compressible to 1/32 inch (0.8 mm).
- D. Adhesives for Field Gluing Panels to Framing: APA AFG-01.
- E. ZIP-tape for sealing joints of ZIP wall sheathing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fit rough carpentry to other construction; scribe and cope for accurate fit. Correlate location of furring, blocking, and similar supports to allow attachment of other construction.
- B. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Published requirements of metal framing anchor manufacturer.
 - 2. "Table 2304.9.1 Fastening Schedule" of the International Building Code.

- C. Installation of Structural-Use Panels: Comply with applicable recommendations contained in APA Form No. E30 and as follows:
 - 1. Sub-flooring: Glue and nail to framing.
 - 2. Wall Sheathing: Nail to framing as per manufacturers requirements.
 - 3. Roof Sheathing: Nail to framing. Provide H clips at butt joints between each truss.
- D. Install sill sealer to all plates so that no wood is in contact with concrete or masonry.
- E. Install ZIP tape at all horizontal and vertical joints per manufacturers requirements.

END OF SECTION 06100

SECTION 06105 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Dressed lumber, S4S, 15 percent maximum moisture content for 2-inch (38-mm) thickness or less, marked with grade stamp of inspection agency.

2.2 TREATED MATERIALS

- A. Preservative-Treated Materials: AWPA C2 lumber and AWPA C9 plywood, labeled by an inspection agency approved by ALSC's Board of Review. After treatment, kiln-dry lumber and plywood to 19 and 15 percent moisture content, respectively. Treat indicated items and the following:
 1. Wood members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Concealed members in contact with masonry or concrete.
 3. Wood framing members less than 18 inches (460 mm) above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.

2.3 LUMBER

- A. Interior Partition Framing: Standard, Stud, or No. 3 grade: Eastern softwoods: NELMA; Northern species: NLGA; Mixed southern pine: SPIB; or Western woods: WCLIB or WWPA.
- B. Other Framing: Construction or No. 2 grade: Southern pine: SPIB; Douglas fir-larch: NLGA, WCLIB, or WWPA; Hem-fir: NLGA, WCLIB, or WWPA; or Douglas fir south: WWPA.
- C. Exposed Boards: Eastern white pine, D Select; Southern pine, C Finish; Hem-fir, C & Btr or C Select; Spruce-pine-fir, C & Btr or C Select; or Western or Idaho white pine, Choice.
- D. Concealed Boards: Eastern softwoods, No. 3 Common; Northern species, No. 3 Common or Standard; Mixed southern pine, No. 2; or Western woods, Standard or No. 3 Common.
- E. Miscellaneous Lumber: No. 3 or Standard grade of any species for nailers, blocking, and similar members.

2.4 FASTENERS

- A. Fasteners of size and type indicated. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.
 - 1. Power-Driven Fasteners: CABO NER-272.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fit carpentry to other construction; scribe and cope for accurate fit. Correlate location of furring, blocking, and similar supports to allow attachment of other construction.
- B. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- C. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

END OF SECTION 06105

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.
2. Wood floor trusses.
3. Wood girder trusses.

1.2 ALLOWANCES

- A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

1.3 ACTION SUBMITTALS

- A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

- B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

- C. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Professional Engineer shall be registered in the State of Wyoming.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.

- B. Evaluation Reports: For the following, from ICC-ES:

1. Metal-plate connectors.
2. Metal truss accessories.

1.5 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses shall be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

- B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
 2. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Allowable design loads, as published by manufacturer, shall comply with or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

2.6 FABRICATION

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- F. Securely connect each truss ply required for forming built-up girder trusses.
- G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install bracing to comply with Section 061000 "Rough Carpentry."
 - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION 061753

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL (Not Applicable)

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber Standards: DOC PS 20 and grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
- B. Softwood Plywood: DOC PS 1.
- C. Hardwood Plywood: HPVA HP-1.

2.2 STANDING AND RUNNING TRIM

- A. Interior trim: Trim for doors, windows, openings, and base shall be MDF primed white.
- B. Provide finger joint, mdf, primed split jambs at all interior apartment pre-hung doors with applied casing 2 sides primed white as manufactured by Woodwork Mfg & Supply, Hutchinson, KS.
- C. Provide quarter round trim at all kitchen cabinet base, bath vanity base, and wall base conditions in contact with sheet vinyl flooring. Color of trim shall match cabinet base color and wall base color respectively.
- D. Shelving: Wire shelving system by Closetmaid or approved equal. (Apartment Units)
- E. Clothes Rods: Wire shelving system by Closetmaid or approved equal. (Apartment Units)
- F. Special trim: See Drawings for special requirements in first floor common areas. Room Finish Schedule and Room Finish notes identify locations for Chair rails, Crown moldings, 4" wood base, etc.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Condition finish carpentry in installation areas for 24 hours before installing.
- B. Prime and backprime lumber for painted finish exposed on the exterior.
- C. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Scribe and cut to fit adjoining work. Refinish and seal cuts.
- D. Install standing and running trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Stagger joints in adjacent and related trim. Cope at returns and miter at corners.

- E. Install wire shelving and clothes rod systems to solid wood blocking installed between studs. Anchoring to drywall only will not be allowed.

END OF SECTION 06200

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Shop Drawings and samples showing the full range of colors, textures, and patterns available for each type of finish.
- B. Quality Standard: Architectural Woodwork Institute's "Architectural Woodwork Quality Standards."
- C. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Kitchen Cabinets: Leedo Cabinetry, Maple, style: Freeport, Color: Bordeaux, or approved equal.
- B. Bath Vanities: Leedo Cabinetry, Thermofoil, style: Blanco, Color: White, or approved equal.
- C. High-Pressure Decorative Laminate for Kitchen Cabinets and Bath Vanity Countertops: NEMA LD 3.
 - 1. Formica Corporation, Nevamar Corporation, Ralph Wilson Plastics Co. or approved equal.

2.2 CABINET HARDWARE AND ACCESSORY MATERIALS

- A. Provide cabinet manufacturers standard hardware. Provide drawer and door pulls. Selection shall be made from manufacturers standards for decorative hardware.

2.3 INTERIOR WOODWORK

- A. Complete fabrication before shipping to Project site to maximum extent possible. Disassemble only as needed for shipping and installing. Where necessary for fitting at Project site, provide for scribing and trimming.
- B. Backout or groove backs of flat trim members, kerf backs of other wide, flat members, except for members with ends exposed in finished Work.

2.4 SHOP FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

- A. Finishes: Same grades as items to be finished.
- B. Finish architectural woodwork at the fabrication shop; defer only final touch up until after installation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Condition woodwork to prevailing conditions before installing.
- B. Install woodwork to comply with AWI Section 1700 for grade specified.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for level and plumb.
- D. Scribe and cut woodwork to fit adjoining work, seal cut surfaces, and repair damaged finish at cuts.
- E. Install trim with minimum number of joints possible, using full-length pieces to the greatest extent possible. Stagger joints in adjacent and related members.
- F. Anchor countertops securely to base units. Seal space between backsplash and wall.
- G. Provide matching filler strips and toe base as required on all kitchen and bath cabinets.

END OF SECTION 06402

SECTION 07131 - COMPOSITE SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, and Shop Drawings
- B. Installer Qualifications: Certified in writing by waterproofing manufacturer.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

- A. Rubberized-Asphalt Composite Sheet: 60-mil- (1.5-mm-) thick, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil- (0.10-mm-) thick polyethylene film with release liner on adhesive side.
- B. Auxiliary Materials: Primer, sheet flashing, liquid membrane, patching membrane, and liquid mastics recommended by waterproofing manufacturer.
- C. Protection Course: Semi-rigid sheet with reinforced asphaltic core, 1/8 inch (3 mm) thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Clean, prepare, and treat substrate. Remove grease, oil, form-release agents, and other contaminants. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids. Rout and fill joints and cracks in substrate.
 - 1. Install membrane strip over joints and cracks exceeding a width of 1/16 inch (1.6 mm).
- C. Prepare, prime, and treat inside and outside corners, terminations, penetrations, drains, and protrusions.
- D. Prime substrate and allow to dry.
- E. Apply and firmly adhere self-adhering composite sheet. Accurately align sheets and maintain uniform laps. Overlap and seal seams and stagger end laps to ensure watertightness.
- F. Repair and patch tears, voids, and lapped seams in waterproofing. Slit and flatten fishmouths and blisters. Patch with sheet membrane extending 6 inches (150 mm) beyond repaired areas.
- G. Install protection course over waterproofing membrane using tape or adhesive.
- H. Protect waterproofing from damage and wear during construction.

- I. Location of waterproofing requirements: Elevator pit and Garage Building retaining wall
- J. END OF SECTION 07131

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data for each type of insulation product specified.
- B. Surface-Burning Characteristics: ASTM E 84, flame-spread ratings of 75 or less and smoke-developed ratings of 450 or less.

PART 2 - PRODUCTS

2.1 INSULATION PRODUCTS

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 2" thickness, R-10, at foundation perimeters.
- B. Mineral-Fiber-Blanket Insulation: ASTM C 665, Type I, unfaced, with fibers manufactured from glass. Minimum R value required for exterior wall applications is R-21.
- C. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type 1, pneumatic application or Type 2, poured application. Minimum R value required for attic applications is R-50.
- D. Glass-Fiber Sound Attenuation Batt Insulation: ASTM C 665, Type 1 and ASTM E 136, 3 ½" thickness, at apartment party walls, where abutting common areas and building corridors.

2.2 ACCESSORIES

- A. Adhesive and Anchors: As recommended by insulation manufacturer.
- B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed to fit between roof framing members and to provide cross-ventilation between attic spaces and vented eaves.

PART 3 - EXECUTION

PART 4 - INSTALLATION

- A. Install insulation in areas and in thicknesses indicated or required to produce R-values indicated. Cut and fit tightly around obstructions and fill voids with insulation.
- B. Place loose-fill insulation to comply with ASTM C 1015.

END OF SECTION 07210

SECTION 07311 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and Samples.
- B. Identify each bundle of shingles with appropriate markings of UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Test-Response Classification: ASTM E 108 or UL 790, Class A.
 - 2. Wind-Resistance-Test Characteristics: ASTM D 3161 or UL 997, passed.

PART 2 - PRODUCTS

2.1 ASPHALT SHINGLES

- A. Fiberglass Shingles: Mineral-surfaced, self-sealing, laminated, multilayer, 3-dimensional, Class A fiberglass-based asphalt shingles; complying with ASTM D 3462, and ASTM D 3161. Provide a limited lifetime transferable warranty. UL 997 Wind Test, passed.
- B. Provide Certainteed Independence Shingle, minimum weight of 300 pounds per square. Color shall be selected from manufacturers standard. Provide ridge cap shingles at all ridges.
- C. Other Approved Manufacturers: GAF, Tamko, and Owens Corning.

2.2 ACCESSORIES

- A. Underlayment: Glass felt, ASTM D 2178, Type IV, Class A.
- B. Waterproof Underlayment (Ice dam protection): Minimum 40-mil- (1-mm-) thick, self-adhering, polymer-modified, bituminous sheet membrane; complying with ASTM D 1970.
- C. Roof Ventilators: Provide prefinished metal, color to match roof, high performance, square slant back roof ventilator. Provide GAF Masterflow SSB960A or approved equal. Ventilation shall be as per IBC requirements. Provide color to match roof shingles.
- D. Sheet metal products fabricated from aluminum, ASTM B 209 (ASTM B 209M), alloy 3003 H14 with mill finish, minimum 0.024 inch (0.6 mm) Prefinished color coating to match roof color.
 - 1. Metal Drip Edge: Brake-formed sheet metal with at least a 2-inch (50-mm) roof deck flange and a 1-1/2-inch (38-mm) fascia flange with a 3/8-inch (9.6-mm) drip at lower edge. Furnish in lengths of 8 or 10 feet (2.5 or 3 m).
 - 2. Metal Flashing: Job-cut to sizes and configurations required.

3. Open-Valley Metal Flashing: Preformed, inverted-V profile at center of valley and extending at least 9 inches (230 mm) in each direction from centerline of valley.
- E. Asphalt Plastic Cement: ASTM D 4586.
- F. Nails: Aluminum or hot-dip galvanized steel conventional roofing nails of sufficient length to penetrate 3/4 inch (19 mm) into solid decking or at least 1/8 inch (3 mm) through plywood sheathing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with instruction in ARMA's "Residential Asphalt Roofing Manual" or NRCA's "The NRCA Steep Roofing Manual."
- B. Apply waterproof underlayment at eaves and in place of felt underlayment at valleys. Cover deck from eaves to at least 24 inches (600 mm) inside exterior wall line.
- C. Install valleys complying with ARMA and NRCA instructions. Construct sheet metal open valleys.
- D. Install metal flashing and trim according to details and instructions of NRCA's "The NRCA Steep Roofing Manual": Section "Asphalt Roofing," and ARMA's "Residential Asphalt Roofing Manual."
- E. Install asphalt shingles with a weather-exposure pattern of 5 inch (125 mm offset at succeeding course.
- F. Install roof vents according to manufacturer's written instructions.

END OF SECTION 07311

SECTION 07460 - SIDING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data for siding. Include installation instructions and available profiles, textures, and colors.
 - 1. Submit Samples of finishes showing the full range of colors, profiles, and textures available.
 - 2. Submit research/evaluation reports from a model code organization acceptable to authorities having jurisdiction.
- B. Warranties: Submit a written warranty, executed by siding manufacturer, agreeing to repair or replace siding that fails in materials or workmanship within 30 years. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering.

PART 2 - PRODUCTS

2.1 SIDING

- A. Fiber Cement Siding: Siding manufactured by James Hardie or approved equal.
- B. See elevations and schedule located on the drawings for type, sizes, and colors.
- C. Corner Trim: Inside corners, outside corners and perimeter window trim for windows located in siding shall be 1x4 nominal Hardie Trim. Color of trim shall be selected in shop drawing stage.

2.2 SOFFIT

- A. Aluminum Soffit: AAMA 1402.
 - 1. Alcoa Aluminum Traditional Soffit, .019" nominal gauge.
 - 2. Pattern: 12-inch (305-mm) exposure in double 6-inch (152-mm) style.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fiber cement siding, trim and accessories according to ASTM D 4756.
- B. For locations of different fiber cement siding types and colors see exterior building elevations.

C. Install aluminum soffit and accessories according to AAMA 1402.

END OF SECTION 07460

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and Samples.

PART 2 - PRODUCTS

2.1 SHEET METAL

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275), mill phosphatized where indicated for painting; at least 0.0396 inch (1.0 mm) thick.

2.2 FLASHING AND TRIM

- A. Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Coil-coat galvanized steel sheet with 2-coat fluoropolymer Hylar 5000 or Kynar 500 finish.
- C. Finish gutters, downspouts, and similar exposed units with baked-on, acrylic shop finish; 1.0-mil (0.025-mm) dry film thickness, colors selected from manufacturers standards.

2.3 ACCESSORIES

- A. Solder: ASTM B 32, Grade Sn50.
- B. Asphalt Mastic: SSPC-Paint 12, asbestos free, solvent type.
- C. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with SMACNA's "Architectural Sheet Metal Manual." Allow for thermal expansion; set true to line and level. Install Work with laps, joints, and seams permanently watertight and weatherproof; conceal fasteners where possible.

1. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.
- B. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
- C. Fabricate nonmoving seams in sheet metal with flat-lock seams. For metals other than aluminum, tin edges to be seamed, form seams, and solder.
 1. Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), unless pre-tinned surface would show in finished Work.
- D. Separations: Separate noncompatible metals or corrosive substrates with a coating of asphalt mastic or other permanent separation.

END OF SECTION 07620

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under service and application conditions.
- B. Elastomeric Sealants: Comply with ASTM C 920.
 1. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, M, and O, with the additional capability to withstand 50 percent movement in both extension and compression for a total of 100 percent movement. Use for building expansion joints.
 2. Single-component, non-sag polysulfide sealant, Type S; Grade NS; Class 12-1/2; Uses NT, M, G, A, and O. For general exterior use.
 3. Single-component, neutral-curing silicone sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. For general exterior use.
 4. Single-component, non-sag urethane sealant, Type S; Grade NS; Class 25; and Uses NT, M, A, and O. For general exterior use.
 5. Single-component, non-sag urethane sealant, Type S; Grade NS; Class 25; Uses T, NT, M, G, A, and O. Use for exterior traffic-bearing joints, where slope precludes use of pourable sealant.
 6. Single-component, pourable urethane sealant, Type S; Grade P; Class 25; Uses T, M, G, A, and O. Use for exterior traffic-bearing joints.
 7. Single-component, mildew-resistant silicone sealant, Type S; Grade NS; Class 25; Uses NT, G, A, and O; formulated with fungicide. Use for interior sealant joints in ceramic tile, stone, and other hard surfaces in kitchens and toilet rooms and around plumbing fixtures.
- C. Latex Sealant: Single-component, non-sag, mildew-resistant, paintable, acrylic-emulsion sealant complying with ASTM C 834. For interior use only at perimeters of door and window frames.
- D. Acoustical Sealant for Exposed Joints: Non-sag, paintable, non-staining, latex sealant complying with ASTM C 834. For interior use only at acoustical assemblies.
- E. Acoustical Sealant for Concealed Joints: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound. For interior use only at acoustical assemblies.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with ASTM C 1193.
- B. Comply with ASTM C 919 for use of joint sealants in acoustical applications.
- C. Caulk all interior door and window trim and wall base to drywall conditions.
- D. Caulk all interior counter tops and backsplashes to drywall conditions.
- E. Caulk all interior plumbing fixture conditions in contact with floors or walls.

END OF SECTION 07920

SECTION 08110 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and door schedule.
- B. Comply with ANSI/SDI 100.
- C. Fire-Rated Door Assemblies: NFPA 80, tested per ASTM E 152, and labeled and listed by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Hot-Rolled Steel Sheets: ASTM A 569/A 569M.
- B. Cold-Rolled Steel Sheets: ASTM A 366/A 366M or ASTM A 620/A 620M.
- C. Galvanized Steel Sheets: ASTM A 653/A 653M, commercial steel, or ASTM A 642/A 642M, drawing quality, with A60 or G60 (ZF180 or Z180) coating designation, mill phosphatized.

2.2 STEEL DOORS AND FRAMES

- A. Steel Doors: 1-3/4-inch- (44-mm-) thick of materials and ANSI/SDI 100 grades and models specified below.
 - 1. Exterior Doors: Grade III, extra heavy-duty, Model 2, seamless design, minimum 0.0635-inch- (1.6-mm-) thick, galvanized steel sheet faces, insulated with minimum NFRC tested U-value of 0.20.
 - 2. Exterior Apartment Entry Doors: By TruDoor, 4655 W. McDowell Rd, Ste 107, Phoenix, AZ. Six Panel Embossed Hollow Metal Door w/Frame, HD 18 Gauge A-40 Galvannealed Steel, Insulated Polystyrene Core, 1 3/4" Thickness, ADA compliant bottom rail, Factory Baked on Rust Inhibiting Primer, Fire Rated for 60 minutes, Meets or Exceeds ANSI 250.4 and ANSI 250.8.
- B. Door Silencers: Three on strike jambs of single-door frames and two on heads of double-door frames.
- C. Fabricate steel frames to be rigid, neat in appearance, and free from defects, warp, or buckle.
 - 1. Exterior Frames: Fabricate with mitered or coped and continuously welded corners, formed from 0.0635-inch- (1.6-mm-) thick, galvanized steel sheet.
- D. Prepare doors and frames to receive mortised and concealed hardware according to SDI 107.

- E. Prime Coat: Uncoated steel at interior conditions, ANSI A224.1 shop primer, and Galvanized steel at exterior conditions, FS TT-P-641, Type II zinc-dust, zinc-oxide primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Place steel frames to comply with SDI 105.
- B. Install steel doors accurately in frames, within clearances specified in ANSI/SDI 100.
 - 1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
 - 2. Smoke-Control Doors: Comply with NFPA 105.
- C. Prime Coat Repair: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and repair finish with compatible air-drying primer.
- D. Install doors and frames at storm shelter locations.

END OF SECTION 08110

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Samples for factory-finished doors.
- B. Quality Standard: NWWDA I.S.1-A.
- C. Fire-Rated Wood Doors: Labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing per NFPA 252. Test at atmospheric pressure.
 - 1. At stairs, provide doors that have a temperature rise rating of 450 deg F (250 deg C).

PART 2 - PRODUCTS

2.1 FLUSH WOOD DOORS

- A. Hollow Core Doors with Embossed Hardboard Faces: Three-ply, Standard hollow core with lock blocks both sides and top and bottom rail blocking. Finish shall be factory primer to receive final painting
- B. Doors shall be as manufactured by Lynden Door Inc.
- C. Door style shall be Colonist.

2.2 FABRICATION AND FINISHING

- A. Factory fit doors to suit frame-opening sizes indicated and to comply with referenced quality standard.
 - 1. Comply with NFPA 80 for fire-resistance-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
- C. Cut and trim openings to comply with referenced standards.
 - 1. Trim light openings with moldings indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install doors to comply with referenced quality standard.
 - 1. Install fire-rated doors to comply with NFPA 80.
- B. Align and fit doors in frames with uniform clearances and bevels. Machine doors for hardware. Seal cut surfaces after fitting and machining.
- C. Align factory-fitted doors in frames for uniform clearances.
- D. Repair, refinish, or replace factory-finished doors damaged during installation, as directed by Architect.

END OF SECTION 08211

SECTION 08310 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Where fire-rated access doors are required, provide doors that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per UL 10B for vertical installations and ASTM E 119 for horizontal installations and are labeled and listed by a testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

- A. Insulated, Fire-Rated Access Doors for attic access: Steel self-latching units with automatic closer, welded pan type, with frame with exposed trim.
- B. Locks: Flush to finished surface, screwdriver operated..

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install access doors and panels accurately in position. Adjust hardware and door and panels for proper operation.
- B. Install firerated access doors and panels according to NFPA 80.

END OF SECTION 08310

SECTION 08561 - VINYL WINDOWS AND VINYL SLIDING GLASS DOORS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and color Samples.

PART 2 - PRODUCTS

2.1 VINYL WINDOWS

- A. Premium Vinyl Single Slider windows, Series 3580, as manufactured by MI Windows and Doors or approved equal.
- B. Provide vinyl windows that comply with AAMA/NWWDA 101/I.S.2.
 1. Provide AAMA-certified vinyl windows with an attached label.
 2. Provide units labeled and certified according to Energy Star requirements for Northern Zone.
 3. Equip units with charcoal gray coated aluminum mesh insect screens at operable sashes.
 4. Equip units with grilles as indicated on exterior building elevations, grilles shall be between glass panels.
 5. Window Color: White.
 6. Equip units with hardware to meet minimum egress requirements.
- C. Premium Vinyl Sliding Glass Doors, Series 910 as manufactured by MI Windows and Doors or approved equal. Equip units same as windows with the exception of grilles.
- D. Glaze units with clear, low-e coated, argon-filled, sealed insulating glass.
- E. Provide ADA compliant windows at all handicapped accessible units in the project. These windows may need to be casement windows. Verify with window manufacturer.
- F. Windows and Patio Doors shall be Energy Star qualified for Northern Zone.
- G. Warranty: Provide limited lifetime warranty.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set units level, plumb, and true to line, without warp or rack of frames and panels and anchor securely in place.
- B. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.
- C. Adjust operating panels, screens, and hardware for smooth operation and weathertight closure. Lubricate hardware and moving parts.

END OF SECTION 08561

SECTION 08710- DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Hardware Schedule.
- B. Deliver keys to Owner.
- C. For fire-rated openings provide hardware tested and listed by UL or FM (NFPA 80). On exit devices provide UL or FM label indicating "Fire Exit Hardware."

PART 2 - PRODUCTS

- A. Key locks to Owner's new master-key system.
 - 1. Cylinders with six-pin tumblers.
 - 2. Provide key control system, including cabinet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount hardware in locations recommended by the Door and Hardware Institute, unless otherwise indicated.

3.2 HARDWARE SCHEDULE

<u>Hardware Set # 1</u>	<u>SD/SF</u>	<u>Entry - (Taylor) Pre-hung</u>	<u>Handing</u>
<u>Qty per opening</u>		<u>Description</u>	<u>Mfg / Finish</u>
2	each	Spring hinges w/pre-hung	US26D
1	each	Ball bearing hinges w/pre-hung	US26D
1	each	3710 Interconnect AUG lever 2-3/4 BS 6pin SCC	US26D/Hager
1	each	S88 smoke seal 17'	D/PEMKO
1	each	Viewer w/pre-hung (2 on ADA)	US26D
1	each	ADA sill w/pre-hung	MILL
1	each	Sweep w/pre-hung	MILL
<u>Hardware Set # 2</u>		<u>Coat Closet - Pre-hung</u>	<u>Handing</u>
<u>Qty per opening</u>		<u>Description</u>	<u>Mfg / Finish</u>
3	each	3-1/2" RC hinges w/pre-hungs	US26D
1	each	3610 Pass AUG lever 2-3/8 BS FLS	US26D/Hager
<u>Hardware Set #3</u>		<u>Mechanical - Pre-hung</u>	<u>Handing</u>
<u>Qty per opening</u>		<u>Description</u>	<u>Mfg / Finish</u>
6	each	3-1/2" RC hinges w/pre-hungs	US26D/Hager
1	each	3215 Deadbolt 6-pin SCC 2-3/8 BS	US26D
2	each	Flushbolts on in-active door w/prehungs	
<u>Hardware Set #4</u>		<u>Bathroom - Pre-hung</u>	<u>Handing</u>
<u>Qty per opening</u>		<u>Description</u>	<u>Mfg / Finish</u>
3	each	3-1/2" RC hinges w/pre-hungs	US10B
1	each	3640 PRIV AUG lever 2-3/8 BS FLS	US26D/Hager
1	each	060 Spring stop	US26D

<u>Hardware Set #5</u>	<u>Linen - Pre-hung</u>	<u>Handing</u>
	WD/WF	1-6 x 6-8 x 1-3/8 HC
<u>Qty per opening</u>	<u>Description</u>	<u>Mfg / Finish</u>
3	each 3-1/2" RC hinges w/pre-hungs	US26D/Hager
1	each 3610 PASS AUG lever 2-3/8 BS FLS	US26D/Hager
<u>Hardware Set # 6</u>	<u>Bedroom - Pre-hung</u>	<u>Handing</u>
	WD/WF	3-0 x 6-8 x 1-3/8 HC
<u>Qty per opening</u>	<u>Description</u>	<u>Mfg / Finish</u>
3	each 3-1/2" RC hinges w/pre-hungs	US26D
1	each 3640 PRIV AUG lever 2-3/8 BS FLS	US26D/Hager
1	each 060 Spring stop	US26D
<u>Hardware Set #7</u>	<u>Bi-pass Bedroom Closet</u>	<u>Handing</u>
	WD/WF	2-8 x 6-8 x 1-3/8 HC PAIR
<u>Qty per opening</u>	<u>Description</u>	<u>Mfg / Finish</u>
1	each 1166 Bi-pass track	JOHNSON
2	each 2-1/8 Flush pulls	US26D/IVES
<u>Hardware Set #8</u>	<u>Vinyl Patio Door</u>	<u>Handing</u>
		6-0 x 6-8 White sliding vinyl patio door
<u>Qty per opening</u>	<u>Description</u>	<u>Mfg / Finish</u>
	<u>All hardware for vinyl patio door provided by vinyl patio door supplier</u>	
<u>Hardware Set #9</u>	<u>Exterior Storage</u>	<u>Handing</u>
	MD/MF	3-0 x 6-8 x 1-3/4 Flush
<u>Qty per opening</u>	<u>Description</u>	<u>Mfg / Finish</u>
3	each BB1279 4-1/2 x 4-1/2 Hinges	US26D/Hager
1	each 3580 STOR AUG lever 2-3/4 BS SCC ASA	US26D/Hager
1	each 170A Threshold	MILL/PEMKO
1	each 306AV Weatherstrip	MILL/PEMKO
1	each 315 Drip sweep	MILL/PEMKO

Hardware Set #10**EXTERIOR MECHANICAL**

MD/MF 3-0 x 7-0 x 1-3/4

LHR

Qty per opening

	<u>Description</u>	<u>Mfg / Finish</u>
3	BB1279 4-1/2 x 4-1/2 Hinge	US26D/Hager
1	3580 STORE AUG Lever 2-3/4 BS 6 pin SCC ASA	US26D/Hager
1	5200 Closer	689/Hager
1	346AV Overhead Drip	Mill/Pemko
1	170A Threshold	Mill/Pemko
1	345 Drip sweep	Mill/Pemko
1	306AV 17' Weatherstrip	Mill/Pemko

Hardware Set #11**Storm-Pro ICC500(2014)**

MD/MF 3-0 x 7-0 x 1-3/4 Storm-Pro

HandingRHR
LHR**Qty per opening**

	<u>Description</u>	<u>Mfg / Finish</u>
1	FM8713 Storm Pro SVR exit device	US26D/Sargent
4	SP3786 4-1/2 x 4-1/2 .180 hinges	US26D/Mckinley
1	281 Closer w/thru bolt mount	689/Sargent
1	S773 Perimeter seal	Mill/Pemko
1	346AV Overhead drip	Mill/Pemko
1	170A Threshold	Mill/Pemko
1	345 Drip sweep	Mill/Pemko
1	306AV Weatherstrip	Mill/Pemko

Hardware Set #12**Stormshelter Restroom**

MD/MF 3-0 x 7-0 x 1-3/4

Handing

LHR

Qty per opening

	<u>Description</u>	<u>Mfg / Finish</u>
3	BB1279 4-1/2 x 4-1/2 hinge	US26D/Hager
1	5200 Closer	US26D/Hager
1	3540 PRIV AUG lever 2-3/4 BS ASA	US26D/Hager
1	Kick down stop	US26D/Hager
1	1040 Kick plate 34" x 10"	US26D/RO

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. STC-Rated Assemblies: Provide materials and construction identical to assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- C. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to assemblies tested according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 METAL FRAMING AND SUPPORTS

- A. Partitions: Comply with ASTM C 645.
 - 1. Resilient Furring Channels: **1/2-inch- (12.7-mm-)** deep, with single- or double-leg.

2.2 GYPSUM BOARD

- A. Gypsum board products in maximum lengths available to minimize end-to-end butt joints.
 - 1. Gypsum Wallboard: ASTM C 36, in thickness indicated, with manufacturer's standard edges. Type X. Sag-resistant type for ceiling surfaces.
 - 2. Water-Resistant and Mold-Resistant Gypsum Backing Board: ASTM C 1178, of thickness indicated Type X.

2.3 ACCESSORIES

- A. Trim Accessories: Cornerbead, edge trim, and control joints complying with ASTM C 1047, formed from steel sheet zinc coated by hot-dip process or rolled zinc or plastic.
- B. Gypsum Board Joint Treatment Materials: Comply with ASTM C 475. Paper reinforcing tape and [dry-ing-type, ready-mixed, all-purpose compounds.
- C. Polystyrene aggregate texture finish where indicated.
- D. Miscellaneous Materials: Auxiliary materials for gypsum board construction that comply with referenced standards.

PART 3 - EXECUTION

3.1 INSTALLATION

- A.** Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
 - 1. Isolate steel framing from building structure, except at floor, to prevent structural movement from transferring loading to partitions.
 - 2. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B.** Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
 - 1. STC-Rated Assemblies: Comply with ASTM C 919 for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies.
 - 2. Fire-Resistance-Rated Assemblies: Comply with requirements of listed assemblies.
 - 3. Single-Layer Fastening Methods: Fasten gypsum panels to wood supports with adhesive and supplementary screws.
 - 4. Multilayer Fastening Methods: Fasten base layers with screws and face layers to base layers with adhesive and supplementary fasteners.
 - 5. Water and Mold Resistant gypsum board to be installed in Kitchens, Bathrooms, and Laundry Rooms.
- C.** Finishing Gypsum Board Assemblies: Level 4 finish, unless otherwise indicated. Level 1 finish for concealed areas, unless a higher level of finish is required for fire-resistance-rated assemblies
 - 1. Walls and ceilings: provide orange peel knock down textured type finish, contractor shall submit samples for texture approval.
- D.** END OF SECTION 09260

SECTION 09652 - SHEET VINYL FLOOR COVERINGS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.
- B. Extra Materials: Deliver to Owner at least 10 linear feet (3 linear m) in roll form for each 500 linear feet (150 linear m) or fraction thereof, of each type and color of sheet vinyl floor covering installed.

PART 2 - PRODUCTS

2.1 SHEET VINYL FLOOR COVERING

- A. Sheet vinyl floor covering, with backing, ASTM F 1303, Type I, minimum binder content of 90 percent, Grade 1 wear-layer thickness.
 - 1. Sheet vinyl shall be Armstrong Initiator color #66205.
 - 2. See Room Finish Schedule for locations.
- B. Overall Thickness: 0.080.
- C. Wearing Surface: Smooth or Embossed
- D. Interlayer Material: Foamed plastic.
- E. Backing Class: Class A (fibrous).
- F. Sheet Width: 12 foot rolls.
- G. Seaming Method: **NO SEAMS ALLOWED.**

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement- or blended hydraulic cement-based formulation provided or approved by floor covering manufacturer for applications indicated.
- B. Gypsum floor and Concrete floor sealers: As recommended by Sheet Vinyl flooring subcontractor and flooring and adhesive manufacturers.
- C. Adhesives: Water-resistant type recommended by manufacturer to suit sheet vinyl floor covering and substrate conditions indicated.
- D. Vinyl Edge Strips: Provide Vinyl transition strips of height required to protect exposed edge of floor coverings, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.2 Maintain uniformity of sheet vinyl floor covering direction, and match edges for color shading and patterns.
- A. Install Gypsum floor and Concrete floor sealers prior to installation of mastic and sheet vinyl. I shall be responsibility of installer to verify compatibility of floor sealers and mastics prior to installation.
 - B. Install Sheet Vinyl flooring under all kitchen cabinets and bath vanities.

END OF SECTION 09652

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.
- B. Comply with CRI 104, Section 6, "Site Conditions."
- C. Extra Materials: Deliver to Owner full-width carpet equal to 5 percent of each type and color carpet installed, packaged with protective covering for storage.

PART 2 - PRODUCTS

2.1 CARPET

- A. Carpet for typical units - CPT-1
 - 1. Type II, Class I, Texture C.
 - 2. Nylon Continuous Filament
 - 3. 26 oz. Minimum pile weight
 - 4. Density, 2600 minimum
 - 5. Flammability in accordance with Federal requirement 44d, table 4
 - 6. Low VOC rating required
- B. Carpet for Handicap units - CPT-2
 - 1. Type II, Class 2, texture A.
 - 2. Nylon Continuous Filament
 - 3. 26 oz Minimum pile weight
 - 4. Density 4000 minimum.
 - 5. Flammability in accordance with Federal requirement 44d, table 4.
 - 6. Low VOC rating required

2.2 CARPET CUSHION

- A. Traffic Classification: CCC Class I, moderate traffic
- B. Polyurethane Foam Cushion:
 - 1. Type: Densified foam
 - 2. Compression Force Deflection at 64 Percent:
 - 3. Thickness: $\frac{1}{2}$ inch
 - 4. Density: 6 lb./cu. ft.
 - 5. Low VOC rating required
 - 6. Carpet cushion shall be installed in all standard apartment units.

PART 3 -

3.1 INSTALLATION

- A. Comply with CRI 104, Section 8, "Direct Glue-Down." and Section 11, "Stretch-in Utilizing Tackless Strip."
- C. Maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position. Bind or seal cut edges as recommended by carpet manufacturer.
- D. Install pattern parallel to walls and borders.
- E. Install Carpet tile in accordance with manufacturers installation instructions.
- F. Carpet Adhesives shall have low VOC rating.

END OF SECTION 09680

SECTION 09910 - PAINTING

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Summary: Paint all exposed surfaces, new unless otherwise indicated.
 - 1. Do not paint prefinished items, finished metal surfaces, operating parts, labels, and materials obviously intended to be left exposed such as brick and tile.
 - 2. Unless otherwise indicated do not paint concealed surfaces.
- B. Submittals: Product Data and color Samples.
- C. Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- D. Extra Materials: Deliver to Owner a 1-gal. (3.8-L) container, properly labeled and sealed, of each color and type of finish coat paint used on Project.

PART 2 - PRODUCTS

2.1 PAINTS, STAINS AND CLEAR FINISHES

- 1. Colors: As selected from manufacturers standards
- B. Material Quality: Manufacturer's best-quality of coating types specified.
- C. Material Compatibility: Complete system of compatible components that is recommended by manufacturer for application indicated.
- D. Low VOC products required.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with paint manufacturer's written instructions for surface preparation, environmental and substrate conditions, product mixing, and application.

3.2 EXTERIOR PAINT APPLICATION SCHEDULE

- A. Fiber Cement Siding: As follows:
 - 1. Semigloss, Acrylic Enamel: Two coats over primer. Or manufacturers standard pre-finished product.

- B. Fiber Cement Trim: As follows:
 - 1. Semigloss, Acrylic Enamel: Two coats over primer. Or manufacturers standard pre-finished product.
- C. Ferrous Metal: Stairs and Railings, As follows:
 - 1. Semigloss, Acrylic Enamel: Two coats over rust-inhibitive primer.
- D. Zinc-Coated Metal: As follows:
 - 1. Semigloss, Acrylic Enamel: Two coats over galvanized metal primer.

3.3 INTERIOR PAINT APPLICATION SCHEDULE

- A. Gypsum Board: Walls As follows:
 - 1. Eggshell Acrylic: Two coats over primer.
 - a. Wall color shall be as selected by owner.
- B. Woodwork, Doors and Trim:
 - 1. Painted: Semi Gloss, Acrylic Enamel: Two coats over primer.
 - a. Doors and trim shall be painted white in all apartment units.
 - b. Painting contractor shall putty fill all nail holes prior to painting.
- C. Ferrous Metal:
 - 1. Low-Luster, Acrylic Enamel: Two coats over primer.
- D. Zinc-Coated Metal:
 - 1. Low-Luster, Acrylic Enamel: Two coats over primer.

END OF SECTION 09910

SECTION 10431 – PANEL SIGNAGE

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data, Shop Drawings, and material Samples.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Plastic Laminate: High-pressure engraving stock with face and core in contrasting colors.

2.2 SIGNS

- A. Unframed Panel Signs: Engraved plastic laminate with square-cut edges and rounded corners that comply with ADA regulations.
 - 1. Provide signs for the following rooms: Apartment numbers.
 - 2. Show dimensional letters and numbers on Drawings, indicating required text and noting sizes.
- B. Dimensional Letters and Numbers: Cast-aluminum characters in Helvetica font, color as selected by the owner. Provide building address numbers as assigned by the City in size required. Provide garage stall numbers above garage doors. Numbering sequence as directed by the owner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate signs where indicated or directed by Architect. Install level, plumb, and mount at ADA height, with sign surfaces free from distortion or other defects in appearance.

END OF SECTION 10431

SECTION 10520 - FIRE- PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.
- B. Fire Extinguishers: NFPA 10, listed and labeled for the type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS AND CABINETS

- A. Portable Fire Extinguishers
 - 1. Larsen's Model MP2.5 or approved equal.
 - a. Location: Apartment Units, kitchens. See plans for locations.
 - 2. Larsen's Model MP10 or approved equal.
 - b. Location: To be installed in all Fire Protection Cabinets. See plans for locations.
- B. Fire Protection Cabinets
 - 1. Enameled steel, semirecessed cabinets for fire extinguisher.
 - 2. Larsen's, Gemini Series, FS G2409-6R, or approved equal.
 - 3. Fire Rating: For installation in 1-hour rated walls.
 - 4. ADA: Shall comply with wall projection and mounting height guidelines.
 - 5. Location: See Plans

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cabinets and brackets at heights indicated or, if not indicated, at heights to comply with applicable regulations of authorities having jurisdiction.

END OF SECTION 10520

SECTION 10550

MAILBOXES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cluster box units.

1.2 REFERENCES

- A. Architectural and Transportation Barriers Compliance Board (ATBCB): Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG).
- B. United States Postal Service (USPS):
 - 1. USPS-STD-4B+ - United States Postal Service Standard 4B+, Receptacles, Apartment House, Mail; modified.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data : Provide manufacturer's standard catalog data for specified products.
- C. Shop Drawings: Prepared specifically for this project; show dimensions of mail boxes, wall cuts, and interface with other products.

1.4 REGULATORY REQUIREMENTS

- A. Comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inspect the materials upon delivery to ensure that specified products have been received.
- B. Store materials protected from exposure to harmful weather conditions.
- C. Handle materials to prevent damage or marring of finish.

1.7 WARRANTY

- A. Manufacturer's standard warranty to repair or replace components of postal specialties that fail in materials or workmanship within five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Postal Products Unlimited, Inc., which is located at: 500 W. Oklahoma Ave.; Milwaukee, WI 53207-2649; Toll Free Tel: 800-229-4500; Fax: 800-570-0007; Web: www.mailproducts.com
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 CLUSTER BOX UNITS

- A. Front-Loading Mailboxes: USPS approved; aluminum, with two parcel lockers and one outgoing mail slot. 360 degree wrapped hinges on all doors. Tenant doors equipped with five-pin cylinder lock cam with dust and rain shield. F-Spec as manufactured by Postal Products Unlimited, Inc.
 - 1. Type I; 10 tenant door unit with two parcel locker
 - a. Color: Grey - standard.
 - 2. Cluster Box Unit Decals: Standard - Black text on silver background; weather resistant.
 - 3. Provide three Type I cluster boxes, located at each main front entry.
 - 4. Salsbury Cluster Pedestal mount mailbox model #3410DAX-10. Bottom shelf no lower than 15" and no key higher than 48" above hard surface floor.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that openings in wall are correctly located, aligned, and sized for mailboxes.
- B. Installer's Examination: Examine conditions under which construction activities of this section are to be performed; submit written notification if such conditions are unacceptable. Beginning installation indicates acceptance of conditions.

3.2 INSTALLATION

- A. Install mail boxes in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Align, plumb, and level; anchor in accordance with manufacturer's requirements.

3.3 ADJUSTING

- A. Adjust doors and locks to operate correctly.

3.4 CLEANING

- A. Clean surfaces with mild dish detergent. Do not use harsh abrasive cleaners. Lubricate locks with graphite type lubricants only.

3.5 PROTECTION OF INSTALLED PRODUCTS

- A. Protect finishes from damage by construction activities.

END OF SECTION

SECTION 10801 – TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, No. 4 finish (satin), 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.
- B. Sheet Steel: ASTM A 366/A 366M, 0.0359-inch (0.9-mm) minimum nominal thickness.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
- D. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- E. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.
- F. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
- G. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- H. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
- I. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of four keys to Owner's representative.

2.2 TOILET AND BATH ACCESSORIES

A. Accessory Schedule: Apartments

1. Mirror, surface mounted, typical units, polished edge mirror 48" wide x 42" high, adhesive mount to wall.
2. Medicine Cabinet, surface mounted, handicapped units, Basco SM 375 P-ATM-W, 16" x 26".
3. Towel Bar, Basco 7924, 24" long, see plans for quantities
4. Towel Ring, Basco 7406, see plans for quantities
5. Toilet Paper Holder, Basco 711, one per bathroom.
6. Shower Curtain Rod, Basco 1210, one per bathroom.
7. Shower Curtain Flanges, Basco 1203, two per bathroom.
8. Grab Bars. Basco 5000H Series, Sizes and locations as shown on the drawings.

B. Accessory Schedule: Public Restrooms and Storm Shelter

1. Grab Bars, Basco 5000H Series, Sizes and locations as shown on the drawings.
2. Mirror, ASI 0600T, 24" x 36"
3. Toilet Paper Holder, Basco 711
4. Paper Towel Dispenser, ASI 6452-9

PART 3 - EXECUTION

3.1 INSTALLATION

- A.** Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
 1. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.
- B.** Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.
- C.** Mounting heights shall be as recommended by manufacturer.

D. Mounting heights for public restrooms shall comply with ADA requirements.

END OF SECTION 10801

SECTION 11451 - RESIDENTIAL APPLIANCES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

PART 2 - PRODUCTS

2.1 RESIDENTIAL APPLIANCES

- A. Electric Range: Electric, 30-inch, drop-in at handicapped units, electric range with 4-burner cook-top, self cleaning oven with broiler, listed by UL.
 - 1. GE, Model JD630DFWW
 - 2. Color: White
 - 3. Front Controls
 - 4. ADA Compliant
- B. Electric Range: Electric, **30-inch- (762-mm)**, freestanding at typical units, electric range with 4-burner cook-top, self-cleaning oven with broiler; listed by UL.
 - 1. GE, Model JB645DKWW
 - 2. Color: White
- C. Exhaust Hood: **30-inch (762-mm)** under-cabinet over the range, non-vented, exhaust hood with 2-speed fan, light, listed by UL. Provide at handicapped units. Provide wall switch for operation.
 - 1. GE, Model JN327HW
 - 2. Color: White.
 - 3. Energy Star Qualified if available
- D. Microwave Oven: 30-inch (762-mm)(1.6 c.f.) under-cabinet, over the range, microwave oven, non-vented recirculating, exhaust hood/microwave with 2 speed fan listed by UL.
 - 1. GE, Model JNM7196DKWW
 - 2. Color: White
 - 3. Energy Star Qualified if available
- E. Top Mounted Refrigerator/Freezer: Freestanding, frost-free, two-door refrigerator with top mounted freezer, ABS thermoplastic-copolymer interior cabinet liners; listed by UL. Provide at first floor serving area, Typical Units, and all handicapped units.
 - 1. GE, Model GIE21GTHWW, 21.1 C.F.
 - 2. Color: White
 - 3. ADA Compliant
 - 4. Energy Star Qualified

- F. Dishwasher: Built-in, under-counter, automatic dishwasher, sized to replace **24-inch- (610-mm-)** base cabinet, listed by UL. Provide at all typical units.
1. GE, Model GDT605PGMWW
 2. Color: White.
 3. Energy Star Qualified
- G. Dishwasher: Built-in, under-counter, automatic dishwasher, sized to replace **24-inch- (610-mm-)** base cabinet, listed by UL. Provide at Handicapped Units.
1. GE, Model GDT225SGLWW
 2. Color: White.
 3. ADA Compliant
 4. Energy Star Qualified
- H. Food Waste Disposal: Continuous feed 1/3 HP, 1725 rpm, overload protection, wall switch operated, corrosion resistant construction, with quick mounting feature, stainless steel sink flange, cushioned suspension, and stainless steel grinding chamber, jam resistant cutting/shredding mechanism featuring swivel mounted impellers on turntable, cast tool steel grinding ring, and cutlery steel under-cutter blade, insulated housing for grinder chamber, anti-splash guard and combination cover/stopper. UL listed.
- I. Clothes Washers:
1. GE, Model GFW430SSMWW, front loading, required at Handicapped Units.
 - a. ADA compliant
 - b. Color: White
 - c. Energy Star Certified
 2. GE, Model GTW485ASJWS, top loading, at all typical Units
 - a. Color: White
 - b. Energy Star Certified
- J. Clothes Dryers: Electric
1. GE, Model GFD43ESSMWW, required at Handicapped Units.
 - a. ADA Compliant
 - b. Color: White
 - c. Long Vent model
 - d. Energy Star qualified if model is available

2. GE, Model GFD43ESSMWW, front loading at all typical units
 - a. Color White
 - b. Long Vent model
 - c. Energy Star Qualified if available

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Built-in Appliances: Securely anchor to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- B. Freestanding Appliances: Place in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

END OF SECTION 11451

SECTION 12491 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.
- B. Provide blinds passing NFPA 701.
- C. Provide electrical components that comply with NFPA 70 and that are listed and labeled by UL.
- D. Extra Materials: Deliver to Owner full-size blind units equal to 5 percent of amount installed, packaged with protective covering for storage.

PART 2 - PRODUCTS

A. HORIZONTAL LOUVER BLINDS

- 1. Color: White
- B. Louver Material: Aluminum
- C. Louver Width: 1 inch (25 mm).
- D. Tilt Operation: Manual with cord.
- E. Headrail Mounting: Wall outside window jambs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install blinds level, plumb, and located not closer than 1 inch (25 mm) to interior face of glass lites.
- B. Isolate metal parts from concrete or mortar to prevent galvanic action. Use tape or another method recommended by manufacturer.

Provide 1 inch blinds at all apartment unit windows.

END OF SECTION 12491

SECTION 12492 - VERTICAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data and color Samples.
- B. Provide blinds passing NFPA 701.
- C. Extra Materials: Deliver to Owner vertical louver vanes equal to 5 percent of each type and color installed, packaged with protective covering for storage.

PART 2 - PRODUCTS

2.1 VERTICAL LOUVER BLIND

- A. Louver Material: PVC, color shall be white.
- B. Nominal Louver Width: **3-1/2 inches (90 mm)**.
- C. Louver Profile: Curved.
- D. Draw: One way, stacking shall be on the fixed side of sliding glass patio doors.
- E. Louver Bottom: As required by manufacturer for proper spacing.
- F. Traversing Control: Manual with chain
- G. Headrail Mounting: Wall mounted outside window jambs.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install blinds level and plumb.
- B. Location of blinds shall be at all sliding glass patio doors.

END OF SECTION 12492



SECTION 16010
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

A. SECTION INCLUDES

1. Basic Electrical Requirements specifically applicable to Division 16 Sections, in addition to Division 1 - General Requirements.

B. WORK SEQUENCE

1. Install work to accommodate Owner's occupancy requirements. During the construction period coordinate electrical schedule and operations with the Owner.

C. ALTERNATES

1. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
2. Coordinate related work and modify surrounding work as required.

D. REFERENCES

1. ANSI/NFPA 70 - National Electrical Code.

E. SUBMITTALS

1. Submittal shall submitted electronically in PDF format for review as directed.
2. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
3. Mark dimensions and values in units to match those specified.

F. REGULATORY REQUIREMENTS

1. Conform to applicable building, state and local codes.
2. Electrical: Conform to NFPA 70.
3. Obtain and pay for all permits, and request inspections from authority having jurisdiction. Pay all utility fees.

G.PROJECT/SITE CONDITIONS

1. Install Work in locations shown on Drawings, unless prevented by Project conditions.

PART 2 - PRODUCTS

- A.Not Used

PART 3 - EXECUTION

- A. Not Used

END OF SECTION

SECTION 16111

CONDUIT

PART 1 - GENERAL

A.WORK INCLUDED

1. Rigid metal conduit and fittings.
2. Electrical metallic tubing and fittings.
3. Flexible metal conduit and fittings.
4. Liquidtight flexible metal conduit and fittings.
5. Non-metallic conduit and fittings.

B.RELATED WORK

1. Trenching: Excavation and backfill for conduit and utilities on site.
2. Section 16121 - Building Wire and Cable (600 Volts and Below).
3. Section 16130 - Boxes.
4. Section 16170 - Grounding and Bonding.
5. Section 16190 - Supporting Devices.

C.REFERENCES

1. American National Standards Institute (ANSI).
 - a. C80.1 - Rigid Steel Conduit, Zinc-Coated.
 - b. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
2. American National Standards Institute/National Electrical Manufacturers Associate.
 - a. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
 - b. ANSI/NEMA - ANSI C1/NFPA70 - National Electrical Code.
3. Federal Specifications (FS):

1. W-C-582(1) Conduit, Raceway, Metal, and Fittings: Surface
2. W-C-586B(1) Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal for Shore Use

3. W-C-1094A Conduit and Conduit Fittings Plastic, Rigid

4. W-F-406B Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible

5. W-F-408C(1) Fittings for Conduit, Metal, Rigid (Thick-wall and Thin-wall (EMT) Type)

6. W-J-800D Junction Box; Extension Junction Box; Cover Junction Box Steel, Cadmium, or Zinc-coated

7. FF-S-760A(2) Strap, Retaining (Metal for Conduit, Pipe and Cable)

8. FF-S-325 Shield, Expansion, Nail, Expansion; and Nail, Drive

9. INT AMD 3 Screw (Devices, Anchoring, Masonry)

10. WW-C-563A Conduit, Metal, Rigid: Electrical, Thin-wall, Steel Type (Electrical Metallic Tubing); Straight Lengths, Elbows and Bends

11. WW-C-566C Conduit, Metal, Flexible

12. WW-C-581E Conduit, Metal, Rigid; and Couplings, Elbow and Nipple, Electrical Conduit: Zinc-coated

4. National Electrical Manufacturers Association (NEMA):
 - a. NEMA RN 1 - PVC Externally-Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.
 - b. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

PART 2 - PRODUCTS

A.RACEWAYS

1. Conduit:

1. General Construction: All metal conduit shall have a continuous zinc coating throughout the entire interior and exterior surfaces of conduit regardless of diameter.
2. Rigid Galvanized Steel Conduit (RGS): Shall be hot-dipped galvanized mild steel, manufactured to meet ANSI C80.1 and FS WW-C-581 specifications and UL-6.
3. Flexible Metal Conduit and Fittings: Shall comply with FS-WW-C-566 and UL-1.
4. Liquidtight Flexible Metal Conduit: Shall comply with FS-WW-C-566 and FS-W-F-406 and UL-1, and shall be constructed of single strip, flexible, continuous, interlocked and double wrapped steel, galvanized inside and outcoated with liquidtight nonmetallic jacket consisting of flexible sunlight-resistant polyvinylchloride.
5. Rigid Nonmetallic: (PVC) Comply with NEMA TC-2, PVC, Schedule 40 or 80.

B. Tubing

1. Steel Electrical Metallic Tubing (EMT): Shall be mild steel, electrically welded, galvanized, and manufactured to meet ANSI C80.3 and FS WW-C-563 specifications and UL 797.

C. Acceptable Manufacturers for Conduit and Tubing

- a. Allied Tube and Conduit
- b. Anaconda
- c. Carlon
- d. Certain-Teed Corp.
- e. Republic Steel
- f. Triangle PWC Inc.
- g. Youngstown Steel

B.FITTINGS

1. RGS Fittings and Conduit Bodies:

- a. Comply with ANSI C80.4, ANSI/NEMA FB 1, Fed. Specification W-F-408, threaded type.

- b. Locknuts; steel with sharp edges for digging into metal walls of an enclosure.
 - c. Bushings; metallic insulating or insulated throat type with an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
 - d. Couplings; conduit threaded or gland compression malleable iron type. Set screw or indenter type not acceptable. IMC couplings may be integral, retractable type.
 - e. Erickson-type and set-screw couplings may be used to complete a conduit run where conduit is installed in concrete. Set screw fittings shall be approved for concrete installation and be case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is not permitted.
 - f. Sealing fittings for exposed or exterior conduit system, shall be of the threaded hub cast Feraloy (iron) type. Sealing fittings used to prevent passage of water vapor shall be of the continuous drain type. In concealed work, each fitting shall be installed in a flush steel box with blank coverplate having the same finish as that of other electrical plates in the room.
2. Electrical metallic tubing fittings:
- a. Federal Specification W-F-408, ANSI/NEMA FBI shall apply, except material shall be malleable type with steel locknuts.
 - b. Couplings and connectors shall be "concrete tight" or "raintight", couplings and connectors for conduit sizes 2-inch and smaller shall be of the gland and ring compression type. Connectors shall have insulated throats. Connectors for conduit sizes 2-1/2 inch and larger shall be set screw type with two screws each. Couplings for conduit sizes 2-1/2 inch and larger shall be set screw type with four screws each. Set screws shall be case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive ground.
 - c. Set screw connectors and couplings may be used in dry locations.
 - d. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are not permitted.
3. Flexible Steel Conduit (Greenfield) Fittings and Conduit Bodies:
- a. Connectors; malleable iron, threadless, squeeze clamp type for nonjacketed conduit.

C.SEALING

1. Fire Seal

- a. Seal penetrations of fire-rated walls, floors or ceilings by raceways for compliance with NEC 300-21. Fill void around raceway. Use heavy wall steel pipe sleeves, anchored to building construction and finished plumb with wall, ceiling or floor lines. Acceptable products:
 - 1) Chase Technology - CTC, PR-855
 - 2) Dow Corning - Silicone RTV foam 3-6548
 - 3) Nelson - Flameseal
 - 4) T&B - Flamesafe
 - 5) 3M - Fire Barrier
 - b. Smoke and fire stop fittings may be used in lieu of sealant. Acceptable product:
 - 1) O-Z/Gedney, series CFS
2. Thermal Seal
- a. Seal penetrations of thermally insulated equipment or rooms to prevent heat transfer. Exterior of raceway with fiberglass or other seal material compatible to equipment or room and approved by Architect-Engineer. Interior of raceway with duct sealing compound at entry to equipment or room.

D.CONDUIT SUPPORTS

1. All parts and hardware shall be zinc-coated or have equivalent corrosion protection.
2. Pipe Straps: Federal Specification FF-S-760, type 1, style A or B.
3. Individual Conduit Hangers: Shall be designed for the purpose, and have pre-assembled closure bolt and nut, and provisions for receiving hanger rod.
4. Multiple conduit (trapeze) hangers shall not be less than 1-1/2 by 1-1/2 inch, 12 gage steel, cold formed, lipped channels. Hanger rods shall be not less than 3/8-inch diameter steel.

PART 3 - EXECUTION

A.CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

1. Interior conduits shall be 1/2" minimum size except for flexible metal conduit enclosing tap conductors from the fixture terminal connection of flush and recessed light fixtures to its outlet box (fixture tails) in accordance with NEC Article 410, which shall be 3/8" minimum. Exterior conduits shall be 1" minimum size.
2. Arrange conduit to maintain headroom and present a neat appearance.

3. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
4. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
5. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, clevis hangers, or bolted split stamped galvanized hangers. Conduit shall not be supported from suspended ceiling as support wires.
6. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
7. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
8. Support conduit at a maximum of 7 feet on center and within 12 inches of junction boxes and conduit couplings.

B.CONDUIT INSTALLATION

1. Route all conduit concealed within walls, above ceilings or below floors except in unfinished spaces such as mechanical/electrical rooms.
2. Cut conduit square using a saw or pipecutter; de-burr cut ends.
3. Bring conduit to the shoulder of fittings and couplings and fasten securely.
4. Use conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
5. Install no more than the equivalent of three 90-degree bends between boxes.
 - a. Use conduit bodies to make sharp changes in direction, as around beams.
 - b. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.
 - c. Conduits shall not be bent with a pipe tee or vise.
 - d. Field bends shall be made with an approved bender or hickey or hub-type conduit fittings. Bends or offsets shall be made with standard conduit ells.

6. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
7. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
8. Provide No. 12 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
9. Install UL listed expansion joints where conduit crosses building expansion or seismic joints, any Rigid Galvanized Steel (RGS) conduit run exceeding 150 feet and any Electrical Metallic Tubing (EMT) or Intermediate Metal Conduit (IMC) run exceeding 75 feet in length.
10. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket. Coordinate with roofing contractor.
11. Maximum Size Conduit in Slabs Above Grade: 3/4 inch. Do not route conduits to cross each other in slabs above grade.
12. Use PVC-coated rigid steel factory elbows for bends in plastic conduit runs longer than 200 feet.
13. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.
14. Install separate raceway system for emergency circuits to meet the requirements of NEC, Article 700. No other circuits shall be installed in the raceway for emergency circuits.
15. All raceway systems shall be thoroughly swabbed out with a dry swab to remove moisture and debris and bars removed before conductors are drawn into place. All ends of raceways shall be tightly plugged with tapered plugs or capped bushings until the conductors are pulled to prevent water and debris from entering.
16. All conduit and raceway systems must be installed complete before conductors are pulled in.
17. Install flexible conduit for motor connections and other electrical equipment connections where subjected to movement and vibration per NEC Article 350. Length of flexible conduit shall be a minimum of one foot up to 1-1/2 inch conduit. A minimum of 3 inches of flexible conduit shall be added for every 1/2 inch increase in conduit size.

18. Vertical branch circuit drops from the ceiling to equipment shall be rigid galvanized steel (RGS) conduit if the run exceeds ten feet, if a connector must be used or if the drop is subject to physical damage.
19. All metallic conduits buried or otherwise in contact with the earth shall be painted one heavy continuous coat of asphaltic after assembly of conduit and fittings.
20. Conduits shall be secured to cabinets, junction boxes, pull boxes, and outlet boxes by bonding type locknuts. Rigid and IMC conduit installations shall have a locknut on the outside and locknut and bushing on the inside of the enclosure.
21. Branch circuit conduits, and conduits feeding ceiling lighting shall not be supported by the suspended ceiling or its supporting members, lighting fixtures, mechanical piping, or air conditioning ducts.
22. Horizontal runs shall be installed close to the ceiling or beams and secured with approved conduit straps.
23. Horizontal or vertical runs shall be supported at not over eight foot intervals.

C.CONDUIT INSTALLATION SCHEDULE

1. Underground Installations More than 10 Feet From Foundation Wall: Schedule 40 plastic conduit.
2. Under Concrete Slab, or Underground Within 10 Feet of Foundation Wall: Rigid steel conduit.
3. In Slab Above Grade: Schedule 40 plastic conduit.
4. Exposed Outdoor Locations: Rigid steel or Electrical metallic tubing.
5. Wet Interior Locations: Rigid steel. Unless noted otherwise.
6. Concealed Dry Interior Locations: Rigid steel conduit where subject to physical damage. Electrical metallic tubing.
7. Exposed Dry Interior Locations: Rigid steel conduit. Where subject to physical damage. Electrical metallic tubing.
8. Above 600 Volts Cable Use: Rigid steel conduit.

END OF SECTION

SECTION 16123
BUILDING WIRE AND CABLE

PART 1 - GENERAL

A. SECTION INCLUDES

1. Building wire and cable.
2. Wiring connectors and connections.

B. RELATED SECTIONS

1. Section 16111 - Conduit.
2. Section 16130 - Boxes.

C. REFERENCES

1. ANSI/NFPA 70 - National Electrical Code.

D. SUBMITTALS

1. Not required.

E. REGULATORY REQUIREMENTS

1. Conform to requirements of ANSI/NFPA 70.
2. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

F. PROJECT CONDITIONS

1. Verify that field measurements are as shown on Drawings.
2. Conductor sizes are based on copper unless indicated as aluminum or "AL".
3. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
4. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

G.COORDINATION

1. Coordinate Work under provisions of Section 01040.
2. Determine required separation between cable and other work.
3. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

A.BUILDING WIRE

1. Conductor: Copper.
 - a. Insulation Voltage Rating: 600 volts.
 - b. Insulation: ANSI/NFPA 70, Type THHN/THWN
2. Type NM Cable:
 - a. Use for branch circuits serving 15 and 20 amp circuits in living units. All larger branch circuits in the living units and all circuits outside of living units shall be installed in conduit. Install type NM cable only where allowed by the authority having jurisdiction.

PART 3 - EXECUTION

A.PREPARATION

1. Completely and thoroughly swab raceway before installing wire.

B.WIRING METHODS

1. Concealed Dry Interior Locations: Use only building wire, Type THHN/THWN insulation, in raceway.
2. Use wiring methods indicated on Drawings.

C.INSTALLATION

1. Install products in accordance with manufacturer's instructions.
2. Use solid conductor for branch circuits #10 AWG and smaller.

3. Use stranded conductors for control circuits.
 4. Use conductor not smaller than #12 AWG for power and lighting circuits.
 5. Use conductor not smaller than #14 AWG for control circuits.
 6. Use #10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
 7. Pull all conductors into raceway at same time.
- D. Use suitable wire pulling lubricant for building wire where required.
- E. Protect exposed cable from damage.
- F. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- G. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- H. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, #8 AWG and larger.
- I. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, #10 AWG and smaller.

3.1 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 16130
BOXES

PART 1 - GENERAL

A.SECTION INCLUDES

1. Wall and ceiling outlet boxes.
2. Pull and junction boxes.

B.RELATED SECTIONS

1. Section 16141 - Wiring Devices

C.REFERENCES

1. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
2. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
3. ANSI/NFPA 70 - National Electrical Code.
4. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D.PROJECT CONDITIONS

1. Verify field measurements are as shown on Drawings.
2. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
Install at location required for box to serve intended purpose.

PART 2 - PRODUCTS

A.OUTLET BOXES

1. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
 - a. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch (13 mm) male fixture studs where required.

PART 3 - EXECUTION

A.INSTALLATION

1. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
2. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
3. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
4. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.
5. Install boxes to preserve fire resistance rating of partitions and other elements.
6. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
7. Use flush mounting outlet boxes in new walls of finished areas.
8. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch (150 mm) separation. Provide minimum 24 inches (600 mm) separation in acoustic rated walls.
9. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
10. Use stamped steel bridges to fasten flush mounting outlet box between studs.
11. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
12. Do not fasten boxes to ceiling support wires.
13. Support boxes independently of conduit.
14. Use gang box where more than one device is mounted together. Do not use sectional box.
15. Use gang box with plaster ring for single device outlets.

B.INTERFACE WITH OTHER PRODUCTS

1. Coordinate installation of outlet box for products furnished under other sections of this specification.
2. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.
3. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

C. ADJUSTING

1. Adjust flush-mounting outlets to make front flush with finished wall material.
2. Install knockout closures in unused box openings.

END OF SECTION

SECTION 16141

WIRING DEVICES

PART 1 - GENERAL

A. SECTION INCLUDES

1. Switches
1. Receptacles.
2. Device plates and decorative box covers.

B. RELATED SECTIONS

1. Section 16130 - Boxes.

C. REFERENCES

1. NEMA WD 1 - General Purpose Wiring Devices.
2. NEMA WD 6 - Wiring Device Configurations.

D. SUBMITTALS

1. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
2. Manufacturer's Instructions:
 - a. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.
 - b. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

E. QUALIFICATIONS

1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

F. REGULATORY REQUIREMENTS

1. Conform to requirements of ANSI/NFPA 70.

2. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

A.SWITCHES

1. Lighting Switches:

Outside of dwelling units:

Hubbell "Pro" series, 20 amp, 120-277 volt AC, or equal by Slater, P&S or Leviton.

Inside dwelling units:

Commercial Specification Grade, Hubbell "CS" series,, 20 amp, 120-277 volt AC, or equal by Slater, P&S or Leviton.

B.RECEPTACLES

1. Single Convenience Receptacle (Disposal):

Hubbell No. HBL5261 or equal by Slater, P&S or Leviton.

2. Duplex Convenience Receptacles:

Outside of dwelling units:

Heavy Duty Specification Grade, Hubbell "Pro" series or equal by Slater, P&S or Leviton.

Inside dwelling units:

Commercial Specification Grade, Hubbell "CR" series, (Tamper-Resistant in locations required by the N.E.C.) or equal by Slater, P&S or Leviton.

3. Duplex Ground Fault Circuit Interrupter (GFI):

Outside of dwelling units:

Commercial Specification Grade, Hubbell "GFRST" series or equal by Slater, P&S or Leviton.

Inside dwelling units:

Commercial Specification Grade, Hubbell "GFTRST20" series, (Tamper-Resistant in locations required by the N.E.C.) or equal by Slater, P&S or Leviton.

4. Range Receptacle:

Hubbell No. HBL9450A or equal by Slater, P&S or Leviton. Provide matching cordset and install on each range.

5. Dryer Receptacle:

Hubbell No. HBL9430A or equal by Slater, P&S or Leviton. Provide matching cordset and install on each dryer.

6. Substitutions: Under provisions of Section 01631.

C.DEVICE COVER PLATES

1. Provide plastic device covers.
2. Type sized to fit outlet box and device openings, by Hubbell, Slater, P&S or Leviton.

D.DEVICE AND DEVICE COVER PLATE COLOR

1. Verify device and device cover plate color with Architect.

PART 3 - EXECUTION

A.EXAMINATION

1. Verify conditions under provisions of the General Conditions.
2. Verify outlet boxes are installed at proper height.
3. Verify wall openings are neatly cut and will be completely covered by wall plates.
4. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

B.PREPARATION

1. Provide extension rings to bring outlet boxes flush with finished surface.
2. Clean debris from outlet boxes.

C.INSTALLATION

1. Install products in accordance with manufacturer's instructions.

2. Install devices plumb and level.
3. Install switches with OFF position down.
4. Install receptacles with grounding pole on bottom.
5. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.
6. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
7. Connect wiring devices by wrapping conductor around screw terminal.
8. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

D.INTERFACE WITH OTHER PRODUCTS

1. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.

E.FIELD QUALITY CONTROL

1. Inspect each wiring device for defects.
2. Operate each wall switch with circuit energized and verify proper operation.
3. Verify that each receptacle device is energized.
4. Test each receptacle device for proper polarity.

F. ADJUSTING

1. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 - GENERAL

A. SECTION INCLUDES

1. Conduit supports.
2. Anchors and fasteners.

B. REFERENCES

1. NECA - National Contractors Association.
2. ANSI/NFPA 70 - National Electrical Code.

C. REGULATORY REQUIREMENTS

1. Conform to requirements of ANSI/NFPA 70.
2. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

A. PRODUCT REQUIREMENTS

1. Materials and Finishes: Provide adequate corrosion resistance.
2. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
3. Anchors and Fasteners:
 - a. Concrete Structural Elements: Use expansion anchors.
 - b. Steel Structural Elements: Use spring steel clips
 - c. Concrete Surfaces: Use expansion anchors
 - d. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
 - e. Solid Masonry Walls: Use expansion anchors.
 - f. Sheet Metal: Use sheet metal screws.
 - g. Wood Elements: Use wood screws.

PART 3 - EXECUTION

A.INSTALLATION

1. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not drill or cut structural members.

END OF SECTION

SECTION 16195
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

A. SECTION INCLUDES

1. Nameplates and labels.
2. Wire and cable markers.

B. REFERENCES

1. ANSI/NFPA 70 - National Electrical Code.

PART 2 - PRODUCTS

A. NAMEPLATES AND LABELS

1. Nameplates: Engraved three-layer laminated plastic, white letters on black background.
2. Locations:
 - a. Each electrical distribution and control equipment enclosure.
 - b. Each new and existing panelboard as labeled on the floor plans.
3. Letter Size:
 - a. Use 1/8 inch letters for identifying individual equipment and loads.

B. WIRE MARKERS

1. Description:

Cloth Identification Labels: Each conductor at special system junction and device boxes.

Plastic Tape: Each phase, neutral and ground conductor for feeders:

120/208 Volt, 3 Phase, 4 Wire System:

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Equipment Ground	Green

PART 3 -EXECUTION

A.PREPARATION

1. Degrease and clean surfaces to receive nameplates.

B.APPLICATION

1. Install nameplate parallel to equipment lines.
2. Secure nameplate to equipment front using adhesive.
3. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

END OF SECTION

SECTION 16441
DISCONNECT SWITCHES

PART 1 - GENERAL

A. SECTION INCLUDES

1. Fusible switches.
2. Nonfusible switches.
3. Fuses.

B. REFERENCES

1. NEMA KS 1 - Enclosed Switches.
2. NFPA 70 - National Electrical Code.
3. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.
4. UL 198E - Class R Fuses.

C. SUBMITTALS

1. Submit under provisions.
2. Product Data: Provide switch ratings and enclosure dimensions.
3. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

D. QUALITY ASSURANCE

1. Perform Work in accordance with NECA Standard of Installation.
2. Maintain one copy each document on site.

E. REGULATORY REQUIREMENTS

1. Conform to requirements of NFPA 70.
2. Furnish products listed and classified by UL as suitable for purpose specified and shown.

F. EXTRA MATERIALS

1. Provide three of each size and type fuse installed.

PART 2 - PRODUCTS

A. MANUFACTURERS

1. Square D
2. General Electric
3. Siemens/ITE
4. Substitutions: Instruction to Bidders.

B. DISCONNECT SWITCHES

1. Fusible Switch Assemblies: NEMA KS 1, Type GD (General Duty) load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
2. Nonfusible Switch Assemblies: NEMA KS 1, Type GD (General Duty) load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
3. Enclosures: NEMA KS 1.
 - a. Interior Dry Locations: Type 1.
 - b. Exterior Locations: Type 3R.

C. FUSES

1. Manufacturers:
 - a. Bussman
 - b. Gould Shawmut
2. Description: Dual element, current limiting, time delay, one-time fuse, FRN (250 volt), FRS (600 volt), RK 5.
3. Interrupting Rating: 200,000 rms amperes.

PART 3 EXECUTION

A. INSTALLATION

1. Install disconnect switches where indicated.
2. Install fuses in fusible disconnect switches.
3. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

A. SECTION INCLUDES

1. Branch circuit panelboards.

B. RELATED WORK

1. Section 16190 - Supporting Devices.
2. Section 16195 - Electrical Identification: Engraved nameplates.

C. REFERENCES

1. NECA (National Electrical Contractors Association) "Standard of Installation."
2. NEMA AB 1 - Molded Case Circuit Breakers.
3. NEMA PB 1 - Panelboards.
4. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
5. NFPA 70 - National Electrical Code.

D. SUBMITTALS

1. Submit under provisions of Section 01300.
2. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
3. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

E. OPERATION AND MAINTENANCE DATA

1. Submit under provisions of Section 01700.
2. Maintenance Data: Include spare parts data listing; source and current prices of

replacement parts and supplies; and recommended maintenance procedures and intervals.

F. QUALITY ASSURANCE

1. Perform Work in accordance with NECA Standard of Installation.
2. Maintain one copy of each document on site.

G. REGULATORY REQUIREMENTS

1. Conform to requirements of NFPA 70.
2. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

H. FIELD MEASUREMENTS

1. Verify that field measurements are coordinated with equipment size.

I. MAINTENANCE MATERIALS

1. Provide maintenance materials under provisions of Section 01700.
2. Provide two of each panelboard key.

PART 2 - PRODUCTS

A. MANUFACTURERS

1. General Electric
2. Siemens
3. Square D

B. LOAD CENTERS (Unit Panels)

1. Load Centers: Circuit breaker load center, with bus ratings as indicated.
2. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical.
3. Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where indicated. Do not use tandem circuit breakers.

4. Enclosure: General Purpose.
5. Box: Surface or Flush type with door and latch. Finish in manufacturer's standard gray enamel.
6. Provide accessories as indicated on schedule.

C.BRANCH CIRCUIT PANELBOARDS: (Panels "H1 & H2")

1. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.
2. Panelboard Bus: Copper, ratings as indicated. Provide copper equipment ground bus and isolated ground bus in each panelboard as indicated on the drawings.
3. Minimum integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards.
4. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Do not use tandem circuit breakers.
5. Enclosure: NEMA Type 1 or 3R as indicated on Panel Schedule.
6. Cabinet box: 5 3/4" inches deep; width: 22 inches.
7. Cabinet Front: Flush or Surface as indicated with and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
8. Provide accessories as indicated on schedule.

PART 3 - EXECUTION

A.INSTALLATION

1. Install panelboards in accordance with NEMA PB 1.1.
2. Install panelboards plumb. Install recessed panelboards flush with wall finishes. Provide supports in accordance with Section 16190.
3. Height: 6 ft (2 M) to top of panelboard; install panelboards taller than 6 ft (2 M) with bottom no more than 4 inches (10 cm) above floor.
4. Provide filler plates for unused spaces in panelboards.
5. Provide typed circuit directory for each branch circuit panelboard. Revise directory to

reflect circuiting changes required to balance phase loads.

6. Provide engraved plastic micarta nameplates.

B.FIELD QUALITY CONTROL

1. Field inspection and] testing will be performed under provisions of Section 01400.
2. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.
3. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers and lugs.

END OF SECTION

SECTION 16721

FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1. DESCRIPTION:

- A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- B. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- C. Underwriters Laboratories Inc. (UL) - USA:

No. 38 Manually Actuated Signaling Boxes
No. 50 Cabinets and Boxes
No. 864 Control Units for Fire Protective Signaling Systems
No. 268 Smoke Detectors for Fire Protective Signaling Systems
No. 268A Smoke Detectors for Duct Applications
No. 346 Waterflow Indicators for Fire Protective Signaling Systems
No. 464 Audible Signaling Appliances
No. 521 Heat Detectors for Fire Protective Signaling Systems
No. 1971 Visual Notification Appliances

1.2. SCOPE:

- A. An intelligent, microprocessor-controlled, fire alarm detection system shall be installed in accordance to the project specifications and drawings.
- B. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.
- C. Control Panel shall be expandable from 1 to 2 SLC loops as necessary to accommodate future expansion using add-on modules.
- D. Basic Performance:
 - 1. Signaling Line Circuits (SLC) Serving Addressable Devices: Class B.
 - 2. Initiation Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class B.

3. Notification Appliance Circuits (NAC) Serving Strobes and Horns: Wired Class B.
 4. Alarm Signals Arriving at Control Panel: Not lost following primary power failure until alarm signal is processed and recorded.
 5. Network Node Communications:
 - a. System shall have the capability of networking with other Control Panels on single pair of copper wires or fiber optic cables.
 6. Signaling Line Circuits (SLC):
 - a. SLC modules shall operate in peer-to-peer fashion with all SLC modules in the Control Panel.
 - b. On loss of an SLC module, each remaining panel shall continue to communicate with remainder of system, including all SLC and control functions
 7. NAC Circuits: Arranged such that there is a minimum of 1 audible device per fire alarm zone.
 8. Notification Appliance Circuits (NAC), and Control Equipment: Arranged such that loss of any 1 NAC circuit will not cause loss of any other NAC circuit in system.
 9. NAC Circuits:
 - a. Electrically supervised for open and short circuit conditions.
 - b. If short circuit exists on NAC circuit, it shall not be possible to activate that circuit.
- E. Basic System Functional Operation: When fire alarm condition is detected and reported by one of the system alarm initiating devices, the following functions shall immediately occur:
1. System Alarm LEDs: Flash.
 2. Local Piezo-Electric Signal in Control Panel: Sound at a pulse rate.
 3. 4.3 inch Color Touchscreen Display: Indicate all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
 4. Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence. History Log shall have a capacity for recording up to 4,100 events.
 5. System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
 - a. Close Fire Doors
 - b. Shut down air handlers as required by code
 - c. Notify the Central Station or Municipal Tie.
 6. Strobes flash synchronized continuously until system is reset.
 7. Audible devices sound continuous Temporal pattern until system is reset or silenced.
- F. Fire Alarm System Functionality:

1. Provide complete, electrically supervised distributed, Style 7 networked analog/addressable fire alarm and control system, with analog addressable initiating devices.
2. Fire Alarm System:
 - a. Incorporate S3 Series multiprocessor-based control panel SLP motherboard with 4.3 inch color touchscreen annunciator (SLP) and up to 2 loop modules (SLC-PM or SLC95-PM).
3. Each SLC-PM SLC module: Incorporate 1 Signaling Line Circuits (SLC), with capacity to support up to 159 analog addressable detectors and 159 addressable modules per SLC.
4. Each SLC95-PM SLC module: Incorporate 1 Signaling Line Circuits (SLC), with capacity to support up to 126 analog addressable detectors and addressable modules per SLC.
5. Control Panel shall incorporate Boolean control-by-event programming, including as a minimum AND, OR, NOT, XOR and Timer functions.
6. Control Panel shall have the capability to accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips.
7. Control Panel shall have the capability of having an optional DACT (digital alarm communicator transmitter) that can report to single central station monitoring account.
8. Control Panel shall have the capability of storing its entire program, and allow installer to activate only devices that are installed during construction, without further downloading of system.
9. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords using 6 digits.
10. Control panel shall have an Ethernet port (RJ-45) located on the main control board, which can be used for uploading and downloading programs from a laptop or desktop computer. The Ethernet port can also be used for interface to a Graphic Control System when such a system is specified.

1.3. SUBMITTALS

- A. Comply with Section 01330 (01 33 00) – Submittal Procedures.
- B. Include sufficient information, clearly presented, to determine compliance with the specifications and the Drawings.
- C. Equipment Submittals:
 1. Cover Page: Indicate the following:
 - a. Project name and address.
 - b. Engineered systems distributor's name and other contact information.
 - c. Installing contractor's name and other contact information.
 - d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
 2. Table of Contents: Lists each section of equipment submittal.
 3. Scope of Work Narrative: Detail indented scope of work.

4. Sequence of Operations: Use matrix or written text format, detailing activation of each type of device and associated resulting activation of the following:
 - a. Control panel.
 - b. Annunciator panels.
 - c. Notification appliances.
 - d. Building fire safety functions, including elevator recall, elevator power shutdown, door lock release, door holder release, HVAC unit shutdown, smoke evacuation system activation, and stair pressurization fan activation.
5. Bill of Material: Indicate for each component of system the following:
 - a. Quantity.
 - b. Model number.
 - c. Description.
6. SLC Circuit Schedule: Detail address and associated description of each addressable device. Clearly provide information that indicates number of both active and spare addresses.
7. Battery Calculations: Show load of each of, and total of, components of system along with standby and alarm times that calculations are based on. Show calculated spare capacity and size of intended battery.

D. Shop Drawings:

1. Cover Page: Indicate the following:
 - a. Project name and address.
 - b. Engineered systems distributor's name and other contact information.
 - c. Installing contractor's name and other contact information.
 - d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
2. Floor Plans:
 - a. Provide separate floor plan for each floor.
 - b. If a floor plan must be split using match lines to fit on the page, provide match lines and match line references that refer to sheet number that shows area on opposite side of match line.
 - c. Prepare using AutoCAD.
 - d. Prepare to scale 1/8 inch = 1'-0", unless otherwise required by the Architect or Engineer.
 - e. Show equipment and device locations.
 - f. Show wiring information in point-to-point format.
 - g. Show conduit routing, if required by the AHJ.
3. Title Block: Provide on each sheet and include, at a minimum, the following:
 - a. Project name.
 - b. Project address.
 - c. Sheet name.
 - d. Sheet number.
 - e. Scale of drawing.
 - f. Date of drawing.
 - g. Revision dates, if applicable.

4. Control Panel: Provide sheet that details exterior and interior views of control panel and clearly shows associated wiring information.
 5. Annunciator Panels: Provide sheet that details exterior and interior views of annunciator panels and clearly shows associated wiring information.
- E. Certification: Submit with equipment submittals and shop drawings, letter of certification from major equipment manufacturer, indicating proposed engineered system distributor is an authorized representative of major equipment manufacturer.
- F. Project Record Drawings:
1. Submit complete project record drawings within 14 calendar days after acceptance test.
 2. Project record drawings shall be similar to shop drawings, but revised to reflect changes made during construction.
- G. Operation and Maintenance Manuals:
1. Submit complete operation and maintenance manuals within 14 calendar days after acceptance test.
 2. Operation and maintenance manuals shall be similar to equipment submittals, but revised to reflect changes made during construction.
 3. Include factory's standard installation and operating instructions.

1.4. GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5. APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

- A. National Fire Protection Association (NFPA) - USA:
- No. 13 Sprinkler Systems
No. 70 National Electric Code (NEC)
No. 72 National Fire Alarm Code
No. 101 Life Safety Code
- B. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- C. Local and State Building Codes.

- D. All requirements of the Authority Having Jurisdiction (AHJ).

1.6. APPROVALS:

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

UL Underwriters Laboratories Inc

PART 2.0 PRODUCTS

2.1 MANUFACTURER

- A. Gamewell-FCI, Honeywell Fire Systems, 12 Clintonville Road, Northford, Connecticut 06472. Phone (203) 484-7161. Fax (203) 484-7118. Website: www.gamewell-fci.com.
- B. References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality. Equivalent equipment from Gamewell may be substituted for the specified equipment, as long as minimum standards are met. No other manufacturers, other than Gamewell-FCI, FCI, and Gamewell will be considered for use on this project.

2.2 FIRE ALARM SYSTEM

- A. Fire Alarm System: Gamewell-FCI S3 Series Small Addressable Fire Alarm System.

2.3 CONTROL PANEL HARDWARE

- A. Intelligent Small Addressable Panel (SLP): Supply user interface, including 4.3 inch touch-screen display. Control Panel shall consist of the following units and components:
 1. System Cabinet (SLP-BB) or Cabinet with associated inner door (S3BB-BB/S3BB-RB).
 2. Power Supply Module (FLPS-7) with batteries.
 3. SLP Motherboard (SLP-MB).
 4. 4.3 inch color touch screen display (LCD-SLP).
 5. SLC Modules (SLC-PM or SLC95-PM) up to 2 per control panel.
 6. Optional DACT (DACT-E3).
 7. Optional Auxiliary Switch Module (ASM-16).
- B. System Cabinet:
 1. Surface or semi-flush mounted with texture finish.
 2. Consist of back box and black door (SLP-BB) or back box, inner door, black or red outer door (S3BB-BB/S3BB-RB)
 3. Houses 1 FLPS-7 Power Supply Module, 1 SLP-MB assemblies, 1 or 2 SLC-PM/SLC95-PM SLC modules and other optional modules as specified.

4. Construction: Display-front steel construction with lockout (SLP-BB) or Dead-front steel construction with inner door to conceal internal circuitry and wiring (S3BB-BB/S3BB-RB).
 5. Wiring: Terminated on removable terminal blocks to allow field servicing of modules without disrupting system wiring.
- C. Power Supply Module (FLPS-7): Use latest technologies to provide power to the Control Panel and incorporate the following features:
1. Power-saving switching technology using no step-down transformers.
 2. 7-amp continuous-rated output to supply up to all power necessary under normal and emergency conditions.
 3. Integral battery charger with capacity to charge up to 55 amp-hour batteries while under full load.
- D. Batteries:
1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.
- E. 4.3 inch Color Touch Screen Display Module (LCD-SLP):
1. Color Touch Screen Display: RS-485 based textual annunciator with capability of being mounted locally or remotely. Provides audible and visual annunciation of all alarms and trouble signals. Provide dedicated LEDs for:
 - a. AC: Green.
 - b. Fire Alarm: Red.
 - c. Hazard: Blue.
 - d. Supervisory: Yellow.
 - e. Trouble: Yellow.
 - f. Silenced: Yellow.
 2. 4.3 inch Color Touch Screen Display: Provide status of all analog/addressable sensors, monitor and control modules. Display shall be liquid crystal type (LCD), clearly visible in dark and under all light conditions.
 3. Panel shall contain 3 functional keys:
 - a. Menu.
 - b. Fire Drill.
 - c. System Reset.
 4. Panel shall contain 5 custom programmable function buttons for:
 - a. Alarm Acknowledge.
 - b. Trouble Acknowledge.
 - c. System Silence.
 - d. Fan Reset.
 - e. Lamp Test.
 - c. Other functions like output bypass, device enable/disable, device on/off.
 5. Systems that do not have a minimum of 200 characters (4 lines of 40 characters) are not acceptable.

- F. Intelligent Small Addressable Panel (SLP): System shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. Shall be capable of mounting in stand-alone enclosure as specified.
1. Field Programmable: System shall be capable of being programmed by Field Configuration Program (FCP), allowing programming to be downloaded via portable computer.
 2. Ethernet Output: Ethernet port shall be provided to accept downloaded program from portable computer, connect to FocalPoint Graphical Workstation, or provide 80-column readout of all alarms, troubles, location descriptions, time, and date. Communication shall operate at 10/100 speeds.
 3. RS-232C Serial Output: Supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept downloaded program from portable computer, or provide 80-column readout of all alarms, troubles, location descriptions, time, and date. Communication shall be standard ASCII code operating from 1,200 to 115,200 baud rate.
 4. RS-485 Serial Output: Each SLP shall incorporate RS-485 bus via ribbon harness for connection of modules inside same cabinet, and via 4-wire quick connector for connection of modules up to 3,000 feet from cabinet. Each SLP's RS-485 bus shall support up to 16 ASM-16 auxiliary switch modules, 16 LCD-SLP main annunciators, 6 LCD-E3 remote annunciators, and 5 LCD-7100 remote annunciators.
 5. Peer-to-Peer Panel Configuration: All Intelligent Small Addressable Panels shall incorporate own programming, log functions, Central Processor Unit, and control-by-event (CBE) programming. If any loop driver becomes disabled, each remaining loop driver shall continue to communicate with remainder of network and maintain normal operation.
 6. Control-by-Event (CBE) Program: SLP shall be capable of programming using Boolean logic including AND, OR, NOT, XOR and TIMING functions to provide complete programming flexibility.
 7. Alarm Verification: Smoke detector alarm verification shall be standard option while allowing other devices such as manual stations and sprinkler flow to create immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
 8. Alarm Signals: All alarm signals shall be automatically latched or "locked in" at control panel until operated device is returned to normal and control panel is manually reset. When used for sprinkler flow, "SLNC" button may be bypassed, if required by AHJ.
 9. Electrically Supervised:
 - a. Each SLC and NAC circuit shall be electrically supervised for opens, shorts, and ground faults. Occurrence of fault shall activate system trouble circuitry, but shall not interfere with proper operation of other circuits.
 - b. Yellow "TROUBLE" LED shall light and system audible sounder shall steadily sound when trouble is detected in system. Failure of power, open or short circuits on SLC or NAC circuits, disarrangement in system wiring, failure of microprocessor or any identification module, or system ground faults shall activate this trouble circuit. Trouble signal shall be

- acknowledged by operating “TRBL ACK” button. This shall silence sounder. If subsequent trouble conditions occur, trouble circuitry shall resound. During alarm, all trouble signals shall be suppressed with exception of lighting yellow “TROUBLE” LED.
10. Drift Compensation – Analog Smoke Sensors: System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to effects of component aging or environment, including dust. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring factors which generally contribute to nuisance alarms. System trouble circuitry shall activate, display units that require maintenance.
 11. Analog Smoke Sensor Test: System software shall automatically test each analog smoke sensor a minimum of 3 times daily. Test shall be recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of sensor shall activate system trouble circuitry, display “Test Failed” indication, and identify individual device that failed.
 12. Off-Premises Connection:
 13. Positive Alarm Sequence (PAS): The system control panel shall be capable of setting any detector or sensor into Positive Alarm Sequence mode. Positive Alarm Sequence will operate in the following manner. Any alarms received from a device will activate an alarm at the control panel but will not execute any output functions (e.g. turning on the strobes or fire horns). The operator has 30 seconds to “acknowledge” the event or the system will activate a general alarm and sound all the fire horn and strobes. If the operator does acknowledge the event within thirty (3) seconds, the panel will start a timer for 180 seconds (3 minutes) in which time the operator must find the device in alarm and reset the device. If the operator has not performed a reset within 180 seconds or a second device reports an alarm, the system will immediately sound the general alarm.
 14. Central Station Option: Fire alarm control panel shall provide Digital Alarm Communicator Transmitter (DACT) for signaling to central station. DACT shall contain “Dialer-Runaway” feature preventing unnecessary transmissions as result of intermittent faults in system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. Fire department shall be consulted as to authorized central station companies serving municipality. Fire alarm system shall transmit both alarm and trouble signals, with alarm having priority over trouble signal. Contractor shall be responsible for all installation charges and Owner will be responsible for line lease charges.
 15. Redundant History Log: Each SLP shall contain full 4100 event history log supporting local and network functions. If a main processor or network node is lost the entire log shall be accessible at any other Loop Interface board. This shall be demonstrated by removing power followed by extraction of history log from any loop driver location
 16. LEDs Indicator and Outputs: Each SLP Intelligent Small Addressable Panel shall incorporate as a minimum the following diagnostic LED indicators:
 - a. Power: Green.
 - b. Alarm: Red.

- c. Supervisory: Yellow.
 - d. General Trouble: Yellow.
 - e. Ground Fault: Yellow.
 - f. Hazard: Blue.
 - g. Municipal: Yellow.
 - h. NAC1: Yellow.
 - i. NAC2: Yellow.
 - j. NAC3: Yellow.
 - k. NAC4: Yellow.
17. Auxiliary Power Outputs: Each SLP Intelligent Small Addressable Panel shall provide the following supply outputs:
- a. 24 VDC non-resettable, 1 amp. maximum, power limited.
 - b. 24 VDC resettable, 1 amp. maximum, power limited.
18. Microprocessor: Intelligent Small Addressable Panel shall incorporate 32-bit RISC processor. Isolated “watchdog” circuit shall monitor microprocessor and upon failure shall activate system trouble circuits on display. Microprocessor shall access system program for all control-by-event (CBE) functions. System program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, XOR, TIME DELAY functions for maximum flexibility.
19. Auto Programming: System shall provide for all SLC devices on any SLC loop to be pre-programmed into system. Upon activation of auto programming, only devices that are present shall activate. This allows for system to be commissioned in phases without need of additional downloads.
20. Environmental Drift Compensation: System shall provide for setting Environmental Drift Compensation by device. When detector accumulates dust in chamber and reaches unacceptable level but yet still below allowed limit, control panel shall indicate maintenance alert warning. When detector accumulates dust in chamber above allowed limit, control panel shall indicate maintenance urgent warning.
21. NON-FIRE Alarm Module Reporting: Non-reporting type ID shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display message at panel LDC. Activation of NON-FIRE point shall activate control by event logic, but shall not cause indication on control panel.
22. 1-Man Walk Test:
- a. System shall provide both basic and advanced walk test for testing entire fire alarm system. Basic walk test shall allow single operator to run audible tests on panel. All logic equation automation shall be suspended during test and while annunciators can be enabled for test, all shall default to disabled state. During advanced walk test, field-supplied output point programming shall react to input stimuli, such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch input. Advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device, and wiring operation/verification.

- b. Shall Automatically generate professionally formatted NFPA 72, NFPA 10, or Joint Commission Reports such as (GW-eVance Inspection Manager) A second technician will not be required at the fire panel during testing.
 - c. Test feature is intended to provide for certain random spot testing of system and is not intended to comply with requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all functions and verify items such as annunciation with only 1 person.
23. Signaling Line Circuits: Each SLC-PM/SLC95-PM module shall provide communication with analog/addressable (initiation/control) devices via 2 signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. Circuits shall be capable of operating in NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Unique 40-character identifier shall be available for each device.
- a. SLC-PM shall communicate with a maximum of 159 analog sensors and 159 addressable monitor/control devices. Devices shall be of the Velociti series with capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLCs are fully loaded.
 - b. SLC95-PM shall communicate with a maximum of 126 analog sensors and addressable monitor/control devices. Devices shall be of the Apollo series with capability to poll 1 device at a time with a maximum polling time of 3 seconds when both SLCs are fully loaded.
24. Notification Appliance Circuits: 4 Class B or 2 Class A independent NAC circuits shall be provided on the SLP panel, polarized and rated at 2 amperes DC per circuit, 4 amperes max from all circuits. Each NAC individually over-current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y or Class A, Style Z.
25. Alarm Dry Contacts: Provide alarm dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system alarm occurs.
26. Supervisory Dry Contacts: Provide supervisory dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system supervisory condition occurs.
27. Trouble Dry Contacts: Provide trouble dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system trouble occurs.
28. Sounder Synchronization: The panel shall be capable of synchronizing the sounders bases with the fire horns for improved clarity. Synchronization shall be accomplished via the SLC loop.

2.5 SUPPLEMENTAL NOTIFICATION APPLIANCE CIRCUIT

- A. A compatible, Listed, Supplemental Notification Appliance Circuit shall be provided offering up to 6.0 amps of regulated 24-volt power and shall include the following features:
1. Integral Charger: Charge up to 18.0 amp-hour batteries and support 60-hour standby.
 2. 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or relay.

3. Surface-mount back box.
4. Ability to delay AC fail delay in accordance with applicable NFPA requirements.
5. Power limited circuitry in accordance with applicable UL standards.
6. Operates as sync follower or a sync generator.

2.6 SYSTEM PERIPHERALS – SYSTEM SENSOR

A. SLC-PM Addressable Devices – General:

1. Provide address-setting means using rotary-decimal switches.
2. Use simple to install and maintain decade-type (numbered 0 to 15) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
3. Addressable Devices: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
4. Addressable Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
6. Using software, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
7. Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
8. Following bases and auxiliary functions shall be available:
 - a. Standard base with remote LED output.
 - b. Sounder base rated at 85 dBA minimum.
 - c. Intelligent Addressable Sounder base rated at 75 dBA minimum.
 - d. Form-C relay base rated 30 VDC, 2.0 A.
 - e. Isolator base.
9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).

B. Addressable Manual Stations (MS-7AF):

1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
 2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
 3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
 4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
 5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.
- C. Intelligent Thermal Detectors (ATD-RL2F): Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.
- D. Intelligent Photoelectric Smoke Detectors (ASD-PL2F): Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.
- E. Intelligent Duct Smoke Detector Base (DNR, DNRW):
1. In-Duct Smoke Detector Housing: Use ASD-PL2F intelligent photoelectric detector, ASD-PL2FR intelligent remote test photoelectric detector or ASD-IL2F intelligent ionization detector, which provides continuous analog monitoring and alarm verification from panel.
 2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.
 3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide with remote alarm indicator.
 4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.
- F. Addressable Dry Contact Monitor Modules (AMM-2F):
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in standard deep electrical box.
 3. IDC Zone: Suitable for Style B operation.
- G. Addressable Dry Contact Monitor Modules (AMM-4F):
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
 3. IDC Zone: Suitable for Style D or Style B operation.
 4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

H. Addressable Dry Contact Monitor Modules (AMM-2IF):

1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3. IDC Zones: Suitable for Style B operation.
4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

I. Addressable Two Input and Two Output Modules (AMM-2RIF):

1. Provide two isolated sets of Form-C contacts, which operate as a single pole double throw switch. The module shall allow the control panel to switch these contacts on command. Module shall have both normally open and normally closed connections available for field wiring. Two input modules shall connect two supervised initiating device circuit (IDC) or zone of conventional alarm initiating devices (any normally open dry contact device) to the fire alarm control panel signaling line circuit (SLC) Loop.
2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3. IDC Zones: Suitable for Style B operation.
4. LEDs: Four LEDs that are controlled by the panel to indicate status of each input and output. Coded signals, transmitted from the panel, can cause the LED to blink, latch on, or latch off. Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

J. Addressable Control Modules (AOM-2SF):

1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

K. Addressable Relay Modules (AOM-2RF):

1. Provide two isolated sets of Form-C contacts, which operate as a double pole double throw switch. The module shall allow the control panel to switch these contacts on command. The module shall not provide supervision for the notification appliance circuit (NAC). Module shall have both normally open and normally closed connections available for field wiring.
2. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to

- reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
3. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
 4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.
- L. Sprinkler Waterflow Switches (provided and installed by the sprinkler contractor):
1. Integral, mechanical, non-coded, non-accumulative retard type.
 2. Alarm transmission delay time conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 to 45 seconds.
 3. Single manufacturer and series.
 4. Where possible, locate waterflow switches a minimum of 1 foot from fitting which changes direction of flow and a minimum of 3 feet from valve.
 5. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
- M. Sprinkler and Standpipe Valve Supervisory Switches (provided and installed by the sprinkler contractor):
1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with supervisory switch. Standpipe hose valves, test valves, and drain valves shall not be equipped with supervisory switches.
 2. PIV (Post Indicator Valve) or Main Gate Valves: Equip with supervisory switch.
 3. Mount not to interfere with normal operation of valve and adjust to operate within 2 revolutions toward closed position of valve control, or when stem has moved no more than one-fifth of distance from normal position.
 4. Contain in weatherproof aluminum housing, which shall provide 3/4-inch (19-mm) conduit entrance and incorporate necessary facilities for attachment to valves.
 5. Switch Housing Finish: Red baked enamel.
 6. Entire Installed Assembly: Tamper proof and arranged to cause switch operation if housing cover is removed or if unit is removed from mounting.
 7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

2.7 SYSTEM PERIPHERALS – S3 SERIES

- A. LCD Display Announcer:
1. Furnish and install as indicated on the Drawings a remote serial annunciation, Model LCD-7100. Announcer shall provide 80-character display, which shall duplicate all information on basic system display, including any network nodes its host panel is annunciating, with exception of menus. Contain the following function keys:
 - a. Alarm Acknowledge.
 - b. Trouble Acknowledge.
 - c. Signal Silence.

- d. System Reset/Lamp Test.
 - e. System Drill Test.
 2. Key Lock: Enable switches only when placed in “ON” position, with exception of Trouble Acknowledge, which is used to silence local trouble audible sounder. Annunciator shall contain the following LEDs:
 - a. Alarm.
 - b. Supervisory.
 - c. System Trouble.
 - d. Power Fault.
 - e. System Silenced.
 3. Mount on standard 3-gang surface or flush electrical box.
 4. Each SLP: Accommodate up to 5 remote LCD-7100 annunciators which shall be located up to 3,000 feet from control panel.
- B. Horns:
1. Operate on 24 VDC or with field-selectable outputs.
 2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
 3. Have at least 2 audibility options
- B. Strobes:
1. Compliance: ADA and UL 1971.
 2. Maximum Pulse Duration: 0.2 second.
 3. Strobe Intensity: UL 1971.
 4. Flash Rate: UL 1971.
 5. Strobe Candela Rating: Determine by positioning selector switch on back of device.
- C. Horn/Strobes:
1. Operate on 24 VDC
 2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
 3. Have at least 2 audibility options
 4. Maximum Pulse Duration: 0.2 second.
 5. Strobe Intensity: UL 1971.
 6. Flash Rate: UL 1971.
 7. Strobe Candela Rating: Determine by positioning selector switch on back of device.
- D. Door Holders:
1. Door holders indicated on the drawings are furnished as part of the door hardware package. Verify electrical requirements with hardware supplied and interface with the fire alarm system for release upon general system alarm. Provide local power wiring and connections as required for door holders to be controlled through fire alarm actuated and supervised fire alarm system relay.

PART 3.0 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive fire alarm system.
 - 1. Notify Architect of conditions that would adversely affect installation or subsequent use.
 - 2. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install fire alarm system in accordance with NFPA 72, NFPA 70, state and local codes, manufacturer's instructions, and as indicated on the Drawings.
- B. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas.
- C. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.
- D. Flush-mount fire detection and alarm system devices, control panels, and remote annunciators in finished areas. Flush-mount or surface-mount fire detection and alarm system devices, control panels, and remote annunciators in unfinished areas.
- E. Ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on the Drawings. Install not less than 42 inches, not more than 48 inches, above finished floor measured to operating handle.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide service of competent, factory-trained technician authorized by manufacturer to technically supervise and participate during pre-testing and acceptance testing of system.
- B. Testing:
 - 1. Conduct complete visual inspection of control panel connections and test wiring for short circuits, ground faults, continuity, and insulation before energizing cables and wires.
 - 2. Close each sprinkler system control valve and verify proper supervisory alarm at Control Panel.
 - 3. Verify activation of flow switches.
 - 4. Open initiating device circuits and verify that trouble signal actuates.
 - 5. Open signaling line circuits and verify that trouble signal actuates.
 - 6. Open and short notification appliance circuits and verify that trouble signal actuates.
 - 7. Ground initiating device circuits and verify response of trouble signals.
 - 8. Ground signaling line circuits and verify response of trouble signals.
 - 9. Ground notification appliance circuits and verify response of trouble signals.

10. Check installation, supervision, and operation of intelligent smoke detectors.
11. Introduce on system each of the alarm conditions that system is required to detect. Verify proper receipt and proper processing of signal at Control Panel and correct activation of control points.
12. Consult manufacturer's manual to determine proper testing procedures when system is equipped with optional features. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and similar.

C. Acceptance Testing:

1. Before installation shall be considered completed and acceptable by AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by representative approved by Engineer. Monitoring company and/or fire department shall be notified before final test in accordance with local requirements.
2. Contractor's job foreman, in presence of representative of manufacturer, representative of Owner, and fire department shall operate every installed device to verify proper operation and correct annunciation at control panel.
3. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
4. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of manufacturer and Owner, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to Owner and fire department.
5. Leave fire alarm system in proper working order and, without additional expense to Owner, replace defective materials and equipment provided within 1 year (365 days) from date of final acceptance by the owner.

3.4 DEMONSTRATION

- A. Provide instruction as required for operating fire alarm system.
- B. Provide hands-on demonstrations of operation of fire alarm system components and functions.

4.0 APPROVED EQUALS

The following manufacturers are approved as equals to the above manufacturer provided the products offered are equivalent to that specified in function, application and installation:

Siemens
Notifier

END OF SECTION

SECTION 16741

TELEPHONE AND CABLE TELEVISION WIRING SYSTEMS

PART 1 - GENERAL

A. SECTION INCLUDES

1. Jacks and Cable

B. RELATED SECTIONS

1. Section 16130 - Boxes
2. Section 16190 - Supporting Devices

C. QUALITY ASSURANCE

1. Coordinate with Telephone Utility Company.
Coordinate with Cable Television Utility Company.
2. Install work in accordance with Telephone and Cable Television Utility Company rules and regulations.

PART 2 - PRODUCTS

A. JACKS AND CABLING

1. Telephone Jacks: Four Conductor, Modular. Provide mounting studs for wall height outlets. Jack shall be mounted in plastic smooth device cover plate.
2. Cable Television Jacks: RG6 "F" connector keystone. Jack shall be mounted in plastic smooth device cover plate.
3. Telephone Cable: CAT5e, Unshielded, 24 gauge, 4 twisted pairs, Tinned copper, PVC insulated. Provide an individual cable run from each outlet to a location within the living unit as directed by the serving utility company. Provide conductor color coding as directed by the serving utility company. Label all individual cables as to location and room. Provide CAT5e punch down block per serving utility company specs in each living unit mechanical room.
4. Provide a dedicated Telephone cable run from each living unit mechanical room to the Telephone/CATV terminal board in the building sprinkler room. Label dedicated living

unit cable with living unit apartment number.

5. Cable Television Cable: RG6, Quad Shield, 18 gauge, solid bare copper, 95% copper braid, PVC insulated. Provide an individual cable run from each outlet to a location within the living unit mechanical room as directed by the serving utility company. Label all individual cables as to location and room. Provide CATV splitters per serving utility company specs in each living unit mechanical room.
6. Provide a dedicated CATV cable run from each living unit mechanical room to the Telephone/CATV terminal board in the building sprinkler room. Provide compression fittings per utility company specifications. Label dedicated living unit cable with living unit apartment number.

PART 3 - EXECUTION

A. EXAMINATION

1. Verify that surfaces are ready to receive work.
2. Verify that field measurements are as shown on Drawings.
3. Beginning of installation means installer accepts existing conditions.

END OF SECTION