Project Manual for:

Multi-Family New Construction

for

West Birch Apartments

W Branch Street
Princeton, MN

Commission Number: 616-18

June 21, 2018

Blumentals Architecture

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DIVISION 00

1. PROJECT IDENTIFICATION: West Birch Apartments is a 16 unit apartment building.
   1.1. Project Address: W Birch Street Princeton, MN
   1.2. One (1) three-story apartment building / 16 units total, including:
      a) (4) 1-bedroom / 1-bathroom
      b) (4) 2-bedroom / 1-bathroom
      c) (6) 3-bedroom / 2-bathroom
      d) (2) 4-bedroom / 2-bathroom
2. GENERAL CONDITIONS: The AIA A201, General Conditions of the Construction Contract, shall be included as reference for this project. All criteria, provisions, definitions and articles shall be adhered to. The Architect will provide a copy of the A201 to the Contractor upon written request.
3. EXISTING CONDITIONS
   3.1. The Contractor is required to become familiar will all existing conditions of the site. The Contractor should verify all dimensions, existing conditions, and existing electrical, mechanical, plumbing, utility and all other site conditions and notify the Architect of any discrepancies before proceeding with the work or Contract. Any discrepancies found must be immediately brought to the attention of the Architect and Owner in writing.
   3.2. Prior to contracting for or beginning construction of each portion of the work the Contractor is required to carefully verify the Contract Documents and any supplemental information provided by the Owner against the existing conditions and notify the Owner and Architect in writing of an discrepancies. Any remediation of said work begun or completed shall be performed to the satisfaction of the Owner, and Architect by the Contractor at no additional cost to the Owner.
4. CONTRACTOR'S DUTIES
   4.1. Provide and pay for: labor, materials, and equipment; tools, construction equipment, and machinery; and water, heat and utilities required for construction.
   4.2. Pay legally required sales, consumers and use taxes.
   4.3. As applicable at the time of receipt of bids, secure and pay for permits, fees, and licenses necessary for execution and completion of the work.
   4.4. Give required notices.
   4.5. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities, which bear on performance of work.
   4.6. Enforce strict discipline and good order among employees. Do not employ unfit persons or persons not skilled in assigned task.
   4.7. Obtain all required government, utility companies and other agency approvals for layout, equipment, etc.
   4.8. Coordination of work with other trades and prompt notification of requirements affecting execution of work.
   4.9. Scheduling, material purchase, installation lead time, Sub-contractor or interdisciplinary coordination, determining working hours, and complete installation of any appliance or materials necessary for the proper operation of all items, including coordinating work with Owners vendors/Contractors who are under separate Contract, shall be the responsibility of the Contractor. Any uncoordinated issues shall be brought to the attention of the Architect prior to finalizing the Contract with the Owner.
   4.10. Provide storage containers for all construction materials. Contractor to ensure that all materials are stored in a suitable place and in an orderly fashion for the project. Coordinate exact location with the Owner.
   4.11. Construction signage and barricades for the work within the right-of-way shall conform to the

latest revisions of the Manual of Uniform Traffic Control Devices. This work shall be at no additional cost to the Owner.

4.12. The Contractor shall provide all supervision, tools, material, labor, services, transportation, etc. necessary for completion of the work as it is intended, shown and/or described.

4.13. Contractor is not to proceed with any work that will alter the Contract Sum or Construction Schedule without the written consent of the Owner and Architect of the Change Order price or length of time proposed by the Contractor to complete such work. Work completed without prior written approval may be required to be remedied or removed at the discretion of the Owner and Architect without additional cost to the Owner.

4.14. No alcoholic beverages or substances, abusive or profane language, or other disruptive or illegal activities will be tolerated.

4.15. Prior to ordering and installing equipment the Contractor shall verify that clearances required for the proper, warrantied installation of new equipment is either existing or is included in the scope of new work to be performed. If required dimensional clearances are not met in existing locations or are illustrated in the scope of new work the Contractor shall inform the Architect immediately in writing.

5. Any appliances or materials obviously part or required by the manufacturer of any electrical, mechanical, plumbing, sprinkler and/or alarm work and necessary for its proper operation, although not specifically mentioned or shown on the drawings, shall be furnished and installed by the Contractor without additional cost to the Owner.

6. Items depicted as new and/or called out with the words "new", "provide", "complete", "paint", "finish" and/or "install" denote the Contractor is to purchase and fully install/complete the specified or said item/work, as well as the manufacturer recommended accessories and procedures for the proper installation and operation of said item/work for the project scope of work at no additional cost to the Owner. All items shown on the plans are to be new, provided and completely installed by the Contractor unless explicitly stated otherwise.

7. LOW VOLTAGE: All telephone, cable and data work is to be coordinated by the Contractor with the Owner.

8. FURNITURE: All new furniture is not in contract. Contractor to coordinate w/ Owner’s furniture supplier for all electrical, mechanical, logistical, storage, etc. requirements if requested by Owner.

9. PERMITS: The Contractor is responsible for the completion and filing of all required permits and related fees as part of the Contract. The Owner will reimburse for the cost of permit fees.

10. INSPECTIONS: All requests for clarification or for additional design requirements from the inspecting official shall be provided to the Architect in writing.

11. SPECIFICATION FORMATS AND CONVENTIONS: Specification Format: The Specifications are organized into Divisions and Sections using the 2004 CSI/CSC's "Master Format" numbering system.

12. CONTRACT DOCUMENTS: Consist of any or all of the items listed in AIA Document A201 General Conditions of the Contract for Construction, Article 1.1.1.

13. HIERARCHY OF DOCUMENTS: In the case of a conflict between the drawings, notes and specifications the most stringent requirement shall apply.

14. Blumentals / Architecture is the sole interpreter of the Contract Documents and performance in any dispute among Owner and Contractor as it pertains to life safety, code or aesthetic issues.

15. DIMENSIONS: Unless noted otherwise, interior dimensions are from face of finished wall to face of finish wall.

16. SCOPE OF WORK: These Drawings and Specifications indicate general scope of work and design intent only. The Contractor shall visit the site, review construction conditions and, prior to starting work, shall verify all dimensions shown on the Drawings, site conditions, and requirements for the project.

16.1. The intention of the Drawings is to provide for work complete in every detail even though every item involved may not be shown or mentioned in particular.

16.2. Variations or ambiguities between these Drawings and actual site and construction conditions shall be brought to the attention of the Architect in writing and shall be resolved and documented by the Contractor in writing prior to starting construction. Otherwise the Contractor shall perform his work in accordance with the most stringent notation or requirement to properly and functionally execute the work as part of his contract.

16.3. It is assumed that the Contractor shall comply fully with all General Notes and Specifications. It is not the intent of the Owner or Architect to withhold information and any reasonably discoverable items should be brought to the attention of the Owner and Architect prior to contracting. The Contractor is responsible for any deficiencies in the work performed by any of the Contractor's employees including but not limited to proper oversight, installation, execution and field verification, etc. of the work and existing conditions.

17. QUANTITIES: Contractor to verify all quantities required for the Project's whole and complete Scope of Work. Any discrepancies shall be brought to the Architect's attention prior to submitting a bid.

18. SITE SUPERINTENDENT: The General Contractor shall provide a full-time site superintendent. The site superintendent shall be a representative of the General Contractor, shall be present on site during all construction activities, and shall not be provided through any Subcontractor. The site superintendent's role shall be supervisory in nature, and shall not include day-to-day performance of construction activities. A 24-hour contact phone number shall be provided by the Contractor to the Owner and Architect at the time of award of Contract.

19. CONSTRUCTION CLEANUP: All construction-related debris and tools shall be kept clear of required ingress/egress walkways, corridors, drive aisles that are used for access to the site and work areas. Cleanup shall occur in a timely fashion throughout the day, and in all cases, shall be completed at the end of each working day. Final cleanup shall occur before unit and/or building turnover, and a final project cleanup shall occur at the completion of the project.

20. ATTIC STOCK: Any remaining portions of finishes that were not used as part of the work shall be given to the Owner. Contractor to include an additional 5% of all other materials in each finish/texture/sheen/thickness.

21. WARRANTY: All Contractors work shall be guaranteed against defects for a period of (1) year from the date of substantial completion or if Substantial Completion date is not issued then at the date of issuance of Certificate of Occupancy. Any portion of the Contractor's work which develops defects during that time, shall be replaced or repaired in a manner satisfying to the Owner.

22. INSURANCE: All Contractors engaged in this project are to carry proper workman and construction liability insurance, and are to file proper insurance certification when requested by the Owner.

23. ACCESSIBILITY

23.1. One (1) Unit shall comply with 2010 ADA ANSI 117.1.

23.2. One (1) Unit shall comply with 2010 ADA ANSI 117.1 Chapter 7 requirements for visual and hearing impaired.

24. ACCESSIBILITY COMPLIANCE: It is the intention for all work within the identified accessible/ADA/UFAS units and common areas to be in compliance with the governing accessibility regulations. Please reference the Building Code Data on sheet A001 and Financing Requirements below for applicable codes.

24.1. Items include, but are not limited to, electrical switches, outlets and control devices, thermostats and environmental controls, plumbing fixtures, counters and work surfaces, doors and windows including hardware, walls, stairs, ramps, lifts and elevators including controls, common amenities such as washers, dryers and mailboxes.

24.2. New items shall be installed in compliance with the governing accessibility code.

24.3. Reference the typical accessibility mounting heights and clearances within the contract documents for new fixture/device/control locations. If an item is not specifically detailed, contact the architect ahead of installation for the applicable location.

24.4. Reference Concrete Paving 32 13 13 specification for replacement of concrete sidewalks scope,

site verification and slope design limits.

25. ENERGY REBATE AND TAX CREDIT: Contractor to provide assistance, submittals, cut sheets, applicable forms for all energy rebate and/or tax credit applications as requested by the Owner as part of the base bid.
26. FINANCING REQUIREMENTS: The intention of this renovation is to comply with building codes and the physical building requirements of applicable fair housing laws. If the Contractor becomes aware that any of the following criteria may not be met by the Project's Scope of Work the Architect and Owner shall be immediately notified in writing.
    - 26.1. The Section 8 Housing Quality Standards for Existing Housing contained in 24 CFR 982.401 (https://www.law.cornell.edu/cfr/text/24/982.401)
    - 26.2. Lead-Based Paint Regulations issued by the U.S. Department of Housing and Urban Development pursuant to the Lead- Based Paint Poisoning Act. (https://www.law.cornell.edu/uscode/text/42/chapter-63)
    - 26.3. The Americans with Disabilities Act (42 U.S.C. § 12101) (http://finduslaw.com/americans-disabilities-act-1990-ada-42-us-code-chapter-126)
    - 26.4. Fair Housing Amendments Act of 1988 (42 U.S.C. 3604 (f)(3)(C)(iii)
        a) All premises within such dwellings contain the following features of adaptive design: an accessible route into and through the dwelling; light switches, electrical outlets, thermostats, and other environmental controls in accessible locations; reinforcements in bathroom walls to allow later installation of grab bars; and usable kitchens and bathrooms such that an individual in a wheelchair can maneuver about the space.
    - 26.5. Section 504 of the 1973 Rehabilitation Act and all regulations and promulgations there under. (https://www.dol.gov/oasam/regs/statutes/sec504.htm)
    - 26.6. Clean Air Act, specifically 40 CFR Part 82, Subparts A and F
    - 26.7. Air Conditioning Contractors of America (ACCA) Manuals, Part J and S, or ASHRAE handbooks for all HVAC design.
    - 26.8. 2015 Enterprise Green Community Criteria
    - 26.9. 2017 Minnesota Housing Multifamily Rental Housing Design/Construction Standards
    - 26.10. 2017 Minnesota Housing Architect’s Guide
27. OWNER SUPPLIED REPORTS: As part of this Project the following documents are included as part of the Owner's requirements of the Contractor:
    - 27.1. PHASE 1 environmental site assessment, prepared by Braun Intertec, dated February 16, 2018
    - 27.2. Geotechnical Evaluation Report, prepared by Braun Intertec, dated February 13, 2018
    - 27.3. Stormwater Report, prepared by Stark Engineering, dated June 2018
28. AIR QUALITY REQUIREMENTS: At a minimum VOC limitations shall be set for by the following criteria:
    - 28.1. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - 28.2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
    - 28.3. SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
    - 28.4. SEALANTS: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
29. SOUND TRANSMISSION REQUIREMENTS:
    - 29.1. The contractor shall verify that the STC and IIC requirements listed below will be met as a minimum. Include an allowance in the base bid for acoustic testing.

29.2. All walls and floor-ceiling assemblies between dwelling units and all other interior spaces shall be constructed to have a sound transmission class (STC) of not less than 50 for air-borne noise when tested in accordance with ASTM E90.

29.3. In addition to the above STC requirement, all floor-ceiling assemblies between dwelling units and all other interior spaces shall be constructed to have an impact insulation class (IIC) of not less than 50 when tested in accordance with ASTM E492.

29.4. All wall and floor-ceilings assemblies separating dwelling units from any other interior space shall include acoustic sealant at the following locations before any tape, spackle, molding or trim is installed: below the sill plate; around the perimeter of walls, floors and ceiling; between the seams of drywall sheets; around electric boxes, around recessed lights; around windows and doors.

29.5. Penetrations or openings in any construction separating dwelling units and any other interior spaces for piping, electrical devices, recessed cabinets, bathtubs, soffits or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required STC and IIC ratings.

29.6. Reference the door schedule for additional STC requirements. All dwelling unit entry doors shall be tight fitting to the frame and sill/threshold.

30. PRE CONSTRUCTION MEETING:

30.1. Before major work is to begin, the Contractor is required to hold an on-site preconstruction meeting with representatives from the Owner, Architect, General Contractor and any Sub-Contractor pertaining to a major portion of the work, in particular those performing work on the exterior envelope.

30.2. Agenda to include:

a) List of key personnel from property management, contractor super intendent, owner's rep, architect and other consultants.

b) Submittal quality, labeling, compliance form, information to be included, distribution and deviation from specified materials.

c) Request For Information (RFI) quality and procedure.

d) Electronic submittal service, access, distribution, responsible parties and deadlines.

e) Sustainable design features, codes and standards to follow, and submittal requirements.

f) Pay applications, change order procedure and draw schedule.

g) Construction meeting schedule, minutes by Contractor, 3-week look ahead.

h) Punch list procedure and responsible parties.

i) Certificate of Substantial Completion requirements and anticipated date for issuance.

j) Project close out procedure, required documents and de-mobilization schedule.

k) Site access, staging areas, hours of operation, and construction keys.

DIVISION 01

ALTERNATES – 01 23 00

1. Alternates shall be listed on the Contractor's bid form as separate line items that include additions to or deductions from the base bid.
2. Alternates are described in the contract drawings and specifications and may include other items than those listed in the schedule below. The Contractor is to review the entire specification and drawing set to evaluate all alternates as required.
3. Alternates quoted on the bid forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

4. Each alternate may include alteration or modification of the surrounding work. The scope and price for such coordination, alteration or modification to the surrounding work shall be fully included in the price listed for that alternate.
5. Reference the specification section or drawing listed in the schedule below for a description of each alternate each alternate. The alternate scope within specification sections identified as alternates may not include the full scope of that specification section.
6. SCHEDULE OF ALTERNATES:
    6.1. 04 20 00 Unit Masonry
    6.2. 07 18 00 Traffic Coating
    6.3. 07 46 33 Vinyl Siding
    6.4. 08 14 16 Flush Wood Doors
    6.5. 08 33 26 Overhead Coiling Grille
    6.6. 09 80 00 Acoustical Homasote
    6.7. 09 68 00 Carpeting
    6.8. 10 14 00 Signage
    6.9. 10 55 23 Mailboxes
    6.10. 11 31 00 Residential Appliances
    6.11. 23 00 00 HVAC Design Criteria
    6.12. 32 30 00 Splash Blocks

ADMINISTRATIVE REQUIREMENTS – 01 30 00

1. ELECTRONIC DOCUMENT SUBMITTAL SERVICE: All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
    1.1. Contractor and Architect are required to use this service.
    1.2. It is Contractor's responsibility to setup and maintain the service.
        a) Contractor to receive Owner’s and Architect’s approval prior to setup.
        b) Contractor to include any fees associated with the service as a part of their base bid.
    1.3. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed except that electronic document requirements do not apply to samples or color selection charts.
2. PROGRESS MEETINGS: Schedule and administer Draw Meetings throughout progress of the Work at maximum monthly intervals. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings. Record minutes and distribute electronic copies within two days after meeting, with copies sent to Architect, Owner, participants, and those affected by decisions made.
3. SUBMITTALS FOR REVIEW: When the following are specified in individual sections, submit them for review: Product data, Shop drawings, Samples for selection, Samples for verification.
    3.1. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents. Samples will be reviewed only for aesthetic, color, or finish selection.
    3.2. Interior finish submission should be provided in a single package including all wall, ceiling, flooring, cabinetry, hardware, and all other interior finishes as included in the Finish Schedule.

3.3. Exterior finish submission should be provided in a single package including all wall siding/paint/stucco, roof, soffit, handrail, fencing, concrete finish, decking, window frame and glass, storefront, stair tread and riser as well as any other items that may impact the overall exterior aesthetic.

4. SUBMITTALS FOR INFORMATION: When the following are specified in individual sections, submit them for information: Design data, Certificates, Test reports, Inspection reports, Manufacturer's instructions, Manufacturer's field reports, Other types indicated.

   4.1. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

5. SUBMITTALS FOR PROJECT CLOSEOUT: Submit Correction Punch List for Substantial Completion, Submit Final Correction Punch List for Substantial Completion, When the following are specified in individual sections, submit them at project closeout: Project record documents, Operation and maintenance data, Warranties, Bonds, Other types as indicated. Submit for Owner's benefit during and after project completion.

6. SAMPLES: To be provided by the Contractor at no additional cost to the Owner.

7. PRODUCT DATA SUBMITTALS: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

   7.1. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

8. SUBMITTAL PROCEDURES

   8.1. Substitutions that are submitted with being specifically identified as a substitution will not be reviewed.

   8.2. Shop Drawing / Submittals Procedures:

      a) Contractor must complete and utilize the Submittal Compliance Form for each shop drawing and submittal issued. Items issued without a complete and accurate Compliance Form will be rejected without review.

      b) Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.

      c) Do not reproduce the Contract Documents to create shop drawings.

      d) Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

      e) Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

   8.3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

   8.4. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor for the Architect's initial comments. Due dates, or review by dates setup in the Electronic Document Submittal Service shall not be set for a shorter duration.

   8.5. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

9. REQUESTS FOR INFORMATION (RFI): Questions requiring a written response must be submitted in the form of an RFI. All RFIs shall go through the same electronic document submittal service as Submittals.

   9.1. For each RFI, allow 15 days for the Architect's initial comments.

10. PUNCHLIST, PERIODIC DURING CONSTRUCTION: It is the sole responsibility of the General Contractor to have the work completed as shown in the Contract Documents. It is also the sole

responsibility of the General Contractor to make sure the work that is completed meets the requirements of the documents and expectations of the Owner and Architect.

10.1. Throughout this specification there are specific areas that require Mock-Ups of the work be completed. In order to set the standard of care in which the Owner and Architect expect these mock-ups should be completed and reviewed by both the Owner and Architect.

10.2. The process of generating a punch list shall be the responsibility of the General Contractor unless the Owner hires a third-party to generate the punch list.

11. PUNCHLIST, SUBSTANTIAL COMPLETION: As per the A201 section 9.8 SUBSTANTIAL COMPLETION, the Contractor is responsible for the preparation of a thorough Punchlist (Inspection or Correction List) for the Owner's and Architect's review prior to Substantial Completion. The Punchlist should be compiled prior to any site visits are scheduled to review the project for Substantial Completion. Exclusion of deficient items from the Punchlist does not relieve the Contractor of compliance if required in particular or in general by the Contract Documents or Owner.

12. PUNCHLIST, PRCEDURE: The items on the punch list shall be corrected by the responsible contractor and then re-inspected by the General Contractor to ensure all work is complete and to the approved standards and quality. Once the Punch List has been verified and signed off by the General Contractor, the Architect will conduct a random inspection of the work. If the work is approved, then the Architect will sign off on the work as being complete. If the Architect finds incomplete work that was on the list, or other items that do not meet the set standards, then the work in question will not be signed-off until corrected. Exclusion of deficient items from the Punch list does not relieve the General Contractor of compliance if required in particular or in general by the Contract Documents or Owner.

13. ARCHITECTS RESPONSE TO RFIs AND SUBMITTALS: Any response to an RFI or Submittal does not give approval for any change in the construction cost or schedule. Any change to the construction cost or schedule as a result of the Architect's response shall be documented by the Contractor, issued as a Change Order and approved by the Owner and Architect prior to proceeding with the work or ordering materials.

QUALITY REQUIREMENTS – 01 40 00

1. CONTROL OF INSTALLATION: Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality. Comply with manufacturers' instructions, including each step in sequence. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship. Have Work performed by persons qualified to produce required and specified quality. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2. MOCK-UPS: Tests shall be performed under provisions identified in this section and identified in the respective product specification sections. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes. Accepted mock-ups shall be a comparison standard for the remaining Work. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

2.1. Mock-ups shall be required at a minimum for all exterior finishes and all interior finishes.

2.2. Mock-ups shall be approved by the Owner and Architect prior to continuing with the work.

3. DEFECT ASSESSMENT: Replace Work or portions of the Work not conforming to specified requirements.

4. UNIT INTERIOR MOCK-UP: Unless specifically directed otherwise by the Owner, it is required to complete one full apartment unit as a Mock-Up, have it reviewed by all parties, and approved by the Owner and Architect to set the standards for the project. The workmanship in this apartment unit will be used to judge all other work throughout the project.

TEMPORARY FACILITIES AND CONTROLS – 01 50 00

1. TEMPORARY UTILITIES: Provide and pay for all electrical power, lighting, water, heating and cooling, and ventilation required for construction purposes. Existing facilities may not be used.
2. TELECOMMUNICATIONS SERVICES: Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.
3. TEMPORARY SANITARY FACILITIES: Provide and maintain required facilities and enclosures. Provide at time of project mobilization. Maintain daily in clean and sanitary condition.
4. BARRIERS: Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for Owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition. Provide protection for plants designated to remain. Replace damaged plants.
5. FENCING: Construction fencing shall be placed as required and coordinated with the on-site management as well as the Owner.
6. EXTERIOR ENCLOSURES: Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.
7. SECURITY: Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
8. VEHICULAR ACCESS AND PARKING: Coordinate access and haul routes with governing authorities and Owner. Provide and maintain access to fire hydrants, free of obstructions.
9. FIELD OFFICES: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

PRODUCT REQUIREMENTS – 01 60 00

1. EXISTING PRODUCTS: Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.
2. NEW PRODUCTS: Provide new products unless specifically required or permitted by the Contract Documents.
3. SUBSTITUTION PROCEDURES: Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. A request for substitution constitutes a representation that the submitter:
    - 3.1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
    - 3.2. Agrees to provide the same warranty for the substitution as for the specified product.
    - 3.3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
    - 3.4. Waives claims for additional costs or time extension that may subsequently become apparent.
    - 3.5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

3.6. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

3.7. No substitutions of materials, equipment, quality standards, etc. specified will be accepted or approved unless the deviation is brought the explicate attention of the Owner and Architect prior to purchase or change and written approval is issued by the Owner and Architect.

EXECUTION AND CLOSEOUT REQUIREMENTS – 01 70 00

1. SUBMITTALS FOR CUTTING AND PATCHING: Submit written request in advance of cutting or alteration that affects: Structural integrity of any element of Project, Integrity of weather exposed or moisture resistant element, Efficiency, maintenance, or safety of any operational element.
2. PROJECT CONDITIONS: Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
   2.1. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   2.2. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   2.3. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.
3. PATCHING MATERIALS: New Materials shall be as specified in product sections; match existing products and work for patching and extending work. Existing Products shall be of a type and quality determined by inspecting and testing products where necessary, referring to existing work as a standard.
4. GENERAL INSTALLATION REQUIREMENTS: Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement. Make vertical elements plumb and horizontal elements level, unless otherwise indicated. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated. Make neat transitions between different surfaces, maintaining texture and appearance.
5. CUTTING AND PATCHING: Whenever possible, execute the work by methods that avoid cutting or patching. Perform whatever cutting and patching is necessary to: Complete the work, Fit products together to integrate with other work, Provide openings for penetration of mechanical, electrical, and other services, Match work that has been cut to adjacent work, Repair areas adjacent to cuts to required condition, Repair new work damaged by subsequent work, Remove samples of installed work for testing when requested, Remove and replace defective and non-conforming work.
   5.1. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
   5.2. Patching: Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
6. PROGRESS CLEANING: Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
7. PROTECTION OF INSTALLED WORK: Protect installed work from damage by construction operations. Provide special protection where specified in individual specification sections. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.
8. FINAL CLEANING: Use cleaning materials that are nonhazardous. Clean interior and exterior glass,

surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

9. CLOSEOUT PROCEDURES: Make submittals that are required by governing or other authorities. Notify Architect when work is considered ready for Architect's Substantial Completion inspection. Submit written certification containing Contractor's Correction Punch List,that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL – 01 74 19

1. REGULATORY REQUIREMENTS: Comply with applicable Federal, State, and Local requirements for the handling, removal, reuse, recycling and disposal of construction waste. Contractor is responsible for all debris removal from the site as required by local ordinance, and to the satisfaction of the Owner.
2. CONSTRUCTION WASTE AND RECYCLING MANAGER: A single entity responsible for managing and documenting the volume of construction waste and recycling for the project. The entity shall: Implement the waste management and recycling plan, Compile monthly waste disposal and recycling reports, Coordinate with the Owner in identifying materials to be salvaged, or reused.
3. WASTE MANAGEMENT: Implement waste management procedures in accordance with approved construction waste management and recycling plan. Maintain procedures throughout the life of this Contract.
    3.1. Site Storage: All non-hazardous construction waste may be co-mingled in a single dumpster; on site separation is not required. Remove all waste materials from the work area to dumpsters daily.
    3.2. Keep construction site clear and prevent contamination of materials. Provide empty dumpsters in exchange for loaded dumpsters as demand requires. Deliver loaded dumpsters to the approved off -site recycling facility.
    3.3. Delivery Records: Maintain a record of waste material leaving the site, including: Driver tickets for loaded dumpsters removed from the site, Scale tickets for dumpsters delivered from the site to the off-site recycling facility, Scale tickets for material delivered from the off-site recycling facility to receive entities for recyclable material and landfills.

CLOSEOUT SUBMITTALS – 01 78 00

1. PROJECT RECORD DOCUMENTS: Submit documents to Architect with claim for final Application for Payment. Coordinate with the Owner for any other additional requirements for Project Closeout or if any documents need to be submitted as a hard copy in addition to those listed below.
2. PROJECT RECORD DOCUMENTS: Maintain on site one set of the following record documents; record actual revisions to the Work: Drawings, Addenda, Change Orders and other modifications to the Contract.
3. OPERATION AND MAINTENANCE DATA
    3.1. Source Data: For each product or system, list names, addresses and telephone numbers of SubContractors and suppliers, including local source of supplies and replacement parts.
    3.2. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
    3.3. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as

maintenance drawings.

4. OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES: For Each Product, Applied Material, and Finish: Product data, with catalog number, size, composition, and color and texture designations, Information for re-ordering custom manufactured products, Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
5. OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS: For Each Item of Equipment and Each System: Description of unit or system, and component parts, Identify function, normal operating characteristics, and limiting conditions, Include performance curves, with engineering data and tests, Complete nomenclature and model number of replaceable parts.
    5.1. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
    5.2. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
6. ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS: Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections. Where systems involve more than one specification section, provide separate tabbed divider for each system. Prepare instructions and data by personnel experienced in maintenance and operation of described products. Prepare data in the form of an instructional manual.
    6.1. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
    6.2. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
7. WARRANTIES AND BONDS: Obtain warranties and bonds, executed in duplicate by responsible SubContractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

DIVISION 02

DEMOLITION – 02 41 00

1. SCOPE OF DEMOLITION: All work required for the site as illustrated in the Contract Documents.
    1.1. Site Demolition:
        a) Remove areas of roadway, curb, drive, etc. as needed to tie in new road, site and utility work.
        b) Remove all trees, shrubs, soil and other material from the site as required for the placement of new work and general construction activities.
        c) Reference site clearing specification section 31 10 00 for additional requirements.
        d) All excavation and earthwork as required for new work.
    1.2. If any hazardous materials are encountered on site notify the owner and architect immediately.
2. GENERAL PROCEDURES AND PROJECT CONDITIONS: Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public. Contractor is required to: Obtain required permits, Comply with applicable requirements of NFPA 241, Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures and Provide, erect, and maintain temporary barriers and security devices.

2.1. Use of explosives is not permitted.

2.2. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

2.3. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

2.4. Perform demolition in a manner that maximizes salvage and recycling of materials.

3. EXISTING UTILITIES: Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits. Protect existing utilities to remain from damage.

4. DEBRIS AND WASTE REMOVAL: Remove debris, junk, and trash from site.

DIVISION 03

UNDERSLAB VAPOR BARRIER – 03 05 16

1. SCOPE OF WORK: Provide required vapor barrier under concrete slabs at all habitable spaces.

2. MATERIALS: Underslab Vapor Barrier: Water Vapor Permeance: Not more than 0.010 perms, maximum. Thickness: 15 mils.

2.1. Basis of Design: Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil)

2.2. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

3. INSTALLATION: Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643. Install vapor barrier over gravel fill, under interior slabs on grade; lap sheet over footings and seal to foundation walls. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities. Repair damaged vapor retarder before covering with other materials.

CONCRETE FORMING AND ACCESSORIES – 03 10 00

1. SCOPE OF WORK: Provide and install all required form work for on site concrete.

2. SECTION INCLUDES: Formwork for cast-in place concrete. Form stripping.

3. REFERENCE STANDARDS: ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012). ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011. ACI 347R - Guide to Formwork for Concrete; 2014.

4. FORMWORK – GENERAL: Provide concrete forms, accessories, shoring, and bracing to accomplish cast-in-place concrete work. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

5. EXAMINATION: Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

6. EARTH FORMS: Earth forms are not permitted.

7. ERECTION – FORMWORK: Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

8. APPLICATION - FORM RELEASE AGENT: Apply form release agent on formwork in accordance with manufacturer's recommendations.

9. FORM REMOVAL: Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

CONCRETE REINFORCING – 03 20 00

1. SCOPE OF WORK: Provide all reinforcing as required for the work illustrated in the contract documents. This includes all exterior sidewalks and flatwork.
2. REINFORCING STEEL: ASTM A615/A615M, Grade 60 (60,000 psi). Plain billet-steel bars.
3. STEEL WELDED WIRE REINFORCEMENT (WWR): Galvanized, deformed type; ASTM A1064/A1064M. Style: 6x6: 1.4x1.4 W.W.M.
4. FABRICATION: Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
5. PLACEMENT: Place, support and secure reinforcement against displacement. Do not deviate from required position. Do not displace or damage vapor barrier. Conform to applicable code for concrete cover over reinforcement.
6. Reinforcing shall be supplied as detailed on the drawings for all new concrete including sidewalks. If not specifically detailed in the documents reference Cast In Place Concrete 03 30 00 specification for minimum reinforcing required.

CAST-IN-PLACE CONCRETE – 03 30 00

1. SCOPE OF WORK: Provide new cast in place concrete at all slabs on grade, foundations, footings, piers etc. as described in the contract documents.
2. PROJECT RECORD DOCUMENTS: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
3. QUALITY ASSURANCE: Perform work of this section in accordance with ACI 301 and ACI 318. Follow recommendations of ACI 305R when concreting during hot weather. Follow recommendations of ACI 306R when concreting during cold weather.
4. CONCRETE MATERIALS
    4.1. CEMENT: ASTM C150/C150M, Type I - Normal Portland type.
    4.2. FINE AND COARSE AGGREGATES: ASTM C 33.
    4.3. FLY ASH: ASTM C618, Class C or F.
    4.4. WATER: Clean and not detrimental to concrete.
5. ADMIXTURES: Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
6. BONDING AND JOINTING PRODUCTS: Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.
7. CONCRETE MIX DESIGN:
    7.1. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
    7.2. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
    7.3. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.
8. PREPARATION: Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
9. PLACING CONCRETE: Place concrete in accordance with ACI 304R. Place concrete for floor slabs in

accordance with ACI 302.1R. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

10. FLOOR FLATNESS AND LEVELNESS TOLERANCES: Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.
11. CONCRETE FINISHING: Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows for Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
12. CURING AND PROTECTION: Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
13. MINIMUM REQUIRED: Unless specifically called out elsewhere in the Contract Documents slabs shall be minimum 4” thick with 6x6-W4.0xW4.0 WWF throughout placed at the center of the slab vertically. Lap 12” min. and tie.

CURING AND SEALING CONCRETE FLOORS – 03 39 05

1. SCOPE OF WORK: Provide compliant curing and sealing of all concrete floors prior to the application of finish materials.
2. INSTALLER QUALIFICATIONS: Applicator experienced with installation of product and certified by manufacturer, or applicator experienced with similar products and providing manufacturer's field technician on site to advise on application procedures; and providing adequate number of skilled workers trained and familiar with application requirements.
3. DELIVERY, STORAGE, AND HANDLING: Deliver product in factory numbered and sealed drums, with numbers recorded for Owner's records. Store products in manufacturer's unopened drums until ready for installation.
4. PROJECT CONDITIONS: No satisfactory procedures are available to remove petroleum or rust stains from concrete. Prevention is therefore essential. Take precautions to prevent staining of concrete prior to application of cure-seal-hardener and for minimum of three months after application:
    4.1. Prohibit parking of vehicles on concrete slab.
    4.2. If vehicles must be temporarily parked on slab, place drop cloths under vehicles during entire time parked.
    4.3. If construction equipment must be used for application, diaper all components that might drip oil, hydraulic fluid, or other liquids.
    4.4. Prohibit pipe cutting using pipe cutting machinery on concrete slab.
    4.5. Prohibit temporary placement and storage of steel members on concrete slab.
5. Do not install products under environmental conditions outside manufacturer's absolute limits. Do not use frozen material; thaw and agitate prior to use.
6. WARRANTY: Provide manufacturer's warranty that a structurally sound concrete surface prepared and treated according to the manufacturer's directions will remain permanently dustproof, hardened and water repellent. If after the specified sealing period the treated surface does not remain dustproof, hardened and water repellent, provide, at manufacturer's expense, sufficient material to reseal defective areas.
7. MATERIALS: Cure-Seal water-based chemically-reactive penetrating sealer and hardener, Colorless, transparent, odorless, non-toxic, non-flammable; Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months. Water shall be clean and potable.
8. EXAMINATION: Do not begin installation until substrates have been properly prepared and are suitable for application of product. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

9. PREPARATION: Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
10. INSTALLATION: Install in accordance with manufacturer's instructions. If this is the applicator's first project using this product, provide the manufacturer's technical representative on-site to familiarize installers with proper procedures. Prevent damage to and soiling of adjacent work. New Concrete: Apply cure-seal to new concrete as soon as the concrete is firm enough to work on after troweling, except on colored concrete wait minimum of 30 days.
    10.1. Spray on at rate of as recommended by manufacturer.
    10.2. Comply with manufacturers installation instructions or as follows
    10.3. Keep surfaces wet with cure-seal-hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather slipperiness may appear before the 30 minute time period has elapsed. If that occurs, apply more cure-seal-hardener as required to keep entire surface in a non-slippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a non-slippery state.
    10.4. After this period, when treated surface becomes slippery lightly mist with water until slipperiness disappears.
    10.5. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal-hardener.
    10.6. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
    10.7. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.
11. PROTECTION: Protect installed floors until chemical reaction process is complete; at least three months. Clean floor regularly in accordance with manufacturer's recommendations because water will accelerate the sealing and scrubbing will impart a shine. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier. Precautions and cleaning are the responsibility of the Contractor until Substantial Completion.

GYPSUM CEMENT UNDERLAYMENT – 03 54 13

1. SCOPE OF WORK: As part of the base bid provide gypsum cement underlayment as detailed in the contract documents on all elevated floors, platforms and landings. Reference floor details for thickness. Reference Division 1 for STC and IIC requirements required to be met.
2. SUBMITTALS: Product Data for each type of product.
3. SHOP DRAWINGS: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions. Include qualification Data for Installer.
4. QUALITY ASSURANCE: Installer who is approved by manufacturer for application of underlayment products required for this Project.
5. FIELD CONDITIONS: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance. Place gypsum cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F
6. PERFORMANCE REQUIREMENTS:
    6.1. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    6.2. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
    6.3. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical

to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

6.4. IIC-Rated Assemblies: For IIC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 492 and classified according to ASTM E 989 by an independent testing agency.

7. GYPSUM CEMENT UNDERLAYMENTS: Gypsum Cement Underlayment: Self-leveling, gypsum cement product that can be applied in minimum uniform thickness of 1”. Reference floor/ceiling assembly details in the contract documents for any specific areas that may require more or less.

7.1. BASIS-OF-DESIGN PRODUCT: Subject to compliance with requirements, provide USG Corporation; USG Levelrock® Brand 4500 Floor Underlaymentor a comparable product by one of the following:

a) Allied Custom Gypsum Plasterworks, LLC.

b) ARDEX Americas.

c) Euclid Chemical Company (The); an RPM company.

d) Hacker Industries, Inc.

e) MAPEI Corporation.

f) Maxxon Corporation.

8. OTHER MATERIALS:

8.1. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C 219.

8.2. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 472.

8.3. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

8.4. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

8.5. Water: Potable and at a temperature of not more than 70 deg F (21 deg C).

8.6. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

8.7. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

8.8. VOC Content: Provide coating with VOC content of 100 g/L or less.

8.9. Low-Emitting Materials: Coating shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

8.10. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.

8.11. VOC Content: Provide coating with VOC content of 100 g/L or less.

8.12. Low-Emitting Materials: Coating shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

8.13. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

9. SOUND MAT

9.1. BASIS-OF-DESIGN PRODUCT: Subject to compliance with requirements, provide USG Corporation: USG Levelrock® SAM-N25™ Sound Attenuation Mat or a comparable product by

one of the following:

a) Allied Custom Gypsum Plasterworks, LLC.

b) Dura Undercushions Ltd.

c) Hacker Industries, Inc.

d) Keene Building Products.

e) Maxxon Corporation.

9.2. INSTALLATION: USG Levelrock SAM-N Series sound attenuation mats can be used over a variety of subfloors including plywood, OSB, pre-cast concrete, concrete and corrugated steel deck. For plywood or OSB subfloors, the edges must be tongue and groove or the use of back blocking is required. The subfloor must be clean and free of construction debris and dirt. The building temperature should be maintained at a 50 °F minimum.

a) USG Levelrock SAM-N Series sound attenuation mats should be primed with USG Levelrock™ Wood Primer prior to the installation of the underlayment.

b) USG Levelrock® Perimeter Isolation Strip must be installed between the sound attenuation mat and walls or floor protrusions. The perimeter isolation strip must be installed so that there is no leakage of USG Levelrock engineered cementitious underlayment as any breach will compromise the sound system performance. Follow the detailed drawings included in the USG installation instructions for USG Levelrock SAM-N12, SAM-N25 & SAM-N40 sound attenuation mats.

c) Protect USG Levelrock underlayment floors poured over sound attenuation mat from heavy trade traffic loads (i.e. loaded drywall carts, heavy tool cabinets, etc.) with plywood.

10. EXAMINATION: Examine substrates, with Installer present, for conditions affecting performance of the Work. Proceed with application only after unsatisfactory conditions have been corrected.

11. PREPARATION: Prepare and clean substrate according to manufacturer's written instructions. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment. Fill substrate voids to prevent underlayment from leaking.

12. CONCRETE SUBSTRATES: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

12.1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

13. WOOD SUBSTRATES: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust. Install underlayment reinforcement recommended in writing by manufacturer.

14. METAL SUBSTRATES: Mechanically remove, according to manufacturer's written instructions, rust, foreign matter, and other contaminants that might impair underlayment bond. Apply corrosion-resistant coating compatible with underlayment if recommended in writing by underlayment manufacturer.

15. NONPOROUS SUBSTRATES: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond; prepare surfaces according to manufacturer's written instructions.

16. ADHESION TESTS: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

17. SOUND CONTROL: Install sound control materials according to manufacturer's written instructions. Do not install mechanical fasteners that penetrate through the sound control materials.

18. APPLICATION: Mix and apply underlayment components according to manufacturer's written instructions. Close areas to traffic during underlayment application and for time period after application

recommended in writing by manufacturer. Coordinate application of components to provide optimum adhesion to substrate and between coats. Retain subparagraph below for moving joints in floor. Detail joints on Drawings and revise below to suit Project. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

19. UNDERLAYMENT: Apply primer over prepared substrate at manufacturer's recommended spreading rate. Apply underlayment to produce uniform, level surface. Apply a final layer without aggregate to product surface. Feather edges to match adjacent floor elevations. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.
20. SURFACE SEALER: Apply surface sealer at rate recommended by manufacturer.
21. PROTECTION: Protect underlayment from concentrated and rolling loads for remainder of construction period.

DIVISION 04

UNIT MASONRY – 04 20 00

1. SCOPE OF WORK: As an alternate to providing cast-in-place concrete foundation walls the contractor may utilize CMU to provide cost savings to the Owner. Provide and install all other CMU as illustrated on the contract documents.
   1.1. Provide pricing as an add/deduct to the cost of cast-in-place concrete.
2. QUALITY ASSURANCE: Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents. Verify that field conditions are acceptable and are ready to receive masonry. Verify that related items provided under other sections are properly sized and located. Verify that built-in items are in proper location, and ready for roughing into masonry work. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing. If required the Contractor shall provide engineered bracing documents as part of their scope of work.
3. CONCRETE MASONRY UNITS: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on the drawings for specific locations. Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions. ASTM C90, normal weight. Hollow block unless otherwise noted. Manufacturer's standard color and texture where indicated. Minimum average compressive strength of 2000 psi.
4. REINFORCEMENT AND ANCHORAGE: By Blok-Lok Limited, Hohmann & Barnard, Inc ; 2-Seal Tie, WIRE-BOND, or Approved Equal.
   4.1. Reinforcing Steel: Size as indicated on drawings; galvanized finish.
   4.2. Single Wythe Joint Reinforcement: Truss or ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
   4.3. Wall Ties: Corrugated formed sheet metal, 7/8 inch wide by 0.05 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
   4.4. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
   4.5. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
   4.6. Place continuous joint reinforcement in first and second joint below top of walls.
   4.7. Lap joint reinforcement ends minimum 6 inches.

5. PREFORMED CONTROL JOINTS: Neoprene material. Provide with corner and tee accessories, fused joints.
6. JOINT FILLER: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; sized for joints specified inch.
7. CAVITY MORTAR CONTROL: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
8. WEEPS: Molded PVC grilles, insect resistant with cotton wick. Type to be Polyethylene tubing.
9. CLEANING SOLUTION: Non-acidic, not harmful to masonry work or adjacent materials.
10. MORTAR AND GROUT MIXES: Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
    10.1. Masonry below grade and in contact with earth: Type S; Exterior, loadbearing masonry: Type N; Exterior, non-loadbearing masonry: Type N; Interior, loadbearing masonry: Type N; Interior, non-loadbearing masonry: Type O.
    10.2. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.
    10.3. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
    10.4. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
11. COLD AND HOT WEATHER REQUIREMENTS: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.
12. COURSING: Establish lines, levels, and coursing indicated. Protect from displacement. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness. Concrete Masonry Units lain in Running Bond. One unit and one mortar joint to equal 8 inches. Mortar Joints to be tooled Concave. Brick Units lain in Running Bond.Three units and three mortar joints to equal 8 inches. Mortar Joints to be tooled Concave.
13. PLACING AND BONDING: Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work. Lay hollow masonry units with face shell bedding on head and bed joints. Buttering corners of joints or excessive furrowing of mortar joints is not permitted. Remove excess mortar and mortar smears as work progresses. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods. Interlock intersections and external corners , except for units laid in stack bond. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled. Isolate masonry partitions from vertical structural framing members with a control joint as indicated. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.
14. WEEPS/CAVITY VENTS: Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.
15. CAVITY MORTAR CONTROL: Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.
16. GROUTED COMPONENTS: Reinforce bond beams with 2, No. #5 bars, 1 inch from bottom web. Lap splices minimum 24 bar diameters. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position. Place and consolidate grout fill without displacing

reinforcing. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

17. CONTROL AND EXPANSION JOINTS: Do not continue horizontal joint reinforcement through control or expansion joints. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant. Size control joints as indicated on drawings; if not shown, 3/4 inch wide and deep.
18. TOLERANCES: Maximum Variation From Unit to Adjacent Unit: 1/16 inch. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.
19. CLEANING: Clean all decorative masonry daily. Do not allow excess mortar to dry and harden on face of wall. Remove excess mortar and mortar droppings. Replace defective mortar. Match adjacent work. Clean soiled surfaces with cleaning solution. Use non-metallic tools in cleaning operations.
20. PROTECTION: Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

DIVISION 05

STRUCTURAL STEEL FRAMING – 05 12 00

1. SCOPE OF WORK: AS illustrated in the contract documents for all major, minor and miscellaneous steel members and components.
2. SHOP DRAWINGS: Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
3. MATERIALS
   - 3.1. Steel Angles and Plates: ASTM A36/A36M.
   - 3.2. Steel W Shapes and Tees: ASTM A992/A992M.
   - 3.3. Rolled Steel Structural Shapes: ASTM A992/A992M.
   - 3.4. Steel Shapes, Plates, and Bars: ASTM A242/A242M high-strength, corrosion-resistant structural steel.
   - 3.5. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
   - 3.6. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.
   - 3.7. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.
   - 3.8. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
4. GROUT: Non-shrink, non-metallic aggregate type, complying with 1 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
5. FABRICATION: Shop fabricate to greatest extent possible. Continuously seal joined members by continuous welds. Grind exposed welds smooth.
6. FINISH: Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
7. EXAMINATION: Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.
8. ERECTION: Erect structural steel in compliance with AISC S303 "Code of Standard Practice for Steel Buildings and Bridges". Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45

degrees.

METAL FABRICATIONS – 05 50 00

1. SCOPE OF WORK: All new metal fabrication supporting all other new work.
2. SHOP DRAWINGS: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
3. CODE COMPILANCE: Fabricator shall provide steel framing that has been designed to resist code prescribed loads, with consideration of serviceability (deflections), and be able to submit calculations for review. This includes required PLF and point loading along railings.
4. STEEL SECTIONS: ASTM A36/A36M.
5. STEEL TUBING: ASTM A501/A501M hot-formed structural tubing.
6. PLATES: ASTM A283/A283M.
7. PIPE: ASTM A53/A53M, Grade B Schedule 40, hot-dip galvanized finish.
8. BOLTS, NUTS, AND WASHERS: ASTM A325 (ASTM A325M), Type 1 , plain.
9. WELDING MATERIALS: AWS D1.1/D1.1M; type required for materials being welded.
10. SHOP AND TOUCH-UP PRIMER: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
11. TOUCH-UP PRIMER FOR GALVANIZED SURFACES: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
12. FINISHES – STEEL: Prime paint steel items.
13. INSTALLATION: Install items plumb and level, accurately fitted, free from distortion or defects.

PIPE AND TUBE RAILINGS – 05 52 13

1. SCOPE OF WORK: All new railings on balconies, ramps, sidewalks and stairs.
2. REFERENCE STANDARDS
   - 2.1. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
   - 2.2. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).
   - 2.3. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
3. SHOP DRAWINGS: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
4. QUALITY ASSURANCE: Framing systems are base upon Endurable deck framing system as the standard of quality. Decking assemblies shall be designed to conform to all applicable building codes and loading requirements.
5. WARRANTY: 50 year warranty covering material and workmanship. See manufacturer's warranty statement for specific details.
6. DELIVERY, STORAGE, AND HANDLING: Deliver materials to the job site in good condition. Purchaser to store in clean, dry location, properly protected against damage to finish surfaces. Store away from uncured concrete, masonry, or stucco.
7. MANUFACTURERS: Endurable Building Products, or approved equal
8. NON-WELD PIPE FITTINGS: AlumiLAST posts, rails, and components engineere for maximum strength using ASTM 6063-T54 or 6005A-T61 aluminum. Screws, bolts, washer hardware shall be stainless steel and match color of the railing.
9. RAILINGS - GENERAL REQUIREMENTS: Design, fabricate, and test railing assemblies in accordance

with the most stringent requirements of ASTM E985 and applicable local code. Allow for expansion and contraction of members and building movement without damage to connections or members. Dimensions: See drawings for configurations and heights.

9.1. Top Rails and Wall Rails: 2" wide x 1.875" high inches square.

9.2. Bottom Rails: 5/8" high x 1 3/8" high inches rectangular.

9.3. Hand Rails: 1-1/2” round, welds ground smooth.

9.4. Corner Posts: 1 5/8" inches, 90 degree corner.

9.5. End Posts: 1 5/8" square

9.6. Pickets: 5/8" x 5/8"

9.7. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

9.8. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

10. STEEL RAILING SYSTEM: Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.
11. NON-WELD MECHANICAL FITTINGS: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
12. EXPOSED FASTENERS: No exposed bolts or screws.
13. SHOP AND TOUCH-UP PRIMER: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
14. FABRICATION: Accurately form components to suit specific project conditions and for proper connection to building structure. Fit and shop assemble components in largest practical sizes for delivery to site. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
15. EXAMINATION: Verify that field conditions are acceptable and are ready to receive work.
16. PREPARATION: Clean and strip primed steel items to bare metal where site welding is required. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.
17. INSTALLATION: Install in accordance with manufacturer's instructions. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints. Anchor railings securely to structure.
18. TOLERANCES: Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative. Maximum Offset From True Alignment: 1/4 inch. Maximum Out-of-Position: 1/4 inch.

DIVISION 06

ROUGH CARPENTRY – 06 10 00

1. SCOPE OF WORK: All dimensional lumber as needed for framing, blocking, etc. as needed to complete the design intent in the contract documents.
2. DIMENSION LUMBER: Comply with PS 20 and requirements of specified grading agencies.
   2.1. Species: Spruce-Pine-Fir (South), unless otherwise indicated. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
   2.2. Lumber fabricated from old growth timber is not permitted.
3. DIMENSION LUMBER FOR CONCEALED APPLICATIONS:

3.1. Grading Agency: Western Wood Products Association; WWPA G-5. Nominal sizes as indicated on drawings, S4S, with Moisture Content: S-dry or MC19.

3.2. Stud Framing (2 by 2 through 2 by 6): Spruce-Pine-Fir, Stud grade or better.

3.3. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16): Hem Fir, Grade: No. 2.

3.4. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring: S4S, No. 2 or Standard Grade. Blocking shall be minimum 2x6.

3.5. Boards: Standard or No. 3.

4. STRUCTURAL COMPOSITE LUMBER: Structural Composite Lumber shall be Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer. Specifically, Beams shall Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.

5. BLOCKING: Concealed blocking shall consist of nominal lumber not less than 2"x6" and be provided and installed at all wall mounted appliances and accessories as required as newly installed items only. This includes but is not limited to doors, casework, kitchen and bath accessories, etc.

6. EXPOSED BOARDS: Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping. Moisture Content: Kiln-dry (15 percent maximum). Surfacing: S4S. Species: Douglas Fir, Grade No. 1, 1 Common, or Select.

7. CONSTRUCTION PANELS:

7.1. Subflooring : APA PRP-108: Rated Sheathing. Thickness: 3/4 inch, nominal.

7.2. Roof Sheathing : APA PRP-108, Rated Sheathing, Exterior Exposure Class, Thickness: 5/8 inch, nominal.

8. ACCESSORIES

8.1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

8.2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

8.3. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

9. FACTORY WOOD TREATMENT: Treated Lumber and Plywood shall Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

9.1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

9.2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

10. INSTALLATION – GENERAL: Select material sizes to minimize waste. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

11. FRAMING INSTALLATION: Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members. Install structural members full length without splices unless otherwise specifically detailed. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA (WFCM) Wood Frame Construction Manual. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

12. INSTALLATION OF CONSTRUCTION PANELS

12.1. Subflooring: Glue and nail to framing; staples are not permitted.

12.2. Underlayment: Secure to subflooring with nails and glue.

12.3. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

13. HEADERS: Wood headers over all interior openings of NONBEARING partitions shall be as scheduled below. Headers over all interior finished openings not greater than 3'-0" wide at BEARING partitions shall be a minimum of (2) 2x12, unless otherwise noted. Refer to the Drawings for headers over BEARING partitions. Furnish and install a minimum of two (2) studs at ends of all engineered headers and double joist headers. All framing shall bear a minimum of 1-1/2 inches.

14. MULTIPLE JOISTS: Furnish and install double joist under all partitions parallel to joists and under kitchen base cabinets, bathtubs and all other areas of heavy loading. At all floor and roof openings furnish and install double or triple header and trimmer joists.

15. PLYWOOD: All plywood shall be APA structural II, C-C, exterior or standard tongue and groove sheathing with exterior glue, thickness as indicated. All plywood shall be identified with the appropriate grade-trademark of the APA and shall meet requirements of the latest edition of DOC PS-1 "Construction and Industrial Plywood" and PS-2 "Performance Standard for Wood-based Structural Panels" or one of APA's performance proprietary specifications. All applications shall be in accordance with the recommendations of the APA and the DOC. Provide marine-grade plywood at all locations of fiberglass seamless roofing, if applicable.

16. FRAMING ANCHORS: Provide a complete system of High Wind Resistant Framing Anchors to provide a continuous load path from the ridge to the foundation of the structure as using products as manufactured and as recommended by USP Structural Connectors, Simpson Strong Tie, or equal. Products shall be galvanized steel and shall include, but not be limited to: ridge rafter strapping; rafter-to-top plate anchors; rafter-to-joist/stud strapping; beam/joist hangers; column caps; joist-to-sill plate strapping or anchors.

SHOP FABRICATED WOOD TRUSSES – 06 17 53

1. SCOPE OF WORK: Provide and install whole and complete floor and roof truss system. Include all design, engineering, production of shop drawings, calculations, signed and sealed documents, connections, hangers, bridging, bracing, fire retardant treatment, and all other items for a full complete system.

2. SECTION INCLUDES: Shop fabricated wood trusses for roof and floor framing. Bridging, bracing, and anchorage. Fire retardant treatment of wood.

3. REFERENCE STANDARDS: ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2007 and errata. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

4. METAL-PLATE-CONNECTED WOOD TRUSSES: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

5. LUMBER GRADING AGENCIES: The abbreviations used to reference them, include the following:

5.1. NeLMA: Northeastern Lumber Manufacturers' Association.

5.2. NLGA: National Lumber Grades Authority.

5.3. SPIB: The Southern Pine Inspection Bureau.

5.4. WCLIB: West Coast Lumber Inspection Bureau.

5.5. WWPA: Western Wood Products Association.

6. DESIGN FLOOR LIVE AND DEAD LOAD: As indicated with deflection limited to 1/480.

7. DESIGN ROOF LIVE AND DEAD LOAD: As indicated with deflection limited to 1/360.

8. SUBMITTALS: Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.

9. SHOP DRAWINGS: Show truss configurations, sizes, spacing, laoding and reactions, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing. Include identification of engineering software used for design. Provide shop drawings stamped or sealed by design engineer.

10. QUALITY ASSURANCE: Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

    10.1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

    10.2. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

    10.3. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of Minnesota.

11. DELIVERY, STORAGE, AND HANDLING: Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses." Store trusses flat, off of ground, and adequately supported to prevent lateral bending. Protect trusses from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

12. COORDINATION: Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

13. FIELD MEASUREMENTS: Verify that field measurements are as indicated.

14. TRUSSES: Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.

15. CONNECTORS: Steel plate.

16. MATERIALS:

    16.1. Lumber: Grade and Species: For Truss Chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplements." Moisture Content: Between 7 and 9 percent. Lumber fabricated from old growth timber is not permitted.

    16.2. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

    16.3. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

17. ACCESSORIES:

    17.1. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

    17.2. Fasteners: Hot-dip galvanized steel, type to suit application.

    17.3. Bearing Plates: Hot-dip galvanized steel.

18. WOOD TREATMENT:

    18.1. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific

applications.

18.2. Fire Retardant Treatment, Exterior Type: AWPA U1, Use Category UCFB, Commodity Specification H, chemically treated and pressure impregnated, maximum flame spread index of 25 when tested in accordance with ASTM E84 and with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898; kiln dried after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

18.3. Fire Retardant Treatment, Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated, maximum flame spread index of 25 when tested in accordance with ASTM E84 and with no evidence of significant combustion when test is extended for an additional 20 minutes; kiln dried after treatment to maximum moisture content of 19 percent for lumber and 15 percent for plywood.

19. EXAMINATION: Verify that field measurements are as indicated. Verify that supports and openings are ready to receive trusses.

20. PREPARATION: Coordinate placement of bearing items prior to delivery of trusses to site.

21. ERECTION: Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete. Set members level and plumb, in correct position. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing. Do not field cut or alter structural members without approval of Architect. Install permanent bridging and bracing. Install headers and supports to frame openings required. Frame openings between trusses with lumber in accordance with Section 06 10 00.

22. TOLERANCES: Framing Members: 1/2 inch maximum, from true position.

FINISH CARPENTRY – 06 20 00

1. SCOPE OF WORK: Finish trim on interior of walls, windows, doors, and cabinets.

2. SAMPLES: Submit two samples of wood trim 6 inch long.

3. LUMBER MATERIALS: Hardwood Lumber shall be Maple species, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish. Grading In accordance with rules certified by ALSC; www.alsc.org.

4. ACCESSORIES: Wood Filler shall be Solvent base, tinted to match surface finish color.

5. FABRICATION: Shop assemble work for delivery to site, permitting passage through building openings.

6. SHOP FINISHING: Sand work smooth and set exposed nails and screws. Apply wood filler in exposed nail and screw indentations. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified.

7. INSTALLATION: Set and secure materials and components in place, plumb and level. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

7.1. All nails to be counter sunk and filled with wood FILLER.

7.2. If new trim does not cover old paint lines, include patching and painting in this area.

CAST MARBLE FABRICATIONS – 06 61 50

1. SCOPE OF WORK: All window sills. Reference finish schedule for exact product

2. SECTION INCLUDES: Synthetic marble window sills.

3. SUBMITTALS: Product Data: Manufacturer's printed product data indicating compliance with specified requirements. Manufacturer's cleaning and maintenance data.

3.1. Selection Samples: For each product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

3.2. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

4. QUALITY ASSURANCE: Manufacturer Qualifications: Member of International Cast Polymer Association (ICPA), with not less than five years of experience in manufacturing products similar to those required for this project.

4.1. Installer Qualifications: Not less than five installations of comparable scope within the past three years.

5. DELIVERY, STORAGE, AND HANDLING: Packing and Shipping: Pack countertops, and other flat products in wooden crates to minimize shipping damage. Palletize other components. Check for shipping damage during unloading at site and notify manufacturer immediately of any obvious damage. Store products under cover, off the ground, and protected from moisture. Handle products to prevent physical damage. Protect surfaces from staining, scratching, and other damage during handling and installation.

6. PROJECT CONDITIONS: Field Measurements: Verify shop drawings with field measurements. Coordination: Coordinate construction activities of this section with construction activities specified in related sections.

7. WARRANTY: Window Sills, Thresholds, and Other Flat Items: Manufacturer's standard warranty on defective materials.

8. MANUFACTURERS

8.1. Central Marble Products; Rice, MN

8.2. Princess Marble; Burnsville, MN

9. MATERIALS: Provide cast marble fabrications made of proprietary resin and gel coat finish with finished properties as described under specific product types. Polishing Cream: As recommended by manufacturer.

10. ADHESIVES AND SEALANTS: As specified in Section 07 90 05, and as follows:

10.1. To adhere cast marble panels to gypsum wallboard, use LN-601 Liquid Nails, Nail-No-More, or other product recommended by manufacturer.

10.2. For joints between cast marble panels, use a mildew resistant 100 percent silicone joint sealer; siliconized calking compound is not acceptable.

10.3. For sealing cast marble panels at adjoining surfaces such as gypsum wallboard, use mildew resistant acrylic calk joint sealer, such as Phenoseal Acrylic Caulk by Gibson-Homans, or other product recommended by cast marble panel manufacturer.

11. CONFIGURATION, COLOR AND PATTERN: Minimum thickness of 3/4 inch; other dimensions as indicated in the Finish Schedule.

12. FABRICATION: Use molds, materials, methods, and procedures that will result in proper texture and finish. Fabricate to required profiles and dimensions. To the greatest extent possible, fabricate each unit as a continuous piece, without joints, and configured to minimize on-site cutting or other modifications. Ease all edges and sand smooth; provide uniform gloss finish on all exposed surfaces. Cure components prior to shipping, and remove traces of material that may be toxic or incompatible with other building materials.

13. EXAMINATION: Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

14. INSTALLATION: General: Install in accordance with manufacturer's instructions and approved shop drawings. Install components to be plumb, level, and rigid. Neatly scribe to adjoining surfaces, and field trim for snug fit. Replace any component that is cracked, chipped, broken, or otherwise defective. Window Sills: Attach to solid substrate with silicone joint sealer, as recommended by manufacturer.

15. PROTECTION: Protect installed products until completion of project. Touch-up, repair or replace damaged components before Substantial Completion.

EXTERIOR TREATED WOOD COMPOSITE TRIM – 06 65 01

1. SCOPE OF WORK: As mounting blocks for all exterior mounted items; lights, vents, signs, sensors, bells, speakers, etc. Size mounting blocks according to base of item being mounted. Mounting block should be at least ½" larger in all directions than the base plate of the item being mounted on it.
2. SECTION INCLUDES: Exterior-grade, treated wood composite trim for non-structural applications.
3. SUBMITTALS: Product Data: Submit manufacturer's product data. Certificate of Compliance: Certify that products of this section meet or exceed specified requirements. Application: Submit manufacturer's application instructions. Warranty: Submit manufacturer's standard warranty.
4. DELIVERY: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
5. STORAGE: Store materials in accordance with manufacturer's instructions. Indoor Storage: Store composite materials flat. Outdoor Storage: Store composite materials under cover, protected from weather, off ground, and on flat base. Keep composite materials dry.
6. HANDLING: Protect materials during handling and installation to prevent damage.
7. WARRANTY: Provide 50-year material warranty
8. MANUFACTURERS: CMI, MiraTEC trim
    8.1. Composite Trim: "MiraTEC" treated exterior composite trim. Description: Exterior grade, treated wood composite trim for non-structural applications
9. BOARDS: Nominal Board Width: As noted on the drawings or as described in the scope of work above. Material: Wood fibers combined with phenolic resins, zinc borate, and water repellent. No added formaldehyde. Surface: Clear cedar wood grain texture on one side, smooth the other. Factory-primed on four sides with a low VOC primer with a mildewicide. Substrate: 1-piece solid substrate, uniform density, not laminated. No knots or voids. Thickness: 5/4 Nominal
10. TYPICAL PROPERTIES:
    10.1. Density, ASTM D 1037: 48 pounds per cubic foot.
    10.2. Modulus of Rupture, ASTM D 1037: 3,011 psi.
    10.3. 24-Hour soak, ASTM D 1037:
    10.4. Water Absorption: 6.60 percent.
    10.5. Thickness Swell: 2.50 percent.
    10.6. Accelerated Aging Test, 6-Cycle, ASTM D 1037: Retained 90 percent of original strength.
    10.7. Termite Resistance and Decay, AWPA E7 Rating Scale, 3-Year Exposure: 7.8 our of 10.
    10.8. Rot Resistance, AWPA E16: 1.0 out of 5.
11. ADHESIVES: Designed for use on wood composite materials.
12. PAINT APPLICATION:
    12.1. Prime and paint all exposed field cut edges of exterior trim using a high quality exterior oil/alkyd solvent based or acrylic latex primer recommended by the manufacturer for application over composite wood substrates.
    12.2. Coat all exposed surfaces including the bottom edge.
    12.3. Finish MiraTEC trim with two coats of paint within 90 days after installation. If the material is not painted within 90 days, reprime the trim using an exterior primer that is recommended for use on composite wood products and is compatible with the topcoat to be used. Use the same primer for repair of any damage to the original factory applied primer.

12.4. A total field-applied dry film paint thickness of a minimum of 2-1/2 mils is required on MiraTEC Trim.

13. EXAMINATION: Examine areas and surfaces to receive composite materials. Notify Architect if areas or surfaces are not acceptable. Do not begin installation until unacceptable conditions have been corrected.
14. INSTALLATION: Install in accordance with manufacturer's instructions.
15. CUTTING: Use a fine toothed hand saw or power saw with a combination blade. Cut into exposed face of the material.
16. FASTENING: Double nail a maximum of 16" O.C. for all trim applications. Double nail a maximum of 24" O.C. for fascia. Do not nail into cut edge of material. Nails must penetrate a minimum of 1 1/4" into framing member. Fasten MiraTEC from one end to the other, do not nail towards the ends from center.
17. BUTT JOINTS: All joints must fall over a framing member. Space all butt and scarf joints 1/8" and apply sealant into the full depth of the 1/8" joint. Double nail on both sides of joint, at least 1/2" from the edge.
18. FASTENERS: Use nails with a 3/16" head diameter, long enough to penetrate 1 1/4" into structural framing member. Use nails with performance equivalent to hot dipped galvanized or better (such as 304 SS). Screws, ring shank nails, etc. can be used as long as they meet the same minimum performance criteria as above. Tapered or bugle head fasteners are permitted when heads are properly sealed from moisture. Do not countersink fasteners more than 1/8". All slightly counter sunk fasteners less than 1/8" should be filled with exterior putty and painted.
19. FLASHING AND MOISTURE CONTROL: Do not apply trim to wet sheathing. Do not apply trim closer than 6" to finished grade or landscaping. Do not allow the trim to stand in water. Do not allow direct contact with masonry or concrete. Properly flash and space a minimum of 1/2" from any concrete flatwork or horizontal brick ledge. At foundations or brick veneer, the product should be separated from the masonry by metal flashing, polyethylene film, 30 lb. felt or a 1/4" to 1/2" air space using masonry standoffs.
20. SEALANT: Do not allow water to stand on or leak behind any trim. Sealant is required at butt joints and where trim abuts siding, windows, doors, or other materials. Do not used hard setting caulk. Rather, use exterior quality sealants that remain flexible over time. Caulks and sealants that at a minimum meet ASTM C920 are recommended.
21. MACHINING: Maintain a minimum angle of 100 degrees from the vertical to provide positive drainage. Reprime all machined areas.

CELLULAR PVC TRIM BOARDS – 06 65 02

1. SCOPE OF WORK: Cellular PVC trim boards at all exterior trim locations as illustrated in the contract documents, including:
   1.1. Near grade with minimum 12” universal skirt board
   1.2. Around windows and doors
   1.3. At building inside and outside corners
   1.4. Within gables
   1.5. Along rake, soffit and accent edges; unless specified elsewhere as another material
   1.6. At exterior finish transitions
   1.7. Horizontally at floor lines as illustrated on the building exterior elevations
2. REFERENCE STANDARDS
   2.1. ASTM D792 - Density and Specific Gravity of Plastics by Displacement.
   2.2. ASTM D570 - Water Absorption of Plastics.
   2.3. ASTM D638 - Tensile Properties of Plastics.

2.4. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

2.5. ASTM D1761 - Mechanical Fasteners in Wood.

2.6. ASTM D5420 - Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight.

2.7. ASTM D256 - Determining the Pendulum Impact Resistance of Plastics.

2.8. ASTM D696 - Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C with a Vitreous silica Dilatometer.

2.9. ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

2.10. ASTM E84 - Surface Burning Characteristics of Building Materials.

2.11. ASTM D648 - Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

2.12. ASTM D3679 - Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

3. SUBMITTALS: Submit product data, manufacturer's catalogs, SPEC-DATA product sheet, for specified products.

4. Samples: Submit three material samples representative of the texture, thickness and widths shown and specified herein.

5. QUALITY ASSURANCE: Regulatory Requirements: Check with Local Building Code for installation requirements.

6. ALLOWABLE TOLERANCES: Variation in component length: -0.00 / +1.00”. Variation in component width: ¡¾ 1/16”. Variation in component thickness: ¡¾ 1/16” Variation in component edge cut: ¡¾ 2¢ª Variation in Density -0% + 10%

7. WORKMANSHIP, FINISH, AND APPEARANCE: Free foam cellular pvc that is homogeneous and free of voids, holes, cracks, and foreign inclusions and other defects. Edges must be square, and top and bottom surfaces shall be flat with no convex or concave deviation. Uniform surface free from cupping, warping, and twisting.

8. DELIVERY, STORAGE, AND HANDLING: Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

9. WARRANTY: Provide manufacturer’s 25 year warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

10. MANUFACTURERS: AZEK® Trimboards manufactured by Vycom Corporation, 801 Corey Street, Moosic, PA 18507. Or Approved Equal

11. MATERIALS: Free foam cellular pvc material with a small-cell microstructure and density of .55 grams/cm3.

12. FASTENERS: Use fasteners designed for wood trim and wood siding (thinner shank, blunt point, full round head) with AZEK®. Use a highly durable fastener such as stainless steel or hot-dipped galvanized. Staples, small brads and wire nails must not be used as fastening members. The fasteners should be long enough to penetrate the solid wood substrate a minimum of 1 1/2”. Standard nail guns work well with AZEK trim products. Use 2 fasteners per every framing member for trimboards applications. Trimboards 12” or wider, as well as sheets, will require additional fasteners. Fasteners must be installed no more than 2” from the end of each board. AZEK should be fastened into a flat, solid substrate. Fastening AZEK into hollow or uneven areas must be avoided. Pre-drilling is typically not required unless a large fastener is used or product is installed in low temperatures. 3/8” and 1/2” sheet product is not intended to be ripped into trim pieces. These profiles must be glued to a substrate and mechanically fastened.

13. ADHESIVES: Glue all AZEK to AZEK joints such as window surrounds, long fascia runs, etc. with AZEK Adhesive, a cellular pvc cement, to prevent joint separation. The glue joint should be secured with a

fastener and/or fastened on each side of the joint to allow adequate bonding time. AZEK Adhesive has a working time of 10 minutes and will be fully cured in 24 hours. If standard pvc cements are used, keep in mind these products typically cure quickly which will result in limited working time and may reduce adhesive strength. Surfaces to be glued should be smooth, clean and in complete contact with each other. To bond AZEK to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

14. SEALANTS: Use urethane, polyurethane or acrylic based sealants without silicone.
15. FINISHES: AZEK products do not require paint for protection, but may be painted to achieve a custom color.
16. PREPARATION: No special surface preparations are required prior to painting - sanding is not necessary for paint adhesion. Surface must be clean and dry. If desired, nail holes may be filled with polyurethane or acrylic based caulk. Use a 100% acrylic latex paint with a Light Reflective Value (LRV) of 55 or higher. Follow the paint manufacturer's recommendations to apply.
17. INSTALLATION: Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.
18. CUTTING: AZEK products can be cut using the same tools used to cut lumber. Carbide tipped blades designed to cut wood work well. Avoid fine tooth metal cutting blades. Rough edges from cutting may be caused by excessive friction, poor board support, or worn or improper tooling.
19. DRILLING: AZEK products can be drilled using the same tools used to drill lumber. Drilling AZEK products is similar to drilling a hardwood. Care should be taken to avoid frictional heat buildup. Use standard woodworking drills. Do not use drills made for normal rigid pvc. Periodic removal of AZEK shavings from the drill hole may be necessary.
20. MILLING: AZEK products can be milled using standard milling machines used to mill lumber. Relief Angle 20 to 30 degrees Cutting speed to be optimized with the number of knives and feed rate.
21. ROUTING: AZEK products can be routed using standard router bits and the same tools used to rout lumber. Carbide tipped router bits are recommended.
22. EDGE FINISHING: Edges can be finished by sanding, grinding or filing with traditional woodworking tools.
23. NAIL LOCATION: Use 2 fasteners per every framing member for trimboard applications. Trimboards over 12" or wider, as well as sheets, will require additional fasteners. Fasteners must be installed no more than 2" from the end of each board. Use 2 fasteners per every framing member for trimboard applications. Trimboards over 12" or wider, as well as sheets, will require additional fasteners. Fasteners must be installed no more than 2" from the end of each board.
24. THERMAL EXPANSION AND CONTRACTION: AZEK products expand and contract with changes in temperature. Properly fastening AZEK material along its entire length will minimize expansion and contraction. When properly fastened, allow for 1/8" per 18 foot of AZEK product for expansion and contraction. Joints between pieces of AZEK should be glued to eliminate joint separation. When gaps are glued on a long run of AZEK, allow expansion and contraction at ends of the run.

DIVISION 07

FIRE AND SMOKE ASSEMBLY IDENTIFICATION – 07 05 33

1. SCOPE OF WORK: Install as required by the IBC and local code officials direction. Coordinate with local official prior to installation.
2. FIRE AND SMOKE ASSEMBLY IDENTIFICATION: Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).
3. INSTALLATION: Locate markings as required by ICC (IBC). Install neatly, with horizontal edges level. Protect from damage until Substantial Completion; repair or replace damaged markings.

TRAFFIC COATINGS – 07 18 00

1. SCOPE OF WORK: As an alternate to the base bid:
   1.1. Item #1: Include a cost to coat all walkways.
   1.2. Item #2: Include a cost to coat all maintenance, utility rooms, and storage areas.
2. SECTION INCLUDES: Coating for waterproofing and traffic surface
3. SUBMITTALS: Include product characteristics and limitations. Identify dissolving solvents, fuels, and potential destructive compounds. Manufacturer's Installation Instructions: Include special field conditions required to install traffic membrane and potential incompatibilities with adjacent materials.
4. MAINTENANCE DATA: Include procedures for stain removal, repairing surface, and cleaning.
5. WARRANTY: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
6. QUALITY ASSURANCE: Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
7. APPLICATOR QUALIFICATIONS: Company specializing in performing installation of traffic membrane, with minimum 5 years documented experience and approved by manufacturer.
8. FIELD CONDITIONS: Do not install materials when temperature is below 50 degrees F or above 90 degrees F. Maintain this temperature range, 24 hours before, during and 72 hours after application. Restrict traffic from area where materials are being installed or are curing.
9. WARRANTY:Correct defective Work within a five year period after Date of Substantial Completion. Provide five year manufacturer warranty for 20 years. Include coverage for delamination of system from substrate.
10. PEDESTRIAN COATING: Fluid-applied polyurethane with slip-reducing aggregate surface. Finished Coating Thickness: 50 mils (0.050 inch), minimum.
11. MANUFACTURERS: AVM Industries, Inc; System 650SF, Gaco Western; GacoFlex U61
12. EXAMINATION: Verify that substrate is ready to receive work, surface is clean, dry and free of substances that could adversely affect bond.
13. PREPARATION: Clean substrate surface free of foreign matter. Patch wood substrate with latex filler to produce surface conducive to bond. Patch concrete substrate with filler to produce surface conducive to bond. Install cant strips securely at intersecting surfaces. Protect adjacent surfaces.
14. INSTALLATION: Apply system materials in accordance with manufacturer's instructions.
15. PROTECTION: Do not permit traffic over unprotected surfaces.

THERMAL INSULATION – 07 21 00

1. SCOPE OF WORK: Reference chart on Code Data plan for insulation values of wall, ceiling, floor, and roof assemblies.
2. SUBMITTALS: Provide data on product characteristics, performance criteria, and product limitations.
3. APPLICATIONS (for repair of existing when required and new installation)
   3.1. Insulation Under Concrete Slabs: Extruded polystyrene board.
   3.2. Insulation at Perimeter of Foundation: Expanded polystyrene board.
   3.3. Insulation at Perimeter CMU or Concrete Walls: Expanded polystyrene board.
   3.4. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.
4. ACOUSTIC INSULATION: ASTM C665; preformed glass fiber, friction fit type, un-faced at thickness to fill cavity. Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
   4.1. At all locations detailed on drawings and wall types.

4.2. At a minimum in new walls around: bathrooms, conference rooms, between apartment units, corridors and service areas.

5. FOAM BOARD INSULATION MATERIALS

5.1. Expanded Polystyrene (EPS) Board Insulation: ASTM C578 , Type XI; with the following characteristics: Flame Spread Index of 25 or less, when tested in accordance with ASTM E84. Smoke Developed Index of 450 or less, when tested in accordance with ASTM E84.

5.2. Extruded Polystyrene Board Insulation: Extruded polystyrene board ; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics: Flame Spread Index of 25 or less, when tested in accordance with ASTM E84. Smoke Developed Index of 450 or less, when tested in accordance with ASTM E84.

a) At curved roof: R-value; 1 inch of material at 72 degrees F: 5.6, minimum. Board Size shall be 48 x 96 inch with Square edges. Basis of Design: Owens Corning Formular High-R CW Plus.

b) At all other installations: R-value; 1 inch of material at 72 degrees F: 5, minimum. Board Size shall be 48 x 96 inch with Square edges.

6. GLASS FIBER BATT INSULATION: Flexible preformed batt or blanket, complying with ASTM C665; friction fit. Flame Spread Index of 25 or less, when tested in accordance with ASTM E84. Smoke Developed Index of 450 or less, when tested in accordance with ASTM E84. Non-combustible, when tested in accordance with ASTM E136, except for facing, if any. Thermal Resistance shall be R-Value as detailed.

6.1. Install insulation and vapor retarder in accordance with manufacturer's instructions.

6.2. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

6.3. ACCESSORIES: Insulation Fasteners shall be Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place. Adhesive shall be of a type recommended by insulation manufacturer for application.

WEATHER BARRIERS – 07 25 00

1. SCOPE OF WORK: Provide WRB, tape and flashing as required for full height and width of all exterior walls.

1.1. Ensure that material representative inspects work prior to it being covered work and offers written consent that methods utilized will meet the warranty requirements.

1.2. All materials are to be used in as large as sections as possible for all areas. In particular window head, sill and jamb flashing should be once continuous piece for the full length of the opening.

1.3. WRB should be installed upright with words in a horizontal orientation.

1.4. Materials shall be shingled so that the upper most section is lapping over the section below.

2. SECTION INCLUDES: Weather barrier membrane (DuPont™ Tyvek® Commercial Wrap D), Seam Tape (DuPont™ Tyvek® Tape), Flashing (DuPont™ FlexWrap™ and DuPont™ StraightFlash™), Fasteners

3. SUBMITTALS: Submit manufacturer current technical literature for each component. Samples: Weather Barrier Membrane, minimum 8-1/2 inches by 11 inch.

4. QUALITY ASSURANCE SUBMITTALS: Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements. Manufacturer Instructions: Provide manufacturer’s written installation instructions. Manufacturer's Field Service Reports: Provide site reports from authorized field service representative, indicating observation of weather barrier assembly installation. Weather Barrier Warranty: Manufacturer's executed warranty form with authorized signatures and endorsements indicating date of Substantial Completion.

5. QUALITY ASSURANCE: Installer shall have experience with installation of DuPont TM Tyvek® weather barrier assemblies under similar conditions. Installation shall be in accordance with weather barrier manufacturer’s installation guidelines and recommendations. Source Limitations: Provide weather barrier

and accessory materials produced by single manufacturer.

6. MOCK-UP: Install mock-up using approved weather barrier assembly including fasteners, flashing, tape and related accessories per manufacturer's current printed instructions and recommendations. Mock-up size: 10 feet by 10 feet min. Mock-up Substrate: Match wall assembly construction, including window opening. Mock-up may remain as part of the work. Contact manufacturer's designated representative prior to weather barrier assembly installation, to perform required mock-up visual inspection and analysis as required for warranty.
7. PRE-INSTALLATION MEETING: Hold a pre-installation conference, two weeks prior to start of weather barrier installation. Attendees shall include Contractor, Architect, installer, Owner's Representative, and weather barrier manufacturer's designated representative. Review all related project requirements and submittals, status of substrate work and preparation, areas of potential conflict and interface, availability of weather barrier assembly materials and components, installer's training requirements, equipment, facilities and scaffolding, and coordinate methods, procedures and sequencing requirements for full and proper installation, integration and protection.
8. DELIVERY, STORAGE AND HANDLING: Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact. Store weather barrier materials as recommended by weather barrier manufacturer.
9. SCHEDULING: Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly. Schedule installation of weather barrier materials and exterior cladding within nine months of weather barrier assembly installation.
10. WARRANTY: Weather barrier manufacturer's warranty for weather barrier for a period of five years from date of Substantial Completion. Approval by weather barrier manufacturer for warranty is required prior to assembly installation.
11. MANUFACTURER: DuPont™ Building Innovations™; 4417 Lancaster Pike, Chestnut Run Plaza 728, Wilmington, DE 19805; 1.800.44TYVEK (8-9835); http://construction.tyvek.com
12. ACCESSORIES: Seam Tape: DuPont™ Tyvek® Tape as manufactured by DuPont™ Building Innovations™.
13. FASTENERS: Tyvek® Wrap Caps, as manufactured by DuPont™ Building Innovations™: #4 nails with large 1-inch plastic cap fasteners. AND/OR Masonry tap-con fasteners with Tyvek® Wrap Caps as manufactured by DuPont™ Building Innovations™: 2-inch diameter plastic cap fasteners.
14. SEALANTS: Provide sealants that comply with ASTM C 920, elastomeric polymer sealant to maintain watertight conditions. Products: Dow Corning® 756, Tremco 830, Tremco Butyl, Sealants recommended by the weather barrier manufacturer.
15. ADHESIVES: Provide adhesive recommended by weather barrier manufacturer. Products: Liquid Nails® LN-109, Polyglaze® SM 5700, Denso Butyl Liquid, 3M High Strength 90, SIA 655, Adhesives recommend by the weather barrier manufacturer.
16. PRIMERS: Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing. Products: 3M High Strength 90, Denso Butyl Spray, SIA 655, Permagrip 105, Primers recommended by the flashing manufacturer
17. FLASHING: DuPont™ FlexWrap™, as manufactured by DuPont™ Building Innovations™: flexible membrane flashing materials for window openings and penetrations. AND/OR DuPont™ StraightFlash™, as manufactured by DuPont™ Building Innovations™: straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc.
18. EXAMINATION: Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.
19. INSTALLATION - WEATHER BARRIER: Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to over lap. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent

layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level. Extend bottom roll edge over sill plate 2" to 3". Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of weep screed. Seal weather barrier with sealant or tape to weep screed. Ensure weeps are not blocked. Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner. Window and Door Openings: Extend weather barrier completely over openings.

20. WEATHER BARRIER ATTACHMENT: Attach weather barrier to wood studs through exterior sheathing. Secure using weather barrier manufacturer recommend fasteners, space 6 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally. Apply 4 inch by 7 inch piece of DuPont TM StraightFlashTM to weather barrier membrane prior to the installation cladding anchors.
21. SEAMING: Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams. Seal any tears or cuts as recommended by weather barrier manufacturer.
22. OPENING PREPARATION (FOR USE WITH NON-FLANGED WINDOWS - ALL CLADDING TYPES): Flush cut weather barrier at edge of sheathing around full perimeter of opening. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.
23. OPENING PREPARATION (FOR USE WITH FLANGED WINDOWS): Cut weather barrier in a modified "I-cut" pattern. Cut weather barrier horizontally along the bottom of the header. Cut weather barrier vertically 2/3 of the way down from top center of window opening. Cut weather barrier diagonally from bottom of center vertical cut to the left and right corners of the opening. Fold side and bottom weather barrier flaps into window opening and fasten. Cut a head flap at 45-degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.
24. FLASHING (FOR USE WITH FLANGED WINDOWS): Cut 7-inch wide DuPont™ FlexWrap™ a minimum of 12 inches longer than width of sill rough opening. Cover horizontal sill by aligning DuPont™ FlexWrap™ edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs. Fan DuPont™ FlexWrap™ at bottom corners onto face of wall. Firmly press in place. Mechanically fasten fanned edges. On exterior, apply continuous bead of sealant to wall or backside of window mounting flange across jambs and head. Do not apply sealant across sill. Install window according to manufacturer's instructions. Apply 4-inch wide strips of DuPont™ StraightFlash™ at jambs overlapping entire mounting flange. Extend jamb flashing 1-inch above top of rough opening and below bottom edge of sill flashing. Apply 4-inch wide strip of DuPont™ StraightFlash™ as head flashing overlapping the mounting flange. Head flashing should extend beyond outside edges of both jamb flashings. Position weather barrier head flap across head flashing. Adhere using 4-inch wide DuPont™ StraightFlash™ over the 45-degree seams. Tape head flap in accordance with manufacturer recommendations. On interior, install backer rod in joint between frame of window and flashed rough framing. Apply sealant around entire window to create air seal. Apply sealant in accordance with sealant manufacturer's instructions and ASTM C 1193.
25. FIELD QUALITY CONTROL: Notify manufacturer's designated representative to obtain [required] periodic observations of weather barrier assembly installation.
26. PROTECTION: Protect installed weather barrier from damage.

VAPOR BARRIER – 07 26 00

1. SCOPE OF WORK: Provide vapor barrier under all slab on grade as well as on the interior face of wood framing CMU and concrete on exterior walls. Thickness of sheet material for underslab as described below; exterior walls could either be kraft-facing of fiberglass batt or 10-mil polyethylene sheet, lapped.
2. SECTION INCLUDES: Vapor barrier, seam tape, and mastic for installation under concrete slabs.
3. SUBMITTALS: Manufacturer's samples, literature. Manufacturer's installation instructions for placement, seaming and pipe boot installation
4. QUALITY ASSURANCE: Designer Qualifications: Perform design under direct supervision of a

Professional Engineer experienced in design of this type of work and licensed in the project municipality.

5. MATERIALS: Vapor Barrier must have all of the following qualities: Permeance of less than 0.01 Perms [grains/(ft2 *hr * in.Hg)] per ASTM F 1249 or ASTM E 96. ASTM E 1745 Class A
6. VAPOR BARRIER PRODUCTS: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC.
7. ACCESSORIES: Seam Tape: Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96 Vapor Proofing Mastic: Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96
8. Pipe Boots: Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.
9. PREPARATION: Ensure that subsoil is approved by Architect or Geotechnical Engineer.
10. Level and tamp or roll aggregate, sand or granular base.
11. INSTALLATION: Install in accordance with manufacturer's instructions. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643-98 (2005). Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour. Lap vapor barrier over footings and/or seal to foundation walls. Overlap joints 6 inches and seal with manufacturer's tape. Seal all penetrations (including pipes) per manufacturer's instructions. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

ASPHALT SHINGLES – 07 31 13

1. SCOPE OF WORK: On all roofs as illustrated on the contract documents. Flash and connect with other roofing types as recommended by the product manufacturer.
2. SUBMITTALS: Provide data indicating material characteristics.
3. SAMPLES: Submit two samples of each shingle color indicating color range and finish texture/pattern for each color selection.
4. QUALITY ASSURANCE: Perform Work in accordance with the recommendations of NRCA Steep Roofing Manual. Products Required to Comply with Fire Resistance Criteria: UL (DIR) listed and labeled.
5. FIELD CONDITIONS: Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.
6. WARRANTY: Manufacturer's standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship with specified warranty period. Materials failures include manufacturing defects and failure of asphalt shingles to self-seal after a reasonable time. Material Warranty Period: 30 years from date of Substantial Completion, prorated, with the first 5 years non prorated. Workmanship Warranty period: 1 year from Substantial Completion.
7. SHINGLES: GAF Materials Corporation; Product Timberline HD Series; Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462; Class A fire resistance.
8. SHEET MATERIALS: Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.
9. UNDERLAYMENT: Asphalt-saturated organic felt underlayment, complying with ASTM D 4869, minimum Type III "#30".
10. FLEXIBLE FLASHING: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.
11. NAILS: Standard round wire shingle type, of hot-dipped zinc coated steel, 10 wire gage, 0.1019 inch shank diameter, 3/8 inch head diameter, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.
12. METAL FLASHINGS: Provide sheet metal eave edge, gable edge, and other flashing indicated. Form

flashings to profiles appropriate for installation. Hem exposed edges of flashings minimum 1/4 inch on underside. Sheet Metal: Prefinished galvanized steel, 24 gauge thick, minimum G90/Z275 hot-dipped galvanized; PVC coated, color as selected.

13. EXAMINATION: Verify existing conditions prior to beginning work. Verify that deck is of sufficient thickness to accept fasteners. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface. Verify roof openings are correctly framed. Verify deck surfaces are dry, free of ridges, warps, or voids.
14. PREPARATION: Broom clean deck surfaces before installing underlayment or eave protection. Install eave edge flashings tight with fascia boards. Weather lap joints 2 inches and seal with plastic cement. Secure flange with nails spaced 12 inches on center.
15. INSTALLATION - EAVE PROTECTION MEMBRANE: Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall. Install eave protection membrane in accordance with manufacturer's instructions.
16. INSTALLATION – UNDERLAYMENT
    16.1. At Roof Slopes Less Than 4:12 : Install two layers of underlayment over entire roof area, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.
    16.2. Underlayment At Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place. Weather lap minimum 4 inches over eave protection.
    16.3. Items projecting through or mounted on roof: Weather lap and seal watertight with plastic cement.
17. INSTALLATION - VALLEY PROTECTION: Install one ply of smooth surfaced self adhering membrane, minimum 36 inches wide, centered over valleys. Install flexible flashing in accordance with manufacturer's instructions.
    17.1. All valleys to be Exposed Valleys:
        a) Install one layer of sheet metal flashing, minimum 24 inches wide, centered over open valley and crimped to guide water. Weather lap joints minimum 2 inch wide band of lap cement along each edge of first, press roll roofing into cement, and nail in place minimum 18 inches on center, 1 inch from edges.
18. INSTALLATION - METAL FLASHING AND ACCESSORIES: Install flashings in accordance with NRCA requirements. Weather lap joints minimum 2 inches and seal weather tight with plastic cement. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.
19. KICKER FLASHINGS: Install at eaves where roof meets vertical wall to direct water away from wall.
20. GUTTER FLASHING: Install gutter flashing at eaves to receive gutters.
21. INSTALLATION – SHINGLES: Install shingles in accordance with manufacturer's instructions. Fasten individual shingles using 2 nails per shingle, or by code, whichever is greater. Fasten strip shingles using 4 nails per strip, or by code, whichever is greater. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area. Provide double course of shingles at eaves. Project first course of shingles 3/4 inch beyond fascia boards. Extend shingles 1/2 inch beyond face of gable edge fascia boards. Complete installation to provide weather tight service.
22. PROTECTION: Do not permit traffic over finished roof surface.

COMPOSITE WALL PANELS – 07 42 43

1. SCOPE OF WORK: Provide and install all new panel brick system as illustrated in the contract documents, including:
    1.1. Along major exterior building elements as illustrated on the exterior elevations
2. SECTION INCLUDES: Exterior, panelized fiber cement cladding system and accessories to complete a

drained and back-ventilated rainscreen.

3. SUBMITTALS: Product Data: Submit manufacturer's product description, storage and handling requirements, and installation instructions. Product Test Reports and Code Compliance: Documents demonstrating product compliance with local building code, such as test reports or Evaluation Reports from qualified, independent testing agencies. Manufacturer's Details: Submit drawings (.dwg, .rvt, and/or .pdf formats), including plans, sections, showing installation details that demonstrate product dimensions, edge/termination conditions/treatments, compression and control joints, corners, openings, and penetrations.
4. SHOP DRAWINGS: Submit drawings, including plan, section, and elevation drawings, showing installation details that demonstrate product layout, dimensions, finish colors, edge/termination conditions/treatments, compression and control joints, openings, and penetrations.
5. SAMPLES: Submit samples of each product type proposed for use.
6. QUALITY ASSURANCE: All fiber cement panels specified in this section must be supplied by a manufacturer with a minimum of 10 years of experience in fabricating and supplying fiber cement cladding systems. Products covered under this section are to be manufactured in an ISO 9001 certified facility. Provide technical and design support as needed regarding installation requirements and warranty compliance provisions. All products listed in this section are to be installed by a single installer trained by manufacturer or representative.
7. MOCK-UP WALL: Provide a mock-up wall as evaluation tool for product and installation workmanship.
8. PRE-INSTALLATION MEETINGS: Prior to beginning installation, conduct conference to verify and discuss substrate conditions, manufacturer's installation instructions and warranty requirements, and project requirements.
9. DELIVERY, STORAGE, AND HANDLING: Panels must be stored flat and kept dry before installation. A waterproof cover over panels and accessories should be used at all times prior to installation. If panels are exposed to water or water vapor prior to installation, allow to completely dry before installing. Failure to do so may result in panel shrinkage at ship lap joints, and such action may void warranty. Panels MUST be carried on edge. Do not carry or lift panels flat. Improper handling may cause cracking or panel damage. Direct contact between the panels and the ground should be avoided at all times. It is necessary to keep panels clean during installation process.
10. WARRANTY: Provide manufacturer's 15-year warranty against manufactured defects in fiber cement panels. Additional 5-year extension available when refinished in year 14-15. Provide manufacturer's 15-year warranty against manufactured defects in panel finish. Warranty provides for the original purchaser. See warranty for detailed information on terms, conditions and limitations.
11. MANUFACTURERS: Nichiha Corporation, Nichiha USA, Inc., Nichiha CanyonBrick, Color: Shale Brown.
12. PROFILE: Rows one, three, and five begin and end with a whole brick pattern. Rows two, four, and six begin and end with a half brick pattern.
13. ACCESSORY/COMPONENT OPTIONS: Manufactured Corners with 3-1/2" returns. Aluminum trim to be painted per finish schedule: Outside corners (Corner Key, Open Outside Corner), vertical joints (H-Mold), terminations (J-Mold) Essential Flashing System: Starter, Compression Joint, Overhang.
14. SUBSTITUTIONS: Not permitted.
15. MATERIALS: Fiber cement panels manufactured from a pressed, stamped, and autoclaved mix of Portland cement, fly ash, silica, recycled rejects, and wood fiber bundles. Panel surface pre-finished and machine applied. Panels profiled along all four edges, such that both horizontal and vertical joints between the installed panels are ship-lapped. Factory-applied sealant gasket added to top and right panel edges; all joints contain a factory sealant.
16. PERFORMANCE REQUIREMENTS: Fiber Cement Cladding – Must comply with:
    16.1. ASTM C-1186, Type A, Grade II requirements:
        a) Wet Flexural Strength: Result: 1418 psi, Lower Limit: 1015 psi.
        b) Water Tightness: No water droplets observed on any specimen.

c) Freeze-thaw: No damage or defects observed.

d) Warm Water: No evidence of cracking, delamination, swelling, or other defects observed.

e) Heat-Rain: No crazing, cracking, or other deleterious effects, surface or joint changes observed in any specimen.

16.2. Mean Coefficient of Linear Thermal Expansion (ASTM E-228): Max 1.0*10^-5 in./in. F.

16.3. Surface Burning (CAN-ULC S102/ASTM E-84): Flame Spread: 0, Smoke Developed: 0.

16.4. Wind Load (ASTM E-330): Contact manufacturer for ultimate test pressure data corresponding to framing type, dimensions, fastener type, and attachment clips. Project engineer(s) must determine Zone 4 and 5 design pressures based on project specifics. Minimum lateral deflection: L/120.

16.5. Water Penetration (ASTM E-331): No water leakage observed into wall cavity.

16.6. Steady-State Heat Flux and Thermal Transmission Properties Test (ASTM C-518): 16mm thick panel thermal resistance R Value of 0.95.

16.7. Fire Resistant (ASTM E-119): The wall assembly must successfully endure 60-minute fire exposure without developing excessive unexposed surface temperature or allowing flaming on the unexposed side of the assembly.

16.8. Ignition Resistance (NFPA 268): No sustained flaming of panels, assembly when subjected to a minimum radiant heat flux of 12.5 kW/m2 ± 5% in the presence of a pilot ignition source for a 20-minute period.

16.9. Fire Propagation (NFPA 285): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Commercial Wrap, ½" Densglass Gold Sheathing, 16" o.c. 18 gauge steel studs, mineral wool in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of NFPA 285.

16.10. Fire Propagation (CAN/ULC S-134): Wall assembly of Nichiha AWP, Ultimate Clips and Starter Track, Tyvek Housewrap, 5/8" FRT plywood, 16" o.c. 2x wood studs, fiberglass in-cavity insulation, and interior 5/8" Type X gypsum met the acceptance criteria of CAN/ULC S-134.

16.11. Drained and Back Ventilated Rainscreen (AAMA 509-14): System classifications: W1, V1.

16.12. Florida Building Code - Test Protocol HVHZ (TAS 202, 203): Design Pressure: 95 psf

17. ULTIMATE CLIP SYSTEM: Install the following for a whole and complete system.

17.1. Starter Track: FA 700 (10mm rainscreen) – 3030mm (l) galvalume coated steel.

17.2. Panel Clips: JEL 777 "Ultimate Clip" (10mm rainscreen for 5/8" AWP) – Zinc-Aluminum-Magnesium alloy coated steel.

17.3. Joint Tab Attachments (included) – used at all AWP-1818 panel to panel vertical joints.

17.4. Single Flange Sealant Backer – FHK 1015 R (10mm) – 6.5' (l) fluorine coated galvalume.

17.5. Double Flange Sealant Backer – FH 1015 R (10mm) – 10' (l) fluorine coated galvalume.

17.6. Corrugated Spacer – FS 1005 (5mm), FS 1010 (10mm) – 4' (l).

17.7. Finish Clip (optional) – JE310 (5mm)

18. ALUMINUM TRIM: Paint as specified in finish schedule.

19. ESSENTIAL FLASHING SYSTEM: Starter – main segments (3030mm), inside corners, outside corners. Compression Joint – main segments (3030mm). Overhang – main segments (3030mm), inside corners, outside corners, joint clips

20. FASTENERS: Corrosion resistant fasteners, such as hot-dipped galvanized screws appropriate to local building codes and practices must be used. Use Stainless Steel fasteners in high humidity and high-moisture regions. Panel manufacturer is not liable for corrosion resistance of fasteners. Do not use aluminum fasteners, staples or fasteners that are not rated or designed for intended use. See manufacturer's instructions for appropriate fasteners for construction method used.

21. FLASHING: Flash all areas specified in manufacturer's instructions. Do not use raw aluminum flashing. Flashing must be galvanized, anodized, or PVC coated.
22. SEALANT: Sealant shall comply with ASTM C920, Class 35.
23. EXAMINATION: Verification of Conditions: Fiber cement panels can be installed over braced wood, steel studs and sheathing including plywood, OSB, plastic foam or fiberboard sheathing. Fiber cement panels can also be installed over Structural Insulated Panels (SIP's), Concrete Masonry Units (CMU's) and Concrete Block Structures (CBS's) with furring strips, and Pre-Engineered Metal Construction. Insulated Concrete Forms (ICFs) are NOT an approved substrate under any condition. Allowable stud spacing: 16" o.c. maximum. A weather resistive barrier is required when installing fiber cement panels. Use an approved weather resistive barrier (WRB) as defined by the 2015 IBC or IRC. Refer to local building codes. Appropriate metal flashing should be used to prevent moisture penetration around all doors, windows, wall bottoms, material transitions and penetrations. Refer to local building codes for best practices. Examine site to ensure substrate conditions are within alignment tolerances for proper installation. Do not begin installation until unacceptable conditions have been corrected. Do not install panels or components that appear to be damaged or defective. Do not install wet panels.
24. TOLERANCE: Wall surface plane must be plumb and level within +/- ¼ inch in 20 feet in any direction. One layer of Nichiha 5mm (~3/16") Spacer may be used as shim.
25. INSTALLATION: General: Install products in accordance with the latest installation guidelines of the manufacturer and all applicable building codes and other laws, rules, regulations and ordinances. Review all manufacturer installation, maintenance instructions, and other applicable documents before installation. Consult with your local dealer or Nichiha Technical Department before installing any Nichiha fiber cement product on a building higher than 45 feet or three stories or for conditions not matching prescribed standard installation guide requirements and methods. Special installation conditions may be required via a Technical Review and Special Applications Form (SAF) process. Vertical Control/Expansion Joints are required within 2-10 feet of outside corners finished with metal trim and approximately every 30 feet thereafter. Horizontal/Compression Joints are required for multi-story installations of AWP. Locate joints at floor lines. Joints are flashed minimum ½" breaks. Do not caulk. Refer to installation guide(s). Wood framed buildings of three or more floors require a compression joint at each floor. Steel framed buildings (including reinforced concrete core with LGMF exterior walls) of more than three floors (or 45 feet) require a compression joint every 25 feet at a floor line.
26. PANEL CUTTING: Always cut fiber cement panels outside or in a well ventilated area. Do not cut the products in an enclosed area. Always wear safety glasses and NIOSH/OSHA approved respirator whenever cutting, drilling, sawing, sanding or abrading the products. Refer to manufacturer SDS for more information. Use a dust-reducing circular saw with a diamond-tipped or carbide-tipped blade. Recommended circular saw: Makita 7-1/4" Circular Saw with Dust Collector (#5057KB). Recommended blade: Tenryu Board-Pro Plus PCD Blade (#BP-18505). Shears (electric or pneumatic) or jig saw can be used for complicated cuttings, such as service openings, curves, radii and scrollwork. Silica Dust Warning: Fiber cement products may contain some amounts of crystalline silica, a naturally occurring, potentially hazardous mineral when airborne in dust form. Consult product SDS or visit https://www.osha.gov/dsg/topics/silicacrystalline/.
27. CLEANING AND MAINTENANCE: Review manufacturer guidelines for detailed care instructions.

ALUMINUM SOFFIT AND TRIM – 07 46 30

1. SCOPE OF WORK: Provide and install full aluminum soffits and fascia throughout. Color as indicated in contract documents.
2. SECTION INCLUDES: Aluminum Soffit. Aluminum Fascia
3. SUBMITTALS: Product Data: Manufacturer's standard printed product data and installation instructions for specified products. Samples for Initial Selection: Manufacturer's sample finishes showing the full range of colors, profiles, and textures available.
4. QUALITY ASSURANCE: Installer Qualifications: Engage an experienced installer who has completed siding installations similar in material, design, and extent to that indicated for Project that has resulted in

construction with a record of successful in-service performance. Source Limitations: Obtain each color, texture, pattern, and type of siding and related accessories from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

5. DELIVERY, STORAGE, AND HANDLING: Deliver products to project site in original packaging. Store products in original packaging, on flat surface under cover, stacked no more than 12 boxes high.
6. WARRANTY: Provide manufacturer's lifetime warranty.
7. MANUFACTURERS: Alcoa Building Products, Inc.
8. ALUMINUM SOFFIT PANELS: Complying with AAMA 1402, fabricated from aluminum sheet in alloy recommended by siding manufacturer, and as follows:
   - 8.1. Pattern: 16-inch (406-mm) exposure in V-grooved, quadruple 4-inch (102-mm) board style.
   - 8.2. Ventilation: center vented
   - 8.3. Solid: Where noted
   - 8.4. Thickness: 0.019 inch (0.6 mm) nominal.
   - 8.5. Finish: Manufacturer's standard 2-coat finish.
   - 8.6. Color: Match trim color, and approved by Architect.
9. ALUMINUM FASCIA: Complying with AAMA 1402, fabricated from aluminum sheet in alloy recommended by siding manufacturer, and as follows:
   - 9.1. Thickness: 0.024 inch (0.6 mm) nominal.
   - 9.2. Finish: Manufacturer's standard 2-coat finish. Color to match trim and approved by Architect.
10. EXAMINATION: Examine substrate conditions before beginning installation of siding and soffit products; verify dimensions and acceptability of substrate. Do not proceed with installation until unacceptable conditions have been corrected.
11. INSTALLATION: Install in accordance with manufacturer's printed installation instructions. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing. Attach panels to substrate interlocked and lapped for weathertight installation, nails concealed; install horizontal components true to level and vertical components true to plumb. Space siding nails at 16 inches on center; center nails in nailing slots without binding to allow for thermal movement. Paint or otherwise protect dissimilar metals in contact.
12. ADJUSTING AND CLEANING: Clean dirt from surface of installed products, using mild soap and water. After completing installation, remove from project site excess materials and debris resulting from installation.

VINYL SIDING – 07 46 33

1. SCOPE OF WORK: As an alternate to the base bid, provide pricing to utilize a whole and complete siding and trim system in conjunction with PVC trim boards to be installed in lieu of fiber cement siding and panels.
2. SUBMITTALS: Manufacturer's data sheets on each product to be used, including: Preparation instructions and recommendations, Storage and handling requirements and recommendations, and Installation methods.
3. SAMPLES: Provide samples in colors specified, not less than 12 inches in length. Where colors are not specified, provide samples of manufacturer's entire color line for selection.
4. STORAGE AND HANDLING: Store products in manufacturer's unopened packaging until ready for installation. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
5. MANUFACTURERS: CertainTeed Corporation. Comply with ASTM D3679.
   - 5.1. HORIZONTAL VINYL SIDING:
     a) Profile: Double 5-Inch (Main Field) and Double 4-Inch (Accent Areas)

b) Thickness: 0.038 inch, minimum.
c) Length: 12 feet, minimum.
d) Nailing Hem: Single layer, with 1-1/8 inch long nail holes at maximum 18 inches on center.
e) Panel Project: 9/16 inch
f) Finish: “Monogram”, “Rough Cedar” by Certanteed
g) Color: As selected by Architect from manufacturers full range of available colors.

5.2. ACCESSORIES: Provide coordinating accessories made of same material as required for complete and proper installation whether or not specifically shown on the drawings.
a) Color: Match adjacent siding or soffit panels.
b) Length: Corner Posts, 10 feet min. Other Trim, 12.5 feet min.
c) Profiles: Provide manufacturer's full range to Architect for selection and approval.
d) Starter Strip: Single-row nailing hem with elongated nailing holes 1-1/4 inches long at 18 inches on center, with 1/4 inch base projection.
e) J-Channel Trim: 3/8 inches.

6. FASTENERS: Aluminum nails, alloy 5056 or 6110, with minimum tensile strength of 63,000 pounds per square inch; length as required to penetrate framing at least 3/4 inch.
7. EXAMINATION: Examine substrate conditions before beginning installation; verify dimensions and acceptability of substrate. Verify that weather barrier has been installed over substrate completely and correctly. Do not proceed with installation until unacceptable conditions have been corrected. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
8. INSTALLATION: Install siding, soffit, and trim in accordance with manufacturer's printed installation instructions. Attach securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation. Clean dirt from surface of installed products, using mild soap and water.
9. PROTECTION: Protect installed products until completion of project. Touch-up, repair or replace damaged products before Date of Substantial Completion.

FIBER CEMENT SIDING – 07 46 46

1. SCOPE OF WORK: Provide and install a whole and complete fiber cement siding system and accessories as illustrated in the contract documents.
2. SECTION INCLUDES: Wood-fiber cement siding.
3. REFERENCE STANDARDS: ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2012).
4. SUBMITTALS: Product Data: Manufacturer's data sheets on each product to be used, including: Manufacturer's requirements for related materials to be installed by others. Preparation instructions and recommendations. Storage and handling requirements and recommendations. Installation methods, including nail patterns.
5. QUALITY ASSURANCE: Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum 3 years of experience.
6. DELIVERY, STORAGE, AND HANDLING: Store products under waterproof cover and elevated above grade, on a flat surface.
7. LAP SIDING: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.

7.1. Style: Standard lap style.

7.2. Texture: As selected by Architect.

7.3. Length: 12 ft, nominal.

7.4. Width (Height): Exposures as noted on drawings.

7.5. Thickness: 5/16 inch, nominal.

7.6. Finish: Unfinished.

7.7. Warranty: 50 year limited; transferable.

7.8. Lap Siding Manufacturers: Nichiha USA, Inc.

8. PANEL SIDING: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.

8.1. Texture: Stucco patterned.

8.2. Length (Height): 96 inches, nominal.

8.3. Width: 48 inches.

8.4. Thickness: 5/16 inch, nominal.

8.5. Finish: Factory applied primer.

8.6. Warranty: 50 year limited; transferable.

8.7. Panel Siding Manufacturers: Nichiha USA, Inc.

9. SHINGLE PANELS: Panels giving appearance of multiple shingles made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.

9.1. Style: Random width, straight edge.

9.2. Texture: Wood grain textured.

9.3. Length: 48 inches.

9.4. Width (Height): 7 inches.

9.5. Thickness: 1/4 inch, nominal.

9.6. Finish: Factory applied primer.

9.7. Warranty: 50 year limited; transferable.

9.8. Shingle Panel Manufacturers: Nichiha USA, Inc.

10. ACCESSORIES:

10.1. Trim: As specified in Section 06 65 01 & 06 65 02. Starter strip for lap siding to be integral to skirt board provided for under Section 06 65 01.

10.2. Sealant: Paintable, 100 percent acrylic latex sealant complying with ASTM C 920.

10.3. Sheet Metal Flashing: Minimum 24 gage prefinished metal flashing - white.

10.4. Sealant: Match immediately adjacent predominant siding field.

10.5. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

11. EXAMINATION: Examine substrate and clean and repair as required to eliminate conditions that would be detrimental to proper installation. Do not begin until unacceptable conditions have been corrected. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

12. PREPARATION: Install sheet metal flashing: Above door and window trim and casings. Above horizontal trim in field of siding.

13. PROTECTION: Protect installed products until completion of project. Touch-up, repair or replace damaged products before Substantial Completion.

SHEET METAL ROOFING – 07 61 00

1. SCOPE OF WORK: Provide and install standing seam metal roof as illustrated in the contract documents.
2. MANUFACTURERS: ATAS International, Inc..
3. ADMINISTRATIVE REQUIREMENTS: Preinstallation Meeting shall convene one week before starting work of this section.
4. SHOP DRAWINGS: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
5. QUALITY ASSURANCE: Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise noted.
6. MOCK-UP: Locate where directed. Mock-up may remain as part of the Work.
7. DELIVERY, STORAGE, AND HANDLING: Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage. Prevent contact with materials that could cause discoloration or staining.
8. WARRANTY: Correct defective Work within a five year period after Date of Substantial Completion. Defective work includes degradation of metal finish. Provide five year manufacturer warranty for all work. Warranty shall include degradation of metal finish.
9. SHEET MATERIALS: Aluminum Sheet: ASTM B209 (ASTM B209M); 20 gage, 0.032 inch minimum base metal thickness; clear anodized finish.
10. ACCESSORIES:
    - 10.1. Fasteners: Galvanized steel, with soft neoprene washers.
    - 10.2. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.
        a) Minimum Requirements: Comply with requirements of 1 for non-self-adhesive sheet.
        b) Self Sealability: Passing nail sealability test specified in 1.
        c) Ultraviolet Resistance and Weatherability: Approved in writing by manufacturer for exposure to weather for minimum of 12 months.
        d) Low Temperature Flexibility: Passing test specified in 1.
        e) Fasteners: As specified by manufacturer and building code qualification report or approval, if any.
    - 10.3. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
    - 10.4. Sealant to be Exposed in Completed Work: 1 elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear. ASTM C920 elastomeric sealant, with minimum movement capability as recommended by manufacturer for sealed substrates; color to match adjacent material.
11. FABRICATION: Form sections true to shape, accurate in size, square, and free from distortion or defects. Fabricate cleats of same material as sheet, thickness to match roofing sheet, interlockable with sheet. Fabricate starter strips, interlockable with sheet. Form pieces in longest practical lengths. Hem exposed edges on underside 1/2 inch; miter and seam corners. Form material with standing seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
12. FINISHES: Clear Anodized Finish: AAMA 611 AA-M12C22A41 Class I clear anodic coating not less than 0.7 mils thick.
13. EXAMINATION: Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains. Verify deck is dry and free of snow or ice. Verify joints in wood deck are solidly supported and fastened. Verify correct placement of wood nailers and insulation positioning between nailers. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.

14. PREPARATION: Install starter and edge strips, and cleats before starting installation. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.
15. INSTALLATION:
    15.1. EAVE (ICE DAM) PROTECTION: Apply eave protection sheet in accordance with manufacturer's instructions. Extend eave protection sheet up roof slope at least 4 feet beyond exterior wall line of building.
    15.2. ROOFING: Apply underlayment over entire roof area. Apply slip sheet in one layer, laid loose. Cleat and seam all joints. Use plastic cement for joints between metal and bitumen and for joints between metal and felts.
    15.3. STANDING SEAM ROOFING: Lay sheets with long dimension perpendicular to eaves. Apply pans beginning at eaves. Lock cleats into seams and flatten. Stagger transverse joints of roofing sheets. At eaves and gable ends, terminate roofing by hooking over edge strip. Bend up one side edge 1-1/2 inches and other edge 1-3/4 inches. Make first fold 1/4 inch wide single fold and second fold 1/2 inch wide, providing locked portion of standing seam, 5 plies in thickness. Fold lower ends of seams at eaves over at 45 degree angle. Terminate standing seams at ridge and hips by turning down with tapered fold.
    15.4. FLASHINGS: Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted. Cleat and seam all joints. Apply plastic cement compound between metal flashings and felt flashings. Fit flashings tight in place, and make corners square, surfaces true and straight in planes, and lines accurate to profiles.
16. PROTECTION: Do not permit traffic over unprotected roof surface.

SHEET METAL FLASHING – 07 62 00

1. SCOPE OF WORK: Provide all sheet metal flashing as required for all exterior and interior applications required by product manufacturers, called out in the contract documents or as otherwise to provide a complete waterproofed system. Including but not limited to:
    1.1. Flashing to be installed above the head of all exterior horizontal trim, head of all windows and doors.
    1.2. All ends of flashing shall be cut, folded and turned back towards the building to wrap the unfinished edge of the material it is covering.
    1.3. Where flashing turns a corner, the material shall be overlapped, cut, folded and turned around the corner.
2. SECTION INCLUDES: Fabricated sheet metal items, including flashings and counterflashings. Sealants for joints within sheet metal fabrications. Reglets and accessories.
3. QUALITY ASSURANCE: Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
4. DELIVERY, STORAGE, AND HANDLING: Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage. Prevent contact with materials that could cause discoloration or staining.
5. GALVANIZED STEEL: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) thick base metal.
6. PRE-FINISHED GALVANIZED STEEL: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.0276 inch (min 24 gauge) thick base metal, shop pre-coated with modified silicone coating.
7. MODIFIED SILICONE POLYESTER COATING: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
8. PRE-FINISHED ALUMINUM: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop pre-coated with modified silicone coating.

9. MODIFIED SILICONE POLYESTER COATING: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
10. LEAD COATED COPPER: ASTM B101, 24 oz/sq ft weight of bare copper sheet, HOO (cold-rolled) temper.
11. ACCESSORIES: Fasteners: Galvanized steel, with soft neoprene washers. Primer: Zinc chromate type. Sealant to be Concealed in Completed Work: Non-curing butyl sealant. Sealant to be Exposed in Completed Work: 1; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear. Plastic Cement: 1, Type I.
12. FABRICATION: Form sections true to shape, accurate in size, square, and free from distortion or defects. Form pieces in longest possible lengths. Hem exposed edges on underside 1/2 inch; miter and seam corners. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.
13. EXAMINATION: Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located. Verify roofing termination and base flashings are in place, sealed, and secure.
14. INSTALLATION: Conform to drawing details. Insert flashings into reglets to form tight fit; secure in place with lead wedges; pack remaining spaces with lead wool; seal flashings into reglets with sealant. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted. Apply plastic cement compound between metal flashings and felt flashings. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles. Seal metal joints watertight.

FLASHING PANELS – 07 65 00

1. SCOPE OF WORK: Provide all new flashing panels at all exterior wall penetrations, including plumbing and electrical penetrations.
2. SUBMITTALS: Product Data: Submit manufacturer's product data, including installation instructions.
3. DELIVERY, STORAGE, AND HANDLING: Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions. Handling: Protect materials during handling and installation to prevent damage.
4. WARRANTY PERIOD: 10 years.
5. MANUFACTURERS: Quickflash Weatherproofing Products, Inc
6. PLUMBING FLASHING PANELS:
   6.1. Materials:
   a) Panel: Combination of high-density polyethylene (HDPE) and low-density polyethylene (LDPE).
      - HDPE, Specific Gravity, ASTM D 1505: 0.953 g/cm3.
      - HDPE, Tensile Strength at Yield, ASTM D 638: 3,100 psi.
      - LDPE, Specific Gravity, ASTM D 792: 0.917 g/cm3.
      - LDPE, Tensile Strength at Yield, ASTM D 638: 1,300 psi.
   b) Weatherproof Seal: Thermoplastic elastomer.
      - Hardness, ASTM D 2240, Shore A, 10 Seconds: 46.
      - Specific Gravity, ASTM D 792: 1.05 g/cm3.

- Tensile Strength, ASTM D 412: 490 psi.

6.2. Model: P-50.
   a) Fits: 1/2-inch to 3/4-inch pipes; copper, rigid, PVC, and ABS.
   b) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

6.3. Model: P-100.
   a) Fits: 1-inch to 1-1/4-inch pipes; copper, rigid, PVC, and ABS.
   b) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

6.4. Model: P-150.
   a) Fits: 1-1/2-inch to 1-3/4-inch pipes; copper, rigid, PVC, and ABS.
   b) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

6.5. Model: P-200.
   a) Fits: 2-inch to 2-1/2-inch pipes; copper, rigid, PVC, and ABS.
   b) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

6.6. Model: P-300.
   a) Fits: 3-inch pipes, ABS.
   b) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

6.7. Model: P-400.
   a) Fits: 4-inch pipes, ABS.
   b) Size: 12-1/2 inches by 12-1/2 inches by 3/32 inch.

6.8. Model: P-600.
   a) Fits: 6-inch sheet metal duct.
   b) Size: 12-1/2 inches by 12-1/2 inches by 3/32 inch.

6.9. Model: P-2PS.
   a) Fits: Cut out center to fit 1/2-inch to 2-inch copper pipes with exterior tees sweated on.
   b) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch. 2-piece panel.

7. ELECTRICAL FLASHING PANELS:

7.1. Material: Thermoplastic elastomer.
   a) Hardness, ASTM D 2240, Shore A, 10 Seconds: 93.
   b) Specific Gravity, ASTM D 792: 1.05 g/cm3.
   c) Tensile Strength, ASTM D 412: 1,300 psi.

7.2. Model: E-SGB-A 1-3/8 inches, electrical single-gang box flashing panel.
   a) Use: 1-coat stucco and EIFS.
   b) Fits: Allied Moulded electrical single-gang boxes, part 9327-N.
   c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.3. Model: E-3/0 B-A 1-3/8 inches, electrical 3/0 box flashing panel.
   a) Use: 1-coat stucco and EIFS.
   b) Fits: Allied Moulded electrical 3/0 boxes, parts 9335-HNK and 9335-HNGK.
   c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.4. Model: E-SGB-A 7/8 inches, electrical single-gang box flashing panel.
   a) Use: 3-coat stucco.

b) Fits: Allied Moulded electrical single-gang boxes, part 9327-N.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.5. Model: E-3/0 B-A 7/8 inches, electrical 3/0 box flashing panel.

a) Use: 3-coat stucco.

b) Fits: Allied Moulded electrical 3/0 boxes, parts 9335-HNK and 9335-HNGK.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.6. Model: E-3/0 B, electrical 3/0 box flashing panel.

a) Use: 3-coat stucco and lap siding.

b) Fits: Specified electrical 3/0 plastic boxes.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.7. Model: E-4/0 B, electrical 4/0 box flashing panel.

a) Use: 3-coat stucco and lap siding.

b) Fits: Specified electrical 4/0 plastic boxes.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.8. Model: E-PC 3/0, electrical pancake 3/0 box flashing panel.

a) Use: 3-coat stucco and lap siding.

b) Fits: Specified electrical pancake 3/0 metal boxes.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.9. Model: E-PC 4/0, electrical pancake 4/0 box flashing panel.

a) Use: 3-coat stucco and lap siding.

b) Fits: Specified electrical pancake 4/0 metal boxes.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.10. Model: E-SGB, electrical single-gang box flashing panel.

a) Use: 3-coat stucco and lap siding.

b) Fits: Specified electrical single-gang plastic boxes.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

7.11. Model: E-SGR, electrical single-gang 1/2-inch raised-plaster-ring cover flashing panel.

a) Use: 3-coat stucco and lap siding.

b) Fits: Specified electrical single-gang raised-plastic-ring cover.

c) Size: 11-1/8 inches by 11-1/8 inches by 3/32 inch.

8. EXAMINATION: Examine areas to receive flashing panels. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not begin installation until unacceptable conditions are corrected.

9. PREPARATION: Copper Pipes: Heat sweat copper pipes before installation of flashing panels.

10. INSTALLATION: Install flashing panels in accordance with manufacturer's instructions.

10.1. Plumbing Flashing Panels, 1 Piece: Select flashing panel required for specific pipe sizes. Push flashing panel over pipe with label facing to exterior to form weatherproof seal around pipe. Nail flashing panels to walls with corrosion-resistant nails at top of panels.

10.2. Plumbing Flashing Panels, 2 Piece: Cut flashing panel scores to size of pipe. Place bottom panel under pipe. Snap top panel to bottom panel over pipe. Caulk pipe to flashing panel with exterior polyurethane joint sealant for weatherproof seal.

10.3. Electrical Flashing Panels: Select flashing panel required for specific electrical boxes. Push

flashing panel over electrical box with label facing to exterior to form weatherproof seal around box. Ensure flashing panel collar edge is flush with electrical box opening edge. Nail flashing panels to walls with corrosion-resistant nails at top of panels.

10.4. Weather Barriers: Place weather barrier up behind bottom of flashing panel to bottom of pipe or electrical box. Place second layer of weather barrier over top of flashing panel to bottom front edge or further down.

11. PROTECTION: Protect installed flashing panels from damage during construction.

MANUFACTURED GUTTERS AND DOWNSPOUTS – 07 71 23

1. SCOPE OF WORK: Provide all new commercial grade gutters and downspouts. Tie into underground drain system as required by the contract documents.
2. DESIGN REQUIREMENTS: Contractor to provide full design of new gutters and downspouts calculated based on local rain levels and as per best local practices as part of the base contract. Location of downspouts to tie into existing underground system if applicable. Final locations to be approved by the Architect and Owner prior to installation. Conform to SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years. Conform to applicable code for size and method of rain water discharge.
3. SUBMITTALS: Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
4. MATERIALS: Polyvinyl Chloride (PVC): ASTM D2665, virgin vinyl, SDR 35 pipe and fittings, high impact type, colorfast; color as selected. OR Pre-Finished Aluminum Sheet: ASTM B 209 (ASTM B 209M) ; 0.019 inch or 0.027 inch thick, shop pre-coated with modified silicone coating. Color as selected by the Owner from manufacturer's standard colors.
5. COMPONENTS: Contractor to provide a whole and complete system including all manufacturer recommended materials accessories and configurations.
   5.1. Gutters: SMACNA rectangular style profile including support saddle brackets.
   5.2. Downspouts: SMACNA Rectangular profile including support saddle brackets.
   5.3. Anchors and Supports: Profiled to suit gutters and downspouts. Anchoring In accordance with SMACNA requirements.
6. FABRICATION: Form gutters and downspouts of profiles and size as designed by the Contractor's gutter designer. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints. Fabricate gutter and downspout accessories; seal watertight.
7. MINIMUM SIZES: Minimum Gutter size to be Seamless 5” - 0.027” thick. Minimum Downspout size to be 3”x4” - 0.019” thick.
8. INSTALLATION: Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
   8.1. Gutter joints shall be lapped minimum of 3 inches, caulked and pop riveted with two rows of SD42BS galvanized steel pop rivits
   8.2. Gutter brackets shall be 0.125 inches thick by 1 inch wide galvanized metal. Stagger gutter brackets at 15 inches on center from the interior to the exterior of the gutter
   8.3. Downspout joints shall be lapped in the direction of water flow
   8.4. Space downspout brackets at 5 feet on center maximum
   8.5. Screen fabric shall be placed within the gutter at the downspout opening and securely attached

FIRESTOPPING – 07 84 00

1. SCOPE OF WORK: To be installed to maintain the ratings of assemblies at any penetrations,

intersections or openings. To be installed as required for any noted UL assemblies in the contract documents. As required by AHJ inspectors for minor applications. See General Notes for additional requirements.

2. SYSTEM REQUIREMENTS: Provide systems that are listed by Underwriters Laboratories Inc. (UL), in "Fire Resistance Directory". All firestopping is to be Low or No VOC.
3. PERFORMANCE REQUIREMENTS
   - 3.1. Provide firestop products that are flexible enough to allow for pipe vibration in a through penetration application.
   - 3.2. Provide firestop sealants and sprays for construction joint applications that are flexible enough to satisfy the movement criteria per the test standards ASTM E 1399, ASTM E 1966 or ANSI/UL 2079.
   - 3.3. Provide products with flame spread index of less than 25 and smoke developed index of less than 450, when tested in accordance with ASTM E 84.
   - 3.4. Provide products that meet the intent of the L rating classification for the movement of smoke per ANSI/UL 1479 for through penetrations and ANSI/UL 2079 for construction joints.
   - 3.5. Provide products that bear classification marking of qualified independent testing agency.
   - 3.6. Where firestop systems not listed by any listing agency are required due to project conditions, submit a substitution proposal with evidence specified.
   - 3.7. Use only products specifically listed for use in listed systems.
   - 3.8. Provide products that are compatible with each other, with the substrates forming openings, and with the items, if any, penetrating the firestopping, under the conditions represented by this project, based on testing and field performance demonstrated by manufacturer.
   - 3.9. Firestopping materials must meet and be acceptable for use by all building codes and NFPA codes cited in this section.
4. SUBMITTALS: List each type of penetration. Provide data on product characteristics, performance ratings, and limitations.
5. QUALITY ASSURANCE: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
6. FIELD CONDITIONS: Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.
7. FIRESTOPPING SYSTEMS: Match rating of existing wall & ceiling assemblies
8. INSTALLATION: Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings. Do not cover installed firestopping until inspected by authorities having jurisdiction. Install labeling required by code.

JOINT SEALERS – 07 90 05

1. SCOPE OF WORK: Install in all locations required by the contract documents, by any material manufacturer's installation instructions. Where sealant is to come in contact with a surface, utilize only the sealant approved by that material manufacturer.
2. SEALANTS: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
   - 2.1. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component. Color: Match adjacent finished surfaces.
   - 2.2. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   - 2.3. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable. Color: Match adjacent finished surfaces.

2.4. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.

2.5. Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component. Color: Color as selected.

3. SILICONE SEALANT: ASTM C920, Grade NS, Class 25 minimum; Uses NT, A, G , M , O; single component, neutral curing, non-sagging, non-staining, fungus resistant, non-bleeding. Color: Match adjacent finished surfaces. Movement Capability: Plus and minus 25 percent. Service Temperature Range: -65 to 180 degrees F.

4. ACCESSORIES: Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

5. INSTALLATION: Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions. Perform installation in accordance with ASTM C1193. Tool joints concave.

DIVISION 08

HOLLOW METAL DOORS – 08 11 13

1. SCOPE OF WORK: Provide doors as outlined in the door schedule. Reference types below for locations.

2. SECTION INCLUDES: Non-fire-rated hollow metal doors. Fire-rated hollow metal doors. Thermally insulated hollow metal doors.

3. SUBMITTALS: Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

4. SHOP DRAWINGS: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

5. QUALITY ASSURANCE: Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience. Provide hollow metal frames from SDI Certified manufacturer. Maintain at project site copies of reference standards relating to installation of products specified.

6. DELIVERY, STORAGE, AND HANDLING: Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

7. MANUFACTURERS:

7.1. Ceco Door, an Assa Abloy Group company; Curries, an Assa Abloy Group company; Republic Doors, an Allegion brand; Steelcraft, an Allegion brand.

7.2. Manufacturer of hollow metal doors and frames shall be the same company.

8. DESIGN CRITERIA: Requirements for Hollow Metal Doors and Frames:

8.1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.

8.2. Accessibility: Comply with ICC A117.1 and ADA Standards.

8.3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.

8.4. Door Edge Profile: Manufacturers standard for application indicated.

8.5. Typical Door Face Sheets: Flush.

8.6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.

8.7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

8.8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

8.9. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

9. HOLLOW METAL DOORS

9.1. Type D07 and D10, Exterior Doors: Thermally insulated.

a) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

b) Level 1 - Standard-duty.

c) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

d) Model 1 - Full Flush.

e) Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.

f) Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.

g) Door Core Material: Polyisocyanurate, 2 lbs/cu ft minimum density.

h) Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.

i) Door Thermal Resistance: R-Value of 9.9, minimum, for installed thickness of polyisocyanurate.

j) Door Thickness: 1-3/4 inch, nominal.

k) Weatherstripping: Refer to Section 08 71 00.

l) Door Finish: Factory finished.

9.2. Type XXX, Interior Doors, Non-Fire Rated with half lite (NOT USED)

a) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

b) Level 1 - Standard-duty.

c) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

d) Model 1 - Full Flush.

e) Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.

f) Door Thickness: 1-3/4 inch, nominal.

9.3. Type D08 and D11, Fire-Rated Doors:

a) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

b) Level 1 - Standard-duty.

c) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

d) Model 1 - Full Flush.

e) Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.

f) Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

g) Provide units listed and labeled by UL (DIR) or ITS (DIR).

h) Attach fire rating label to each fire rated unit.

i) Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;

j) Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.

k) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.

l) Label: Include the "S" label on fire-rating label of door.

m) Door Core Material: Manufacturers standard core material/construction in compliance with requirements.

n) Door Thickness: 1-3/4 inch, nominal.

9.4. Type D09, Exterior Doors: Thermally insulated with half lite.

a) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

b) Level 1 - Standard-duty.

c) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

d) Model 1 - Full Flush.

e) Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.

f) Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.

g) Door Core Material: Polyisocyanurate, 2 lbs/cu ft minimum density.

h) Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.

i) Door Thermal Resistance: R-Value of 9.9, minimum, for installed thickness of polyisocyanurate.

j) Door Thickness: 1-3/4 inch, nominal.

k) Weatherstripping: Refer to Section 08 71 00.

l) Door Finish: Factory finished.

10. EXAMINATION: Verify existing conditions before starting work. Verify that opening sizes and tolerances are acceptable. Verify that finished walls are in plane to ensure proper door alignment.

11. INSTALLATION: Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated. Install fire rated units in accordance with NFPA 80. Coordinate frame anchor placement with wall construction. Install door hardware as specified in Section 08 71 00. Touch up damaged factory finishes.

12. TOLERANCES: Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

13. ADJUSTING: Adjust for smooth and balanced door movement.

14. SCHEDULE: Refer to Door and Frame Schedule on the drawings.

HOLLOW METAL FRAMES – 08 12 13

1. SCOPE OF WORK: Provide frames for all doors as outlined in the door schedule. Reference types below for locations.

2. SECTION INCLUDES: Non-fire-rated hollow metal frames for non-hollow metal and hollow metal doors. Fire-rated hollow metal frames for non-hollow metal and hollow metal doors. Interior glazed borrowed lite frames.

3. SUBMITTALS: Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
4. SHOP DRAWINGS: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
5. QUALITY ASSURANCE: Manufacturer Qualifications: Provide hollow metal frames from SDI Certified manufacturer: www.steeldoor.org/sdicertified.php.
6. DELIVERY, STORAGE, AND HANDLING: Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.
7. MANUFACTURERS: Hollow Metal Frames with Integral Casings:
    7.1. Ceco Door, an Assa Abloy Group company; Curries, an Assa Abloy Group company; Republic Doors, an Allegion brand; Steelcraft, an Allegion brand
    7.2. Manufacturer of hollow metal doors and frames shall be the same company.
8. DESIGN CRITERIA: Refer to Door and Frame Schedule on the drawings for frame sizes, fire ratings, sound ratings, finishing, door hardware to be installed, and other variations, if any.
    8.1. Steel used for fabrication of frames shall conform to one or more of the following requirements; galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
    8.2. Accessibility: Conform to ICC A117.1 and ADA Standards.
    8.3. Combined Requirements: If a particular door and frame unit is indicated to conform to more than one type of requirement, conform to the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must conform to the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, conform to the most stringent.
    8.4. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
    8.5. Frames for Interior Glazing or Borrowed Lites: Construction and face dimensions to match door frames, and as indicated on drawings.
9. HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS
    9.1. Type F1, Exterior Door Frames, Knock-down type
        a) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
        b) Level 1 - Standard-duty.
        c) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
        d) Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
        e) Weatherstripping: Refer to Section 08 71 00.
    9.2. Type F2, Interior Door Frames, Non-Fire Rated, Knock-down type
        a) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
        b) Level 1 - Standard-duty.
        c) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
        d) Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
    9.3. Type F3 and F6, Fire-Rated Door Frames, Knock-down type
        a) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

b) Level 1 - Standard-duty.

c) Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.

d) Frame Metal Thickness: 18 gage, 0.042 inch, minimum.

e) Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C or NFPA 252 ("positive pressure fire tests").

f) Provide units listed and labeled by ITS (DIR) or UL (DIR).

g) Attach fire rating label to each fire rated unit.

h) Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing framed doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;

i) Maximum Air Leakage: 3.0 cfm/sq ft of framed door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.

j) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.

k) Label: Include the "S" label on fire-rating label of door.

l) Frame Finish: Factory finished.

9.4. Type F4, Interior Pre-hung wood frame. Reference Section 08 14 16.

9.5. Type F5, Exterior Aluminum Storefront. Reference Section 08 43 13.

10. FINISHES: Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

11. ACCESSORIES: Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

12. EXAMINATION: Verify existing conditions before starting work. Verify that opening sizes and tolerances are acceptable. Verify that finished walls are in plane to ensure proper door alignment.

13. INSTALLATION: Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated. Install fire rated units in accordance with NFPA 80.

14. Coordinate frame anchor placement with wall construction. Conform to glazing installation requirements of Section 08 80 00. Install door hardware as specified in Section 08 71 00. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861. Coordinate installation of electrical connections to electrical hardware items.

15. TOLERANCES: Clearances Between Door and Frame: Conform to related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

16. SCHEDULE: Refer to Door and Frame Schedule on the drawings.

FLUSH WOOD DOORS – 08 14 16

1. SCOPE OF WORK:

1.1. Reference Door Schedule for locations of all doors.

1.2. D04, D05: Dwelling Unit interior doors, pre-hung flat panel hollow core wood doors.

1.3. D03: Fire Rated Doors, Flat Panel solid core wood door

1.4. D02: As an alternate to the base bid provide 6-panel, fire-rated, solid core wood doors at unit entries.

2. MANUFACTURERS: Lynden Door or approved equal

3. SUBMITTALS: Product Data to Indicate door core materials and construction; veneer species, type and characteristics. Samples: Submit two samples of door veneer, 6 x 6 inch in size illustrating wood grain,

stain/paint color, and sheen.

4. QUALITY ASSURANCE: As Required, Fire Rated Door and Transom Panel Assembly to Conform to NFPA 80 for fire-rating as indicated.
5. WARRANTY: Interior Doors: Provide manufacturer's warranty for 2 years. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
6. INTERIOR DOORS: 1-3/4 inches thick unless otherwise indicated; flush construction. Fire Rated Doors: Tested to 20 minutes, 60 minutes, 90 minutes, and ratings as indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc. (UL) without any visible seals when door is open.
7. ACCESSIBILITY COMPLIANCE: All doors within or as an entry to accessible apartments, amenity spaces, restrooms, common areas, corridors, stairwells or otherwise required to comply with accessibility codes shall contain the features listed below as a minimum. If there is a conflict with the hardware group or manufacture's or suppliers specified hardware and the following, provide compliant hardware and notify the architect immediately.
    7.1. 10” clear smooth space at bottom of door / 10” flush bottom rail for the full width of the door
    7.2. If cavities are created by the installation of kick, armor or other plates, they shall be blocked and capped
    7.3. 32” minimum clear width as measured from the most constraining points with the door installed and open to 90 degrees
    7.4. 80” clear height opening as measured to to the most constraining points with the door installed
    7.5. Handles, pulls, latches, locks and other operating devices on accessible doors must have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate. Lever-operated mechanisms, push-type mechanisms, and U-shaped handles are acceptable designs. When sliding doors are fully open, the operating hardware must still be exposed and usable from both sides.
    7.6. Hardware must be mounted no higher than 48 inches above finished floor.
    7.7. Thresholds must not exceed 3⁄4 inch in height for exterior sliding doors or 1⁄2 inch for other types of doors. Changes in level up to 1⁄4 inch can be vertical and do not need an edge treatment. Changes in level between 1⁄4 inch and 1⁄2 inch must have a beveled slope equaling 1:2.
    7.8. If the changes in level are greater than 1⁄2 inch, the threshold must be equipped with a ramp. The floor or ground surface within the maneuvering clearances at the doorway must not have a slope steeper than 1:48.
    7.9. If a door is equipped with an automatic closing device, then the sweep range of the closer must be adjusted so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door
8. DOOR AND PANEL CORES
    8.1. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
    8.2. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking to provide adequate anchorage of hardware without through-bolting.
    8.3. Hollow Core Doors: Type - Standard (FSHC); plies and faces as indicated above.
9. DOOR CONSTRUCTION: Fabricate doors in accordance with door quality standard specified. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
10. INSTALLATION: Install doors in accordance with manufacturer's instructions and specified quality standard. Install fire-rated doors in accordance with NFPA 80 requirements. Coordinate installation of

doors with installation of frames and hardware.

SLIDING GLASS DOORS – 08 32 00

1. SCOPE OF WORK: Provide and install new sliding glass doors at all openings illustrated on the exterior elevations. Door hardware to comply with accessible regulations for operation, shape and mounting location.
2. SECTION INCLUDES: Thermo-Tech® Classic Series Vinyl Doors
3. SUBMITTALS: Product Data: Submit the following documents for each type of door. Manufacturer's technical data, product descriptions and installation manuals.
4. SHOP DRAWINGS: Elevations for each style door specified indicating its size, color, glazing type, muntin type and design. Manufacturer's head, jamb and sill section details for each door type specified.
5. SELECTION SAMPLES: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
6. TEST REPORTS: Submit certified independent testing agency reports indicating door units meet or exceed specified performance requirements.
7. QUALITY ASSURANCE: Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of twenty (20) years of experience. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
8. MOCK-UP: Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Finish areas designated by Architect. Do not proceed with remaining work until workmanship and color are approved by Architect. Refinish mock-up area as required to produce acceptable work.
9. DELIVERY, STORAGE, AND HANDLING: Store products in manufacturer's unopened packaging until ready for installation. All doors are to be handled and stored sill down in an upright position and not on sides or head. No more than 8 patio doors are to be stored in a stack and keep out of direct sunlight. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.
10. WARRANTY: At project closeout, provide to Owner or Owner’s Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
    - 10.1. UPVC Vinyl Frame and Sash Parts: 10 Years from Date of Manufacture.
    - 10.2. Door Hardware: 10 Years from Date of Manufacture.
    - 10.3. Insulated Glass Seal Failure: 10 Years from Date of Manufacture.
    - 10.4. Stress Cracks: 1 Year form Date of Manufacture.
    - 10.5. Labor on Warranty Parts: 1 Year from Date of Manufacture.
11. MANUFACTURER: AAMA Accredited Manufacturer: Thermo-Tech Premium Windows and Doors
12. SUBSTITUTIONS: Not permitted.
13. D06: SLIMLINE SLIDING PATIO DOOR CONSTRUCTION
    - 13.1. Frame: 4 9/16 inch (116mm) multi-chambered design, made with Polyvinyl Chloride (PVC) with fusion welded corners.
    - 13.2. Frame/Sash Color: White
    - 13.3. Hardware: C-Handle with Dual Point locking system Color: Interior Complementing Color
    - 13.4. Weather Stripping: Multi-layer weather stripping in compliance with AAMA 701.2
    - 13.5. Screens: Color complementing aluminum frame with BetterVue® charcoal fiberglass mesh
    - 13.6. Muntins / Grids: 5/8” Flat Grids between glass (GBG) dividers

13.7. Exterior Trim: Integral Nailing Fin to be coordinated with applicable adjacent materials and siding

13.8. Interior Trim: Jamb receptors to match interior door color (Field Applied): 11/16 inch

13.9. Extension Jambs: Vinyl Wrapped to Complement Interior Door Color Selection

14. PERFORMANCE:

14.1. Unit Size Tested: To be included with submittal documents for each door style.

14.2. Energy and structural performance results to be included with submittal for each door style.

14.3. Air Infiltration: Maximum .02 cfm/sq. ft. at 1.57 psf (25 mph) in accordance with ASTM E 283

14.4. Water Resistance: No leakage when tested at 7.50 psf in accordance with ASTM E 547

14.5. Performance Grade: R-30

14.6. Forced Entry Resistance: Grade 10

15. GLAZING: 7/8 inch (19mm) dual pane insulated glass units utilizing warm edge spacer system and (2) panes of 1/8" double strength glass secured to sash frame using a silicone sealant and glazing bead.

15.1. Type: Premium High Performance 366 LoE^3 with Argon

15.2. U-Factor: 0.29

15.3. Solar Heat Gain Coefficient (SHGC): 0.22 (No Grids), 0.20 (With Grids)

15.4. Visible Light Transmittance: 0.52 (No Grids), 0.45 (With Grids)

15.5. Condensation Resistance: 53

15.6. Color / Tint: None

16. EXAMINATION: do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

17. PREPARATION: Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

18. INSTALLATION: Install in accordance with manufacturer's instructions.

19. PROTECTION: Protect installed products until completion of project. Touch-up, repair or replace damaged products before Substantial Completion.

OVERHEAD COILING DOORS – 08 33 23

1. SCOPE OF WORK: Provide and install (1) overhead coiling door in location illustrated on plans. Include all required mounting, safety, and accessories for a whole and complete operation. Operation and mechanisms are to be tamperproof.

1.1. Base Bid is for door to be operated manual chain pull.

1.2. Provide pricing to include design, upgrade to electric circuiting and installation of electric motor operation for door as an alternate to the base bid.

2. SUBMITTALS: Product Data: Provide general construction, electrical equipment, component connections and details. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures. Maintenance Data: Indicate lubrication requirements and frequency, and periodic adjustments required.

3. SHOP DRAWINGS: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

4. SAMPLES: Submit two slats, 12 inch by slat height in size illustrating shape, color and finish texture.

5. QUALITY ASSURANCE: Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

6. MANUFACTURERS: Alpine Overhead Doors, Inc; or Overhead Door Corp.
7. EXTERIOR COILING DOORS: Steel slat curtain.
    7.1. Capable of withstanding positive and negative wind loads of 20 psf, without undue deflection or damage to components.
    7.2. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.1.
    7.3. Nominal Slat Size: 2 inches wide x required length.
    7.4. Finish: Galvanized.
    7.5. Guide, Angles: Galvanized steel.
    7.6. Hood Enclosure: Manufacturer's standard; primed steel.
    7.7. Manual hand chain lift operation.
    7.8. Mounting: Within framed opening.
    7.9. Locking Devices: Lock and latch handle on outside.
8. CURTAIN CONSTRUCTION: Interlocking slats.
    8.1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
    8.2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
    8.3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
9. STEEL SLATS: Minimum thickness, 26 gage; ASTM A653/A653M galvanized steel sheet.
    9.1. Galvanizing: Minimum G90 coating.
10. GUIDE CONSTRUCTION: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.
11. GUIDES - ANGLE: ASTM A36/A36M metal angles, size as indicated. Hot-dip galvanized in compliance with ASTM A123/A123M.
12. HOOD ENCLOSURE: Internally reinforced to maintain rigidity and shape.
13. LOCK HARDWARE: Latchset Lock Cylinders to be standard mortise cylinder. Keying to be coordinated with door hardware supplier and Owner. Incorporate this door into required door hardware keying meeting. Latch Handle: Manufacturer's standard.
14. MANUAL CHAIN LIFT: Provide padlockable chain keeper on guide.
15. ROLLER SHAFT COUNTERBALANCE: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.
16. EXAMINATION: Verify that opening sizes, tolerances and conditions are acceptable.
17. INSTALLATION: Install units in accordance with manufacturer's instructions. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress. Securely and rigidly brace components suspended from structure. Secure guides to structural members only. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
18. TOLERANCES: Maintain dimensional tolerances and alignment with adjacent work. Maximum Variation From Plumb: 1/16 inch. Maximum Variation From Level: 1/16 inch. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.
19. ADJUSTING: Adjust operating assemblies for smooth and noiseless operation.
20. CLEANING: Clean installed components. Remove labels and visible markings.

OVERHEAD COILING GRILLES – 08 33 26

1. SCOPE OF WORK: Provide and install (2) overhead coiling grilles in locations illustrated on plans. Include all required mounting, safety, electric and accessories for a whole and complete operation. Grille is to be operated by both electric motor and manual chain pull. Operation and mechanisms are to be tamperproof.
   1.1. Provide pricing as an alternate to the base bid.
2. SECTION INCLUDES: Overhead coiling metal grilles and operating hardware, manual and electric operation. Wiring from electric circuit disconnect to operator to control station.
3. SUBMITTALS: Product Data: Provide general construction, component connections and details, and electrical equipment. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.
4. SHOP DRAWINGS: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
5. SAMPLES: Submit two grille members, 12 by 12 inch in size illustrating shape, color and finish texture.
6. QUALITY ASSURANCE: Provide certificate of compliance from authorities having jurisdiction indicating approval of grille and operating hardware assembly. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.
7. MANUFACTURERS: Alpine Overhead Doors, Inc or Overhead Door Corp.
8. GRILLE: Aluminum; horizontal bar curtain, coiling on overhead counterbalanced shaft.
   8.1. Finish: Anodized, clear.
   8.2. Lock Devices: Lock and latch handle on outside.
   8.3. Manual hand chain lift operation.
   8.4. Electric operation.
   8.5. Mounting: Within framed opening.
9. CURTAIN: Round horizontal bars connected with vertical links.
   9.1. Horizontal bars: 5/16 inch diameter.
   9.2. Bar spacing: 1-1/2 inch on center.
   9.3. Tube spacers: 1/2 inch diameter.
   9.4. Spacer spacing: 3-1/4 inch on center.
   9.5. Vertical links: 5/16 inch diameter.
   9.6. Link spacing: 6 inch on center.
   9.7. Bar Ends: Provide with nylon runners for quiet operation.
   9.8. Bottom Bar: Back-to-back angles with tubular resilient cushion.
10. GUIDES: Extruded aluminum angles, of profile to retain grille in place with snap-on trim, mounting brackets of same metal.
11. HOOD ENCLOSURE: Sheet metal; completely covering operating mechanisms; internally reinforced to maintain rigidity and shape. Material: Same metal as grille. Finish: Anodized, clear.
12. LOCK HARDWARE: Latchset Lock Cylinders to be standard mortise cylinder. Keying to be coordinated with door hardware supplier and Owner. Incorporate this door into required door hardware keying meeting. Latch Handle: Manufacturer's standard.
13. MANUAL CHAIN LIFT: Provide padlockable chain keeper on guide.
14. ROLLER SHAFT COUNTERBALANCE: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

15. MATERIALS: Aluminum: ASTM B221 (ASTM B221M).
16. ELECTRIC OPERATION: Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction. Provide interlock switches on motor operated units.
17. ELECTRIC OPERATORS:
    17.1. Mounting: Side mounted.
    17.2. Motor Enclosure:
    17.3. Motor Rating: 1/3 hp; continuous duty.
    17.4. Motor Voltage: 120/208 volt, single phase, 60 Hz. Or as appropriate for operations. Contractor to coordinate with available power and circuit.
    17.5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
    17.6. Controller Enclosure: NEMA 250 Type 1.
    17.7. Opening Speed: 12 inches per second.
    17.8. Brake: Adjustable friction clutch type, activated by motor controller.
    17.9. Manual override in case of power failure.
18. CONTROL STATION: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator. 24 volt circuit. Surface mounted.
19. SAFETY EDGE: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.
20. EXAMINATION: Verify that opening sizes, tolerances and conditions are acceptable.
21. INSTALLATION: Install grille unit assembly in accordance with manufacturer's instructions. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress. Securely and rigidly brace components suspended from structure. Secure guides to structural members only. Fit and align assembly including hardware; level and plumb, to provide smooth operation. Coordinate installation of electrical service with utility. Complete wiring from disconnect to unit components. Install perimeter trim.
22. TOLERANCES: Maintain dimensional tolerances and alignment with adjacent work. Maximum Variation From Plumb: 1/16 inch. Maximum Variation From Level: 1/16 inch. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.
23. ADJUSTING: Adjust grille, hardware and operating assemblies for smooth and noiseless operation.
24. CLEANING: Clean grille and components. Remove labels and visible markings.

ALUMINUM FRAMED STOREFRONT – 08 43 13

1. SCOPE OF WORK: Provide and install new storefront as illustrated in the contract documents. Finish and color as per Finish Schedule.
    1.1. All glazing units to be insulated glass and compliant with Energy Star, the IECC, the HERS Rater’s analysis, and as specified elsewhere in this specification.
    1.2. Storefront to be located in all openings not otherwise noted to receive windows or doors.
2. MANUFACTURERS: Kawneer North America, or Oldcastle Building Envelope
3. SUBMITTALS: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
4. SHOP DRAWINGS: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
5. DELIVERY, STORAGE, AND HANDLING: Handle products of this section in accordance with AAMA CW-10. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed

coatings that bond to aluminum when exposed to sunlight or weather.

6. WARRANTY: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer. Correct defective Work within a five year period after Date of Substantial Completion. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.
7. ALUMINUM-FRAMED STOREFRONT: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
    7.1. Glazing Position: Centered (front to back).
    7.2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
    7.3. Finish & Color: As selected from manufacturer's standards.
    7.4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
    7.5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
    7.6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
    7.7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
    7.8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
    7.9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
8. ALUMINUM FRAMING MEMBERS: Tubular aluminum sections , thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system. Glazing Stops to be Flush.
9. SWING DOORS: Glazed aluminum. Thickness: 1-3/4 inches. Stile & Rails: Wide stile w/ 10" bottom rail. Finish: Same as storefront.
10. EXTRUDED ALUMINUM: ASTM B221 (ASTM B221M).
11. FASTENERS: Stainless steel.
12. EXPOSED FLASHINGS: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.
13. GLAZING GASKETS: Type to suit application to achieve weather, moisture, and air infiltration requirements.
14. FINISHES: Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick. Color as selected by Architect from manufacturer's standard range.
15. EXAMINATION: Verify dimensions, tolerances, and method of attachment with other work. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
16. INSTALLATION: Install wall system in accordance with manufacturer's instructions. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten system to building structure. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances , aligning with adjacent work. Provide thermal isolation where components penetrate or disrupt building insulation. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing. Pack

fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

17. TOLERANCES: Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
18. ADJUSTING: Adjust operating hardware and sash for smooth operation.
19. CLEANING: Remove protective material from pre-finished aluminum surfaces.
20. PROTECTION: Protect installed products from damage until Date of Substantial Completion.

VINYL WINDOWS – 08 53 13

1. SCOPE OF WORK: Provide and install all windows as illustrated in the contract documents.
   - 1.1. Verify insulated glazing meets HERS, Energy Star and other MHFA energy requirements and other criteria as listed in Section 08 80 00.
   - 1.2. Apartment Units: All windows are to be sliding units that comply with egress requirements.
   - 1.3. Common Area: All windows are to be slider units unless indicated as fixed pane/picture.
2. SECTION INCLUDES: Thermo-Tech Classic Series Vinyl Windows
3. SUBMITTALS: Product Data: Submit Manufacturer's technical data, product descriptions and installation manuals for each type of window
4. SHOP DRAWINGS: Elevations for each style window specified indicating its size, color, glazing type, muntin type and design. Manufacturer's head, jamb and sill section details for each window type specified.
5. SELECTION SAMPLES: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
6. TEST REPORTS: Submit certified independent testing agency reports indicating window units meet or exceed specified performance requirements. Window units must be tested to comply with AAMA/WDMA/CSA 101/I.S.2/A440-11
7. QUALITY ASSURANCE: Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of twenty (20) years of experience. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
8. EGRESS: All windows must comply with the requirements of the code bodies having jurisdiction over the project. Install windows with the following properties:
   - 8.1. Sill height must not exceed 44 inches above the floor.
   - 8.2. Minimum net clear opening must be 5.7 square feet with the exception of grade level windows may have a minimum clear opening of 5 square feet.
   - 8.3. Minimum net clear opening height must be 24 inches.
   - 8.4. Minimum net clear opening width must be at least 20 inches.
9. MOCK-UP: Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Finish area as selected by Architect. Do not proceed with remaining work until workmanship and color are approved by Architect. Refinish mock-up area as required to produce acceptable work.
10. DELIVERY, STORAGE, AND HANDLING: Store products in manufacturer's unopened packaging until ready for installation. All windows and doors are to be handled and stored sill down in an upright position and not on sides or head. No more than 8 patio doors and 12 windows are to be stored in a stack and keep out of direct sunlight. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

11. WARRANTY: At project closeout, provide to Owner or Owner's Representative an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.
    11.1. UPVC Vinyl Frame and Sash Parts: 10 Years from Date of Manufacture.
    11.2. Window Hardware: 10 Years from Date of Manufacture.
    11.3. Insulated Glass Seal Failure: 10 Years from Date of Manufacture.
    11.4. Stress Cracks: 1 Year form Date of Manufacture.
    11.5. Labor on Warranty Parts: 1 Year from Date of Manufacture.
12. MANUFACTURER: AAMA Accredited Manufacturer: Thermo-Tech Premium Windows and Doors
13. SUBSTITUTIONS: Not permitted.
14. CLASSIC SERIES WINDOW CONSTRUCTION:
    14.1. Frame: 3 1/4 inch (83mm) multi-chambered design, made from Polyvinyl Chloride (PVC) with fusion welded corners.
    14.2. Frame/Sash Color: White
    14.3. Hardware: Metal lock and keeper system. Hardware Color: To match interior frame color.
    14.4. Sliding window track-lock system locks closed or in place at 3" (76mm) for secure ventilation
    14.5. Weather Stripping: Multi-layer weather stripping in compliance with AAMA 701.2
    14.6. Screens: Color complemented aluminum frame with BetterVue® charcoal fiberglass mesh on operable units
    14.7. Muntins/Grids: 5/8" Flat grids between glass (GBG) dividers
    14.8. Exterior Trim: Integral Nailing Fin to be coordinated with applicable adjacent materials and siding.
    14.9. Interior Trim: Jamb Receptors to Match Interior Window Color: 11/16 inch to coordinate with 5/8" drywall return. Extension Jambs: Complement Interior Window Color Selection
    14.10. Window sill to coordinate with 3/4" thick cast marble sill.
15. PERFORMANCE:
    15.1. Unit Size Tested: To be included with submittal documents for each window style.
    15.2. Energy and structural performance results to be included with submittal for each window style.
    15.3. Air Infiltration: Maximum 0.07 cfm/sq. ft. at 1.57 psf (25 mph) in accordance with ASTM E 283
    15.4. Water Resistance: No leakage when tested at 6.06 psf in accordance with ASTM E 547
    15.5. Performance Grade: Minimum of R-40
    15.6. Forced Entry Resistance: Grade 10
16. SLIDING WINDOWS – CLASSIC SERIES
    16.1. Glazing: 7/8 inch dual pane insulated glass units utilizing warm edge spacer system and (2) panes of 1/8 inch (minimum) double strength glass secured to sash frame using a silicone sealant and glazing bead.
    16.2. Type: Premium High Performance 366 LoE^3 with Argon
    16.3. U-Factor: 0.29
    16.4. Solar Heat Gain Coefficient (SHGC): 0.22 (No Grids), 0.20 (With Grids)
    16.5. Visible Light Transmittance: 0.51 (No Grids), 0.46 (With Grids)
    16.6. Condensation Resistance: 55}
    16.7. Color / Tint: None
17. DIRECT SET PICTURE WINDOWS – CLASSIC SERIES

17.1. Glazing: 7/8 inch dual pane insulated glass units utilizing warm edge spacer system and (2) panes of 1/8 inch (minimum) double strength glass secured to frame using double sided glazing tape and glazing bead.

17.2. Type: Ultimate High Performance 366 LoE^3 with Argon

17.3. U-Factor: 0.27

17.4. Solar Heat Gain Coefficient (SHGC): 0.24 (No Grids), 0.22 (With Grids)

17.5. Visible Light Transmittance: 0.57 (No Grids), 0.51 (With Grids)

17.6. Condensation Resistance: 57

18. EXAMINATION: Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

19. PREPARATION: Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

20. INSTALLATION: Install in accordance with manufacturer's instructions.

21. PROTECTION: Protect installed products until completion of project. Touch-up, repair or replace damaged products before Substantial Completion.

DOOR HARDWARE – 08 71 00

1. SCOPE OF WORK: Door hardware to be provided as outlined in this specification to meet the intended functionality. Contractor to coordinate with Security and electrified function provider and utilize a hardware consultant.

2. ACCESSIBLE ACTUATOR SYSTEM: Provide and install complete accessible actuator system at main entrance vestibule. A total of (4) actuators are to be provided as a part of the system, (2) operating each door of the series from both ingress and egress directions. Include mounting post on exterior side of exterior door. Include pedestrian sensors and adjust for proper operation.

2.1. Basis of Design Product: LCN 8310 Series actuator and accessories.

2.2. Actuators are to be mounted within accessible reach range heights and be provided with a 30 inch by 48 inch clear floor space, centered on the actuator.

2.3. Contractor to include all interconnect, power, controllers and other associated devices and wiring to provide a compliant entrance system. Coordinate locations of all devices with adjacent devices and construction types.

2.4. Provide and install openers for doors to be operated as a part of the hardware group associated with each door. Select appropriate opener as required for the specific door type and mounting.

2.5. Submit to the architect for review and approval a complete package submission.

3. DOOR HARDWARE – GENERAL: Provide hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated. Provide items of a single type of the same model by the same manufacturer. Doors to include hinges, silencers, frames, levers/knobs, and all other hardware as recommended by the supplier/manufacturer for proper operation to meet the design intent of the Contract Documents.

4. FIRE RATED DOORS: Provide products that comply with applicable provisions of federal, state, and local codes and in the case of Fire-Rated Doors, NFPA 80.

4.1. Hardware on Fire-Rated Doors, Except Hinges: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

4.2. Hardware for Smoke and Draft Control Doors: Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.

5. SUBMITTALS: Within ten days after award of contract, submit detailed hardware schedule. Schedule

format shall be consistent with recommendations for a vertical format as set forth in the Door & Hardware Institute's (DHI) publication "Sequence and Format for the Hardware Schedule". Hardware sets shall be consolidated to group multiple door openings which share similar hardware requirements. Schedule shall include the following information:

5.1. Door number, location, size, handing, and rating.

5.2. Door and frame material, handing.

5.3. Degree of swing.

5.4. Manufacturer

5.5. Product name and catalog number

5.6. Function, type and style

5.7. Size and finish of each item

5.8. Mounting heights

5.9. Explanation of abbreviations, symbols, etc.

5.10. Numerical door index, indicating the hardware set/ group number for each door.

6. GENERAL REQUIREMENTS

6.1. HARDWARE CONSULTANT: The hardware schedule will be prepared under the direct supervision of a certified Architectural Hardware Consultant (AHC) employed by the hardware distributor. The hardware schedule shall be signed and embossed with the DHI certification seal of the supervising AHC. The supervising AHC shall attend any meetings related to the project when requested by the Architect.

6.2. Check the specified hardware for suitability and adaptability to the details and surrounding conditions.

6.3. Review drawings from related trades to verify compatibility with specified hardware. Indicate unsuitable or in compatible items, and proposed substitutions in the hardware schedule.

6.4. Provide documentation for all hardware to be furnished on labeled fire doors indicating compliance with positive pressure fire testing UL 10C.

6.5. Furnish manufacturers' catalog data for each item of hardware.

6.6. Submit a sample of each type of hardware requested by the Architect. Samples shall be of the same finish, style, and function as specified herein. Tag each sample with its permanent location so that it may be used in the final work.

6.7. Furnish with first submittal, a list of required lead times for all hardware items.

6.8. After final approved schedule is returned, transmit corrected copies for distribution and field use in quantities by Division 1 - General Conditions.

6.9. Furnish approved hardware schedules, template lists, and pertinent templates as requested by related trades.

6.10. Furnish necessary diagrams, schematics, voltage and amperage requirements for all electro-mechanical devices or systems by related trades.

6.11. After receipt of approved hardware schedule, Hardware supplier shall initiate a meeting including the Owner's representative to determine keying requirements. Upon completion of the initial key meeting, hardware supplier shall prepare a proposed key schedule with symbols and abbreviations as set forth in the door and hardware institute's publication "Keying Procedures, Systems, and Nomenclature". Submit copies of Owner approved key schedule for review and field use.

7. QUALITY ASSURANCE: Manufacturers and model numbers listed are to establish a standard of function and quality. Similar items by approved manufacturers that are equal in design, function, and quality, may be considered for prior approval of the Architect, provided the required data and physical samples are submitted for approval as set forth in Division One General Requirements.

7.1. Obtain each type of hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

7.2. Installation of hardware shall be installed or directly supervised and inspected by a skilled installer certified by the manufacturer of locksets, door closers, and exit devices used on the project, or with not less than 3 years experience in successful completion of projects similar in size and scope.

7.3. Provide hardware for all labeled fire doors, which complies with positive pressure fire testing UL 10C.

7.4. Comply with all applicable provisions of the standards referenced within section 1.4 of this specification.

8. FASTENERS: All exposed fasteners shall be Phillips head or as otherwise specified, and shall match the finish of the adjacent hardware. All fasteners ex-posed to the weather shall be non-ferrous or stainless steel. Furnish correct fasteners to accommodate surrounding conditions. Coordinate required reinforcements for doors and frames. Seek approval of the Architect prior to furnishing through-bolts. Furnish through-bolts for materials not readily reinforced.

9. BUTT HINGES: Unless otherwise specified, furnish the following hinge quantities for each door leaf: 3 hinges for doors up to 90 inches. 1 additional hinge for every 30 inch on doors over 90 inches. 4 hinges for Dutch door applications.

	Ives	Stanley	Hager
Standard Weight, Plain Bearing	5PB1	F179	1279
Standard Weight, Ball Bearing	5BB1	BB179	BB1279
Standard Weight, Ball Bearing, Non-Ferrous	5BB1	FBB19	BB1191

9.1. Unless otherwise specified, furnish hinge weight and type as follows:

a) Standard weight: plain bearing hinge 5PB1 for interior openings through 36 inches wide without a door closer.

b) Standard weight: ball bearing hinge 5BB1 for interior opening over 36 through 40 inches wide without a door closer, and for interior openings through 40 inches wide with a door closer.

c) Heavyweight: 4 ball bearing hinge 5BB1HW for interior openings over 40 inches wide, and for all vestibule doors.

d) Heavyweight: 4 ball bearing hinge 5BB1HWss for exterior openings unless otherwise listed in groups.

9.2. Unless otherwise specified, furnish hinges for exterior doors, fabricated from brass, bronze, or stainless steel. Unless otherwise specified, hinges for interior doors may be fabricated from steel.

9.3. Unless otherwise specified, furnish hinges in the following sizes: 5" x 5" for 2-1/4" thick doors; 4-1/2" x 4-1/2" for1-3/4" thick doors; 3-1/2" x 3-1/2" for 1-3/8" thick doors.

9.4. Furnish hinges with sufficient width to accommodate trim and allow for 180-degree swing.

9.5. Unless otherwise specified, furnish hinges with flat button tips with non-rising pins at interior doors, non-removable loose pins (NRP) at exterior and out-swinging interior doors.

9.6. Unless otherwise specified, furnish all hinges to template standards.

9.7. Hinges: Provide hinges on every swinging door.

a) Provide five-knuckle full mortise butt hinges unless otherwise indicated.

b) Provide ball-bearing hinges at all doors having closers.

c) Provide hinges in the quantities indicated.

d) Provide non-removable pins on exterior outswinging doors.

e) Where electrified hardware is mounted in door leaf, provide power transfer hinges.

10. EXIT DEVICES

Von Duprin	Precision
98 / 99 Series	2000 Series
33 / 35 Series	20 Series
22 Series	50 Series
996 Series	3900 Series
990 Series	1700A Series

10.1. Obtain exit devices from a single manufacturer, although several may be indicated as offering products complying with requirements.

10.2. All exit devices shall be equipped with a sound-dampening feature to reduce touch pad return noise.

10.3. On full glass doors there shall be no exposed fasteners on the back of the mechanism visible through the glass.

10.4. All exit devices shall be provided with flush end caps to reduce potential damage from impact.

10.5. All exit devices shall be provided with dead-locking latchbolts to insure security.

10.6. All exit devices shall be U.L. listed for accident hazard. Exit device for use on fire doors shall also be U.L. listed for fire exit hardware.

10.7. Provide optional strikes, special length rods, and adapter plates to accommodate door and frame conditions. Provide narrow style series devices in lieu of wide stile series devices where optional strikes will not accommodate door and frame conditions.

10.8. Coordinate with related trades to insure adequate clearance and reinforcement is provided in doors and frames. Provide thru bolts.

10.9. Refer to hardware groups for exit device applications utilizing the option of: "less bottom rod and floor strike" (LBR)

10.10. All exit devices shall be provided with optional trim designs to match other lever and pull designs used on the project.

10.11. Provide interchangeable core cylinders when used in conjunction with exit devices. Cylinder keyway shall match locksets furnished on this project.

10.12. Provide cylinder keyed dogging (interchangeable core) for all non-fire rated exit devices.

10.13. Provide glass bead kits to accommodate door conditions. Screws shall not be visible through full glass doors.

10.14. Where specified, provide compatible keyed mullions with cylinder for pairs of doors.

10.15. Provide reinforced crossbars for all traditional style exit devices applied to doors over 36" wide.

10.16. Devices specified are designed for wide style doors. If door size will not allow for the wide style device, provide the appropriate device to fit the door specified.

11. LOCKS AND LATCHES

	Schlage
Grade 2 Cylindrical	AL Series Saturn
Grade 2 Tubular	F Series ELAN
Grade 2 Deadbolt	BC100 Kwikset

11.1. No substitutions allowed.

11.2. Unless otherwise specified, all locks and latches to have: 2-3/4" Backset, 1/2" minimum throw latchbolt, 1" throw deadbolt, 6 pin cylinders, ANSI A115.2 strikes

11.3. Provide guarded latchbolts for all locksets, and latchbolts with sufficient throw to maintain fire rating of both single and paired door assemblies.

11.4. Length of strike lip shall be sufficient to clear surrounding trim.

11.5. Provide wrought boxes for strikes at inactive doors, wood frames, and metal frames without integral mortar covers.

11.6. Provide a lock for every door, unless specifically indicated as not requiring locking.

a) If no hardware set is indicated for a swinging door provide an office lockset.

11.7. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.

11.8. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.

11.9. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.

a) Provide cams and/or tailpieces as required for locking devices required.

11.10. Keying: Grand master keyed.

11.11. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

12. PULLS, PUSHBARS, PUSH/PULL PLATES

	Burns	Hager	Ives
Offset Door Pull (1" dia., 10" ctc)	26C	4J	8190-0
Pull / Push-Bar (1" dia., 10" ctc Pull)	422 x 26C	153	9103EZ-0

12.1. Adjust dimensions of protection plates to accommodate stile and rail dimensions, lite and louver cutouts, and adjacent hardware. Where required by adjacent hardware, protection plates shall be factory drilled for cylinders or other mortised hardware. All push plates shall be beveled 4 sides and counter sunk.

12.2. Where specified, provide surface mounted door edges. Edges shall butt to protective plates. Provide edges with cutouts adjacent hardware.

12.3. Where possible, provide back-to-back, and concealed mounting for pulls and push bars. Push bar length shall be 3" less door width, or center of stile to center of stile for stile & rail or full glass doors.

13. CLOSERS

LCN	Norton	Sargent
SC71 RW/PA	7500/pr7500	281 / 281P10

13.1. Obtain door closers from a single manufacturer, although several may be indicated as offering products complying with requirements.

13.2. Closers shall use high strength cast iron cylinders, forged main arms, and 1 piece forged steel pistons.

13.3. Closers shall utilize a stable fluid withstanding temperature range of +120deg F to -30deg F without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with standards UL10C.

13.4. Unless otherwise specified, all door closers shall have full covers and separate adjusting valves for sweeps, latch, and backcheck.

13.5. Provide closers for all labeled doors. Provide closers with adjustable spring power. Size closers to insure exterior and fire rated doors will consistently close and latch doors under existing conditions. Size all other door closers to allow for reduced opening force not to exceed 5 lbs.

13.6. Install closers on the room side of corridor doors, stair side of stairways and interior side of exterior doors.

13.7. Closers shall be furnished complete with all mounting brackets and cover plates by door and frame conditions, and by adjacent hardware.

14. KICK PLATES AND MOP PLATES

14.1. Furnish protective plates as specified in hardware groups.

14.2. Where specified, provide 10" kick plates, 36" armor plates, and 4" mop plates. Unless otherwise specified, metal protective plates shall be .050" thick; plastic plates shall be 1/8" thick.

14.3. Protective plates shall be 2" less door width, or 1" less door width at pairs. All protective plates shall be beveled 4 sides and counter sunk. Protection plates over 16" shall not be provided for labeled doors unless specifically approved by door manufacturers listing.

14.4. Where required by adjacent hardware, protection plates shall be factory drilled for cylinders or other mortised hardware.

15. OVERHEAD STOPS

Glynn-Johnson	Rixson	Sargent
GJ90 Series	9 Series	590
GJ100 Series	1 Series	690

15.1. Overhead stops (including slide block and end caps) shall be fabricated from metal.

15.2. Unless otherwise specified, furnish GJ450 series overhead stop for doors equipped with regular arm surface type closers that swing more than 140 degrees before striking a wall, for doors that open against equipment, casework, sidelights, or other objects that would make wall bumpers inappropriate, and as specified in hardware groups.

15.3. Furnish chicago screw or barrel nut attachments for wood and mineral core doors unless doors are supplied with proper reinforcing blocks.

15.4. Do not provide holder function for fire rater and/or labeled doors.

16. STOPS AND HOLDERS

	Ives	Hager	Burns
Convex Bumper	WS406CVX	232W	570
Concave Bumper	WS406CCV	236W	575
Spring Stop	069	*****	*****
Hinge pin stop	070	*****	*****

16.1. Furnish a stop or holder for all doors. Furnish floor stops only where specifically specified.

16.2. Where wall stops are not applicable, furnish overhead stops.

16.3. Do not provide holder function for fire rated and/or labeled doors.

17. WEATHERSTRIP, GASKETING

	Pemko	NGP	Reese
Weatherstrip	2891APK	700NA	755A
Gasket	S88D	2525	797B
Edge Seal	S77	5060	*****
Sweeps	18061CP	B606A	964A
Sweep drip	345	*****	*****
Drip Cap	346A	16A	R201A

17.1. Where specified in the hardware groups, furnish the above products unless otherwise detailed in groups.

17.2. Provide weatherstripping all exterior doors and where specified.

17.3. Provide intumescent and other required edge sealing systems by individual fire door listings to comply with positive pressure standards UL 10C.

17.4. Provide S88D smoke gaskets at all fire rated doors and smoke and draft control assemblies.

18. THRESHOLDS

Pemko	NGP	Reese
171	425	S205

18.1. Hardware supplier shall verify all finish floor conditions and coordinate proper threshold to insure a smooth transition between threshold and interior floor finish.

18.2. Threshold Types:

a) Unless otherwise specified, provide saddle threshold similar to Reese S205 for all exterior openings with a interior floor finish less than or equal to 1/4" in height.

b) Unless otherwise specified, provide half saddle threshold similar to Reese S239 for all exterior openings with a interior floor finish greater than 1/4" in height. Threshold height shall match thickness of interior floor finish.

19. DOOR POSITION SWITCHES

Locknetics	Sentrol	Sargent
679 Series	1076W	3287

20. FINISHES AND BASE MATERIALS: Unless otherwise indicated in the hardware groups or herein, hardware finishes shall be applied over base metals as specified in the following finish schedule:

HARDWARE ITEM	BHMA FINISH AND BASE MATERIAL
Butt Hinges: Exterior	630
Butt Hinges: Interior	652
Exit Devices	626
Locks and Latches	626
Closers	689
Protective Plates	630
Wall Stops and Holders	630
Thresholds	628 (AL)
Weather-strip, Sweeps Drips	AL
Miscellaneous	626

21. KEYING: Match Existing

21.1. Provide all locks and cylinders utilizing a patented keyway to prevent manufacturing and distribution of aftermarket key blanks by anyone other than factory authorized dealers.

21.2. Keying shall be by lock manufacturer where permanent records shall be kept.

21.3. Furnish a total of 2 keys per cylinder. Actual cut keys to be determined by Owner.

21.4. Master keys and control keys to be delivered by registered mail to the Owner. Change keys shall be delivered in a set up key cabinet. Construction keys shall be delivered to the Contractor.

21.5. Final keying requirements shall be coordinated by the Contractor with the Owner prior to material ordering.

22. EXAMINATION: Prior to installation of hardware, installer shall examine door frame installation to insure frames have been set square and plumb. Installer shall examine doors, door frames, and adjacent wall, floor, and ceiling for conditions, which would adversely effect proper operation and function of door assemblies. Do not proceed with hardware installation until such deficiencies have been corrected.

23. INSTALLATION: Before hardware installation, general Contractor/construction manager shall coordinate

a hardware installation seminar with a 1 week notice to all parties involved. The seminar is to be conducted on the installation of hardware, specifically of locksets, closers, exit devices, continuous hinges and overhead stops. Manufacturer's representative of the above products to present seminar. Seminar to be held at the job site and attended by installers of hardware (including low voltage hardware) for aluminum, hollow metal and wood doors. Training to include use of installation manuals, hardware schedule, templates and physical products samples.

23.1. Install all hardware in accordance with the approved hardware schedule and manufacturers instructions for installation and adjustment.

23.2. Set units level, plumb and true to the line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

23.3. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accord with industry standards.

23.4. Drill appropriate size pilot holes for all hardware attached to wood doors and frames.

23.5. Shim doors to maintain proper operating clearance between door and frame.

23.6. Unless otherwise specified, locate all hardware in accordance with the recommended locations for builders hardware for standard doors and frames as published by the Door and Hardware Institute.

23.7. Use only fasteners supplied by or approved by the manufacturer for each respective item of hardware.

23.8. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work.

23.9. Conceal push and pull bar fasteners where possible. Do not install through bolts through push plates.

23.10. Install hardware on UL labeled openings in accordance with manufacturer's requirements to maintain the label.

23.11. Install hardware in accordance with supplemental "S" label instructions on all fire rated openings.

23.12. Install wall stops to contact lever handles or pulls. Do not mount wall stops on casework, or equipment.

23.13. Where necessary, adjust doors and hardware to eliminate binding between strike and latchbolt. Doors should not rattle.

23.14. Install door closers on corridor side of lobby doors, room side of corridor doors, and stair side of stairways.

23.15. Adjust spring power of door closers to insure exterior and fire rated doors will consistently close and latch doors under existing conditions. Adjust all other door closers to insure opening force does not to exceed 5 lbs.

23.16. Adjust "sweep", "latch", & "back check" valves on all door closers to properly control door through out the opening and closing cycle. Adjust total closing speed to comply with all applicable state and local building codes.

23.17. Unless otherwise specified or detailed, install thresholds with the bevel in vertical alignment with the outside door face. Notch and closely fit thresholds to frame profile. Set thresholds in full bed of sealant.

23.18. Compress sweep during installation as recommended by sweep manufacturer to facilitate a water resistant seal.

23.19. Deliver to the Owner 1 complete set of installation and adjustment instructions, and tools as furnished with the hardware.

23.20. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

24. QUALITY ASSURANCE: After installation has been completed, the hardware supplier and manufacturers representative for locksets, door closers, exit devices, and overhead stops shall check the project and verify compliance with installation instructions, adjustment of all hardware items, and proper

application according to the approved hardware schedule. Hardware supplier shall submit a list of all hardware that has not been installed correctly. After installation has been completed, the hardware supplier and manufacturers representative shall meet with the Owner to explain the functions, uses, adjustment, and maintenance of each item of hardware. Apply self-adhesive gasketing on frame stop at head & latch side and on rabbet of frame at hinge side.

25. ADJUSTMENT AND CLEANING: At final completion, and when H.V.A.C. equipment is in operation, installer shall make final adjustments to and verify proper operation of all door closers and other items of hardware. Lubricate moving parts with type lubrication recommended by the manufacturer. All hardware shall be left clean and in good operation. Hardware found to be disfigured, defective, or inoperative shall be repaired or replaced.

Hardware Schedule – 08 71 01

(Spec): Reference component section above for information

Reference Door Schedule for required hardware rating

Group U01 – Unit Interior, Swing: Entry Doors

Qty.	Type	Manufacturer	Number	Finish
2 Ea.	Spring Hinge	Ives	3SP1	(Spec)
1 Ea.	Hinge	Ives	5BB1 (Top)	(Spec)
1 Ea.	Passage Set	Schlage	F75	(Spec)
1 Ea.	Sgl. Cyl. Deadbolt	Schlage	B60RF6	(Spec)
1 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)
2 Ea.	Wide Angle Viewer	Ives	U698	626
	Additional Viewer at	Accessible Units		

Group U02 – Unit Interior, Swing: Bedrooms & Bathrooms

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	w/ Pre-Hung Door	N/A	(Spec)
1 Ea.	Privacy Lockset	Schlage	F76	(Spec)
1 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)

Group U03 – Unit Interior, Swing, Double: Closet

Qty.	Type	Manufacturer	Number	Finish
6 Ea.	Hinge	w/ Pre-Hung Door	N/A	(Spec)
2 Ea.	Dummy Trim	Schlage	AL170	(Spec)
2 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)
2 Ea.	Top & Bot. Latch	Ives		(Spec)

Group U04 – Unit Interior, Swing: Closet

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Passage Set	Schlage	F75	(Spec)
1 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)

Group C01 – Common Interior, Swing: Office, Community Room, Laundry

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Classroom Lockset	Schlage	F84	(Spec)
1 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)

Group C02 – Common Interior, Swing: Utility, Storage

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Classroom Lockset	Schlage	F84	(Spec)
1 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)

Group C03 – Common Interior, Swing: Restrooms

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Corridor Lockset	Schlage	F90	(Spec)
1 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)

Group C04 – Common Interior, Swing: Closet

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Passage Set	Schlage	F75	(Spec)
1 Ea.	Door Stop (as req'd)	(Spec)	(Spec)	(Spec)

Group C05 – Common Interior, Swing, Exit: Vestibule C101

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Panic Hardware	Von Duprin	CD-99-NL-OP	(Spec)
2 Ea.	Interchange. Core	Schlage		Mfgr.
1 Ea.	90 Deg. Offset Pull	Ives	8190 10”	(Spec)
1 Ea.	Electric Strike			
1 Ea.	HD Overhead Stop	Gly	100S	(Spec)
1 Ea.	Surface Closer	Falcon	SC71 HD	(Spec)
1 Ea.	Kick Plate	Ives	8400	(Spec)
1 Ea.	Wall Stop	Ives	WS406	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)
1 Ea.	Wiring Diagram	Contractor		

FUNCTION: This door is intended to be tied into an accessible actuator system. Contractor to coordinate function with all hardware and verify the compatibility of all parts to provide desired function.

Group C06 – Common Interior, Swing, Exit: Vestibule C116, Lobby/Garage, Stair C205 & C305

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)

1 Ea.	Panic Hardware	Von Duprin	CD-99-NL-OP	(Spec)
2 Ea.	Interchange. Core	Schlage		Mfgr.
1 Ea.	90 Deg. Offset Pull	Ives	8190 10”	(Spec)
1 Ea.	HD Overhead Stop	Gly	100S	(Spec)
1 Ea.	Surface Closer	Falcon	SC71 HD	(Spec)
1 Ea.	Kick Plate	Ives	8400	(Spec)
1 Ea.	Wall Stop	Ives	WS406	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)

Group C07 – Common Interior, Swing, Double, Exit: Lobby/Stair

Qty.	Type	Manufacturer	Number	Finish
6 Ea.	Hinge	Ives	(Spec)	(Spec)
2 Ea.	Panic Hardware	Von Duprin	CD-99-NL-OP	(Spec)
4 Ea.	Interchange. Core	Schlage		Mfgr.
2 Ea.	90 Deg. Offset Pull	Ives	8190 10”	(Spec)
2 Ea.	HD Overhead Stop	Gly	100S	(Spec)
2 Ea.	Surface Closer	Falcon	SC71 HD	(Spec)
2 Ea.	Mag. Hold Open	LCN	SEM 7840	Mfgr.
2 Ea.	Kick Plate	Ives	8400	(Spec)
2 Ea.	Wall Stop	Ives	WS406	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)
1 Ea.	Smoke Gasket	Zero	188S	(Spec)
1 Ea.	Wiring Diagram	Contractor		

FUNCTION: This door is intended to be tied into magnetic locks holding the doors open. When a fire alarm is sounded, the doors shall close automatically. Contractor to coordinate function with all hardware and verify the compatibility of all parts to provide desired function.

Group C08 – Common Exterior, Swing, Exit: Vestibule C101

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Panic Hardware	Von Duprin	CD-99-NL-OP	(Spec)
2 Ea.	Interchange. Core	Schlage		Mfgr.
1 Ea.	90 Deg. Offset Pull	Ives	8190 10”	(Spec)
1 Ea.	HD Overhead Stop	Gly	100S	(Spec)
1 Ea.	Surface Closer	Falcon	SC71 HD	(Spec)
1 Ea.	Kick Plate	Ives	8400	(Spec)
1 Ea.	Wall Stop	Ives	WS406	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)
1 Ea.	Rain Drip	Zero	142	Mfgr.

WEATHERSEAL TO INCLUDE: Weatherstrip, Gasket, Edge Seal, Sweeps, Sweep Drip and Drip Cap by a single manufacturer as listed in WEATHERSTRIP, GASKETING above.
FUNCTION: This door is intended to be tied into an accessible actuator system. Contractor to coordinate function with all hardware and verify the compatibility of all parts to provide desired function.

Group C09 – Common Exterior, Swing, Exit: Vestibule C116, Community Room, Workroom

Qty.	Type	Manufacturer	Number	Finish

3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Panic Hardware	Von Duprin	CD-99-NL-OP	(Spec)
2 Ea.	Interchange. Core	Schlage		Mfgr.
1 Ea.	90 Deg. Offset Pull	Ives	8190 10”	(Spec)
1 Ea.	HD Overhead Stop	Gly	100S	(Spec)
1 Ea.	Surface Closer	Falcon	SC71 HD	(Spec)
1 Ea.	Kick Plate	Ives	8400	(Spec)
1 Ea.	Wall Stop	Ives	WS406	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)
1 Ea.	Rain Drip	Zero	142	Mfgr.

WEATHERSEAL TO INCLUDE: Weatherstrip, Gasket, Edge Seal, Sweeps, Sweep Drip and Drip Cap by a single manufacturer as listed in WEATHERSTRIP, GASKETING above.
FUNCTION: This door is intended to be a security door that will remain locked from the exterior at all times except when specifically unlocked by a controlled key. Contractor to coordinate function with all hardware and verify the compatibility of all parts to provide desired function.

Group C10 – Common Exterior, Swing, Double, Exit: Utility

Qty.	Type	Manufacturer	Number	Finish
6 Ea.	Hinge	Ives	(Spec)	(Spec)
2 Ea.	Panic Hardware	Von Duprin	CD-99-NL-OP	(Spec)
4 Ea.	Interchange. Core	Schlage		Mfgr.
2 Ea.	90 Deg. Offset Pull	Ives	8190 10”	(Spec)
2 Ea.	HD Overhead Stop	Gly	100S	(Spec)
2 Ea.	Surface Closer	Falcon	SC71 HD	(Spec)
2 Ea.	Kick Plate	Ives	8400	(Spec)
2 Ea.	Wall Stop	Ives	WS406	(Spec)
1 Ea.	Threshold	Profile as Req'd	(Spec)	(Spec)
1 Ea.	Rain Drip	Zero	142	Mfgr.

WEATHERSEAL TO INCLUDE: Weatherstrip, Gasket, Edge Seal, Sweeps, Sweep Drip and Drip Cap by a single manufacturer as listed in WEATHERSTRIP, GASKETING above.
FUNCTION: This door is intended to be a security door that will remain locked from the exterior at all times except when specifically unlocked by a controlled key. Contractor to coordinate function with all hardware and verify the compatibility of all parts to provide desired function.

Group C11 – Common Utility, Swing: Attic Draftstop

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge	Ives	(Spec)	(Spec)
1 Ea.	Passage Set	Schlage	F75	(Spec)
1 Ea.	Gasket	(Spec)	(Spec)	(Spec)

Group C12 – Common Utility, Fence Gate, Swing: Garage

Qty.	Type	Manufacturer	Number	Finish
3 Ea.	Hinge			Mfgr.
1 Ea.	Lockable Latch			Mfgr.
1 Ea.	Bottom Bolt & Sleeve			Mfgr.

GLAZING – 08 80 00

1. SCOPE OF WORK: Provide all glass materials as required in the contract documents.
   1.1. All glazing units to be insulated glass and compliant with Energy Star, the IECC, the HERS Rater's analysis.
   1.2. Insulated units to include High-performance LoE 366/Argon heat reflecting glass. Reference Section 08 53 13 for additional information.
2. MANUFACTURERS: Thermo-Tech or approved equal
3. SUBMITTALS: Provide 12"x12" sample of each type of glazing utilized in the project to the Architect for approval.
4. PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES
   4.1. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
      a) Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
      b) Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
      c) Glass thicknesses listed are minimum.
   4.2. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier. In conjunction with vapor retarder and joint sealer materials described in other sections.
   4.3. Thermal and Optical Performance: Provide glass products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
      a) Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 5.2/6.3 computer program.
      b) Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 5.2/6.3 computer program.
      c) Solar Optical Properties: Comply with NFRC 300 test method.
5. GLASS MATERIALS: Float Glass: Provide float glass based glazing unless noted otherwise.
   5.1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
   5.2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
   5.3. Tinted Type: ASTM C1036, Class 2 - Tinted , Quality-Q3, color and performance characteristics as indicated.
   5.4. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.
6. INSULATING GLASS UNITS: Certified by an independent testing agency to comply with ASTM E2190.
   6.1. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   6.2. Spacer Color: Black.
   6.3. Edge Seal Color: Black. Purge interpane space with dry air, hermetically sealed.
7. SAFETY GLASS: Furnish and install safety glass at all hazardous locations in accordance with IBC requirements for "Hazardous Locations" as follows:
   7.1. Glazing in fixed and swinging exterior doors (means of egress).

7.2. Glazing in fixed and sliding panels of sliding (patio) doors.

7.3. Glazing in storm doors.

7.4. Glazing in doors and enclosures for bathtubs and showers.

7.5. Glazing in fixed or operable panels or windows with an exposed area of an individual pane of 9 SF, bottom edge less than 18 inches above the floor, top edge greater than 36 inches above the floor, one or more walking surfaces within 36 inches horizontally of the glazing.

MIRRORS – 08 83 00

1. SCOPE OF WORK: Provide new mirrors in all common and unit bathrooms.
2. MANUFACTURER: Bobrick, type B-165
3. SUBMITTALS: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
4. MATERIALS:
   4.1. Mirror Glass - General: Select materials and/or provide supports to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.
   4.2. Mirror Glass: Clear float type with copper and silver coating, organic overcoating, frameless, 1/4" thick.
   4.3. Width: Full width of vanity in units and width of sink in common bathrooms. Minimum size to be 24” wide.
5. INSTALLATION: Install mirrors in accordance with GANA (TIPS) and manufacturers recommendations. Set mirrors plumb and level, and free of optical distortion. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

LOUVERS – 08 91 00

1. SCOPE OF WORK: Provide and install all new louvers as required in the contract documents. Verify size and location with the requirements of specific equipment and as scheduled in the drawings.
   1.1. All louvers shall operate as specified in the contract documents. Provide power as needed.
   1.2. Provide trim matching window trim around all exterior louvers.
2. SHOP DRAWINGS: Provide drawings and specifications for each louver to be provided. Provide location on exterior elevation drawings for coordination with architect.
3. LOUVERS: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.
4. SCREENS: Provide insect screens at intake louvers and bird screens at exhaust louvers. Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
5. STATIONARY LOUVERS: Horizontal blade, formed galvanized steel sheet construction, with intermediate mullions matching frame.
   5.1. Blades: Straight.
   5.2. Frame: 4 inches deep, channel profile; corner joints mitered and, with continuous recessed caulking channel each side.
   5.3. Steel Finish: Superior performing organic coatings, finished after fabrication.
6. OPERABLE LOUVERS: Operable horizontal blades, extruded aluminum construction.
   6.1. Movable Blades: Straight, pivoted at, with vinyl, rubber, or polyethylene blade edge and jamb seals; rattle-free linkage.
   6.2. Frame: 4 inches deep, channel profile; corner joints mitered and, with continuous recessed

caulking channel each side.

6.3. Aluminum Thickness: Frame 12 gage, 0.0808 inch minimum; blades 12 gage, 0.0808 inch minimum.

7. MATERIALS:

7.1. Extruded Aluminum: ASTM B221 (ASTM B221M)

7.2. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

8. FINISHES: Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.

9. SEALANT: Non-curing butyl type for Setting Sills and Sill Flashing.

10. INSTALLATION: Install louver assembly in accordance with manufacturer's instructions. Install louvers level and plumb. Align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior. Secure louver frames in openings with concealed fasteners.

11. ADJUSTING: Adjust operable louvers for freedom of movement of control mechanism. Lubricate operating joints.

12. CLEANING: Strip protective finish coverings. Clean surfaces and components.

13. SCHEDULES: Refer to contract documents for required size and location. Refer to equipment manufacturer's documentation for required size. If location is not provided in contract documents, Contractor is to coordinate with architect prior to providing rough opening.

DIVISION 09

GYPSUM BOARD ASSEMBLIES – 09 21 16

1. SCOPE OF WORK: Provide all new gypsum board on all new walls as required by the contract documents.

1.1. All gypsum board is to be a minimum of 5/8" thick

1.2. All gypsum board included as part of a fire rated assembly shall be fire rated units.

1.3. Jointing shall be reduced to a minimum; scrap pieces are not to be used to complete large sections but may be utilized in smaller areas.

1.4. Fasten all gypsum to structure as required in the contract documents.

2. MANUFACTURERS: USG Corporation, National Gypsum or Georgia-Pacific products only.

3. GYPSUM BOARD ASSEMBLIES: Provide completed assemblies complying with ASTM C840 and GA-216. Fire Rated Assemblies: Provide completed assemblies complying with applicable code.

4. BOARD MATERIALS: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut. Thickness: Vertical Surfaces at 1/2 inch. Ceilings at 5/8 inch.

5. BACKING BOARD FOR WET AREAS: For all surfaces behind tile in wet areas including tub and shower surrounds and ceilings; sizes to minimum joints in place; ends square cut. Mold resistance score of 10 when tested in accordance with ASTM D3273.

6. BOARD INSTALLATION: Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

6.1. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

6.2. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

6.3. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

6.4. Installation on Wood Framing: For rated assemblies, comply with requirements of listing

authority.

7. ACOUSTIC SEALANT: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
8. JOINT MATERIALS: ASTM C475 and as recommended by gypsum board manufacturer for project conditions. Tape: 2 inch wide, creased paper tape for joints and corners , except as otherwise indicated. Ready-mixed vinyl-based joint compound.
9. FASTENING: Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant. Screws shall penetrate not less than 5/8 inch. Screw types shall be applied as per the schedule below:
    - 9.1. Type W GWB to wood studs
    - 9.2. Type S GWB to cold formed steel
    - 9.3. Type G GWB to GWB
10. NAILS: Attachment to Wood Members ONLY: ASTM C514.
11. JOINT TREATMENT: Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
    - 11.1. All existing walls and ceilings required to be patched. Patchwork & repairs shall match existing finish and texture.
    - 11.2. Level 4 at all walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated. All joints and interior angles shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. All joint compound shall be smooth and free of tool marks and ridges. Note: It is recommended that the prepared surface be coated with a primer/sealer prior to the application of final finishes. See painting/wallcovering specification in this regard.
    - 11.3. Level 1 at Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction. All joints and interior angles shall have tape embedded in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

TILING – 09 30 00

1. SCOPE OF WORK: Provide and install tile as required by the contract documents and finish schedule.
2. MANUFACTURERS: All products by the same manufacturer. American Olean Corporation, or Dal-Tile Corporation.
3. SUBMITTALS: Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
4. QUALITY ASSURANCE: Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.
5. DELIVERY, STORAGE, AND HANDLING: Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.
6. FIELD CONDITIONS: Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.
7. PORCELAIN TILE: ANSI A137.1, standard grade. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373. Size: 3 by 6 inch, nominal. Thickness: 3/8 inch. Edges: Cushioned. Surface Finish: Unglazed. Color: To be selected by Architect from manufacturer's standard range. Trim Units: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field

tile.

8. ADHESIVE MATERIALS: Bostik Inc, Mapei Corporation or approved equal.
9. MORTAR MANUFACTURERS: Bostik Inc or approved equal
10. MORTAR BED MATERIALS: Portland cement, sand , latex additive and water.
11. MORTAR BOND COAT MATERIALS: Epoxy: ANSI A118.3. Furan: ANSI A118.5.
12. GROUTS Manufacturers: Bostik Inc. or approved equal Standard Grout: Any type specified in ANSI A118.6 or A118.7. Colors: To be selected by Architect from manufacturer's standard range.
13. MAINTENANCE MATERIALS
    - 13.1. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type. Applications: Between tile and plumbing fixtures. Color(s): As selected by Architect from manufacturer's full line.
    - 13.2. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout. Composition: Water-based colorless silicone.
14. BACKER BOARD: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
15. EXAMINATION: Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
16. PREPARATION: Protect surrounding work from damage. Vacuum clean surfaces and damp clean. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
17. INSTALLATION: Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
    - 17.1. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
    - 17.2. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
    - 17.3. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
    - 17.4. Form internal angles square and external angles bullnosed.
    - 17.5. Install thresholds where indicated.
    - 17.6. Sound tile after setting. Replace hollow sounding units.
    - 17.7. Keep control and expansion joints free of mortar, grout, and adhesive.
    - 17.8. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
    - 17.9. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
    - 17.10. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
18. INSTALLATION - SHOWERS AND BATHTUB WALLS: At bathtub walls install in accordance with TCNA (HB) Method B412, over cementitious backer units with waterproofing membrane. Grout with standard grout as specified above.
19. INSTALLATION - WALL TILE
    - 19.1. On exterior walls install in accordance with TCA Handbook Method W244, thin-set over

cementitious backer units, with waterproofing membraneW202, thin-set over concrete and masonry.

19.2. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244 , using membrane at toilet rooms.

19.3. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat , unless otherwise indicated. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.

20. CLEANING: Clean tile and grout surfaces.

SHOWER WATERPROOFING SYSTEM – 09 30 01

1. SCOPE OF WORK: Provide and install shower system at all tiled shower enclosures.
2. SECTION INCLUDES: Foam Tray, Waterproofing, Linear Drain, Square Drain, Accessories
3. ADMINISTRATIVE REQUIREMENTS: Coordinate installation of openings through floor slabs, partition locations, adjacent wall substrates, waterproofing, drain assembly, drain pipes, shower door (s) and finish surfaces. Coordinate Work with other operations, including framing locations with plumbing and other relevant trades. Coordinate installation of finish floor and adjacent wall finish materials per the architectural drawings and to avoid damage to installed materials.
4. SUBMITTALS: Product Data: For each type of shower system assembly. Indicate component materials, dimensions and application details including:
   4.1. Waterproofing membrane, waterproofing accessories, curbs or transitions, sealants and accessories.
   4.2. Preparation and treatment requirements for installation and bonding waterproofing to adjacent substrates, and finish material compatibility information.
   4.3. Include standard drawings illustrating manufacturer's written installation and finishing instructions applicable to Project, including details for assembly, coordinate with architect for finish material joints, accessories and plumbing fixture requirements.
   4.4. Illustrate shower assembly and how they interface with other work that forms part of the shower system.
   4.5. Where standard drawings do not address Project conditions, provide shop drawings prepared for Project to illustrate proposed construction.
5. DELIVERY, STORAGE, AND HANDLING: Store products in manufacturer's unopened packaging until ready for installation. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry. Store materials in a dry, warm, ventilated weather tight location. De-liver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Store USG Durock™ Brand Shower System and adjacent vertical substrates on elevated platforms, under cover, and in a dry location. Store liquid materials in unopened containers and protected from freezing.
6. INSTALLATION REQUIREMENTS: Floor must be level, if existing floor substrate is out of level, use a self-leveling underlayment prior to installation. Note poured underlayment must be fully cured for installation to proceed. Concrete must be fully cured. Install per manufacturer’s recommendations. Coordinate finish tile and pre-sloped shower floor dimensions prior to installation.
7. FIELD CONDITIONS: Environmental Limitations: Do not install setting mortar and finish materials until construction in spaces is complete and ambient temperature and humidity conditions are maintained at 40 degrees F.
8. WARRANTY: Reference product warranty at usg.com, literature piece CB653 for limitations regarding the 10 year product warranty. Installation should follow manufacturer’s written instructions & recommendations and not to invalidate the above referenced warranty.
   8.1. Adjacent vertical surfaces shall be code-approved wall and floor substrate suitable for wet areas,

board products contingent to system warranty are:

8.2. USG Durock® Brand Cement Board with EdgeGuard™ with USG Durock™ Brand Waterproofing Membrane.

8.3. USG Fiberock® Brand Tile Backerboard panels with USG Durock™ Brand Waterproofing Membrane.

8.4. USG Durock™ Brand Glass-Mat Tile Backerboard.

8.5. USG Durock™ Brand UltraLight Foam Tile Backerboard.

9. PREFABRICATED POINT DRAIN SHOWER TRAY UNDERLAYMENT: Pre-sloped high density EPS shower tray underlayment:

9.1. Basis of Design: USG Corporation, LLC, “USG Durock™ Brand Shower System”.

9.2. Classification: High Density EPS tray with integrated slope: IAPMO IGC 195-2013a and ASME A112.18.2-2011/CSA B125.2-11 and ANSI A118.10-2008.

9.3. Thickness: min depth 3/4” at drain, tray slopes up from there.

9.4. Square Drain Shower Floor Dimensions: As indicated in the drawings.

9.5. Drain Location: As illustrated in the drawings or if not indicated place off center

9.6. Point Drain Size: 4” square unless specifically indicated elsewhere

9.7. Install per manufacturer’s recommendations.

10. WATERPROOFING SYSTEMS: Composite waterproofing membrane that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer. Architect, designer and or specification writer shall verify tile, mortar and adhesive compatibility prior to specification.

10.1. Basis of Design: USG Corporation, LLC, “USG Durock™ Brand Waterproofing Membrane”.

10.2. Classification: Composite cross laminated HDPE waterproof membrane and vapor retarder. Thick-ness: 12 mil. Perm Rating (per ASTM E96): less than 0.075.

10.3. Wall and Floor application: Reference installation literature for USG Durock™ Brand Shower Sys-tem for complete wall and flooring installation requirements.

10.4. Apply tile-setting mortar (as specified in ANSI A118.1, A118.4, A118.11 or A118.15) to shower floor using 3/16 inch x 3/16 inch V-notched trowel or 1/8 inch x 1/8 inch square or U-notched trowel.

10.5. Embed USG Durock™ Brand Waterproofing Membrane into the mortar using a finishing trowel or drywall taping knife to remove air pockets and to ensure proper installation.

10.6. Overlap all adjoining sections of the membrane by a minimum of 2 inches using tile-setting mortar (as specified in ANSI A118.1, A118.4, A118.11 or A118.15). Alternatively, adjoining sections of USG Durock™ Brand Waterproofing Membrane can be abutted and then seamed with 5" wide USG Durock™ Brand Waterproofing Membrane Band.

11. WATERPROOFING ACCESSORIES

11.1. Prefabricated waterproof membrane corners

11.2. USG Durock™ Brand Shower System Waterproof Inside Corner 6” x 7”

11.3. USG Durock™ Brand Shower System Waterproof Outside Corner 6” x 7”

11.4. USG Durock™ Brand Waterproofing Membrane Band 5” x 50”

11.5. USG Durock™ Brand Shower System Waterproof Pipe Seal 8”

11.6. USG Durock™ Brand Shower System Waterproof Mixing Valve Seal 10”

12. SETTING MATERIALS: Use tile-setting mortar (as specified in ANSI A118.1, A118.4, A118.11 or A118.15) to set tiles.

13. DRAIN: USG Durock™ Brand Shower System (Square) Drain:

13.1. USG Durock™ Brand Shower System ABS Drain Bonding Flange

13.2. Drain Grate Pattern – USG Durock™ Brand Shower System Professional Series: 4 inch.

13.3. Drain Grate finish to match all other bath accessories.

13.4. For proper drain installation and location, reference installation guide for more information.

13.5. Maximum flow rate for drain: 7.0 gpm.

14. EXAMINATION: Coordinate shower floor and adjacent substrate tolerances, finishes, and installation methods specified in General Conditions with requirements in the ANSI A108 series of tile installation standards. Examine substrates, areas, and conditions where shower floor, stone and or tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
15. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
16. Verify that concrete substrates for tile floors installed with adhesives, bonded mortar bed or thinset mortar as best to comply with surface finish requirements in ANSI A108.01 for installations indicated.
17. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
18. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
19. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
20. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
21. Verify that all plumbing connections for drains and supply valves/mixers are properly located.
22. Proceed with installation only after unsatisfactory conditions have been corrected.
23. PREPARATION: Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
24. INSTALLATION: See corresponding USG product installation guides for complete installation instructions.

ACOUSTICAL CEILINGS – 09 51 00

1. SCOPE OF WORK: Provide & Install new suspended ceiling system with complete grid and tiles in common areas as described in the contract documents.
2. MANUFACTURERS:
   2.1. Acoustic Tiles/Panels: Armstrong World Industries, Inc; CertainTeed Corporation; USG; with
   2.2. Suspension Systems: Same as for acoustical units.
3. SECTION INCLUDES: Suspended metal grid ceiling system. Acoustical units.
4. SUBMITTALS: Product Data: Provide data on suspension system components. Samples: Submit two full size samples illustrating material and finish of acoustical units. Samples: Submit two samples each, 6 inches long, of suspension system main runner. Manufacturer's Installation Instructions: Indicate special procedures.
5. FIRE-RESISTIVE ASSEMBLIES: Complete assembly listed and classified by UL (FRD) for the fire resistance indicated.
6. SUSPENSION SYSTEM MANUFACTURER QUALIFICATIONS: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
7. ACOUSTICAL UNIT MANUFACTURER QUALIFICATIONS: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

8. ACOUSTICAL UNITS - GENERAL: ASTM E1264, Class A. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.
9. ACOUSTICAL PANELS: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics: VOC Content: Certified as Low Emission by one of the following : GreenGuard Children and Schools; Product listing in the CHPS High Performance Products Database; Size: 24 by 24 inches or 24 by 48 inches to fit into existing ceiling system. Thickness: 3/4 inches. Light Reflectance determined in accordance with ASTM E1264. NRC Range: 0.70, determined as specified in ASTM E1264. Ceiling Attenuation Class (CAC) determined in accordance with ASTM E1264. Edge: Reveal edge to fit box grid. Surface Color: White. Surface Pattern: Fine Textured.
10. SUSPENSION SYSTEMS - GENERAL: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty. Profile: Tee; 15/16 inch wide face or match existing; Construction: Double web.
11. ACCESSORIES: Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified. Perimeter Moldings: Same material and finish as grid. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
12. EXAMINATION: Verify existing conditions before starting work. Verify that layout of hangers will not interfere with other work.
13. INSTALLATION - SUSPENSION SYSTEM: Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently. Do not eccentrically load system or induce rotation of runners. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions. Use longest practical lengths. Overlap and rivet corners.
14. INSTALLATION - ACOUSTICAL UNITS: Install acoustical units in accordance with manufacturer's instructions. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function. Install units after above-ceiling work is complete. Install acoustical units level, in uniform plane, and free from twist, warp, and dents. Cutting Acoustical Units: Cut to fit irregular grid and perimeter edge trim. Make field cut edges of same profile as factory edges. Install hold-down clips on each panel to retain panels tight to grid system; comply with fire rating requirements.
15. TOLERANCES Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

RESILIENT FLOORING AND WALL BASE – 09 65 00

1. SCOPE OF WORK: Provide resilient flooring and wall base as described in the finish schedule. Unless specifically noted otherwise, at a minimum the contractor shall include an allowance to provide and install:
    1.1. Vinyl Wall Base along the full length of all interior walls.
    1.2. Vinyl Plank Tile in all bathrooms, laundry room, community room, kitchen.
    1.3. Vinyl composition tile in all common mechanical and storage.
2. SUBMITTALS: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

3. SELECTION SAMPLES: Submit manufacturer's complete set of color samples for Architect's initial selection.
4. SHEET VINYL: Solid vinyl with color and pattern throughout thickness, Comply with ASTM F1913, of Class corresponding to type specified. Size & Pattern as selected by Owner. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions. Lay flooring with joints and seams parallel to building lines. Heat weld seams.
    4.1. MANUFACTURER: Mannington Commercial, Congoleum or approved equal.
5. VINYL PLANK TILE: Solid vinyl with color and pattern throughout thickness, Comply with ASTM F1700, of Class corresponding to type specified. Size & Pattern as selected by Owner. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.
    5.1. MANUFACTURER: Mannington Commercial or approved equal.
6. VINYL COMPOSITION TILE: Homogeneous, with color extending throughout thickness. Comply with ASTM F1066, of Class corresponding to type specified. Size: 12 by 12 inch. Thickness: 0.125 inch. Color: To be selected by Architect from manufacturer's full range.
    6.1. MANUFACTURER: Armstrong World Industries, Inc, Johnsonite or approved equal.
7. RESILIENT BASE: ASTM F 1861, Type TV, vinyl, thermoplastic; top set Style B, Cove, roll good, Finish & Color as selected by Owner. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
    7.1. MANUFACTURER: Johnsonite
    7.2. Material shall be supplied in rolls; 4-foot sections shall not be used.
    7.3. Butt joints shall occur at inside corners or in hidden conditions to reduce the number of visible joints.
8. SUBFLOOR FILLER: White premix latex; type recommended by adhesive material manufacturer.
9. PRIMERS, ADHESIVES, AND SEAM SEALER: Waterproof; types recommended by flooring manufacturer.
10. MOLDINGS, TRANSITION AND EDGE STRIPS: Same material as flooring.
11. FILLER FOR COVED BASE: Plastic.
12. INSTALLATION: Install in accordance with manufacturer's written instructions. Spread only enough adhesive to permit installation of materials before initial set. Fit joints and butt seams tightly. Set flooring in place, press with heavy roller to attain full adhesion.

CARPETING – 09 68 00

1. SCOPE OF WORK: Provide and install all carpeting as required by the finish schedule. Unless specifically noted otherwise, at a minimum the contractor shall include an allowance to provide and install:
    1.1. Carpeting in all apartment units: living room, bedroom, closets, linen, any other area in apartments not receiving resilient flooring.
    1.2. Direct-Glued Carpeting on all common stairs and landings.
    1.3. ALTERNATE: Cushion under all carpeting in apartment units
2. SUBMITTALS: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation. Provide shop drawings illustrating locations of seams as well as tack-less strips, thresholds, and all other accessories locations and types
3. SAMPLES: Contractor to submit manufacturer's standard color and pattern to Owner for selection. Submit two samples 12 by 12 inch in size illustrating color and pattern for each carpet and cushion material selected by Owner.

4. FIELD CONDITIONS: Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation. Ventilate installation area during installation and for 72 hours after installation.
5. CUSHION: Provide cushion under all carpet installations. Cushion shall not be less than 1/2” thick with integral water repellent. If applicable, verify thickness of any immediately adjacent carpet cushion installations that are existing to remain abutting to new carpet and match thickness.
    5.1. Provide this as a separate line item with a unit cost if this scope is removed from the project
6. SUB-FLOOR FILLER: Type recommended by carpet manufacturer.
7. TACKLESS STRIP: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.
8. INSTALLATION – GENERAL: Lay out carpet and locate seams in accordance with shop drawings. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
9. STRETCHED-IN CARPET: Install tack-less strips with pins facing the wall around entire perimeter, except across door openings. Use edge strip where carpet terminates at other floor coverings. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and un-frayed. Apply seam adhesive to all cut edges immediately. Join seams by hand sewing. Form seams straight, not overlapped or peaked, and free of gaps. Following seaming, hook carpet onto tack-less strip at one edge, power stretch, and hook firmly at other edges. Follow manufacturer's recommendations for method and amount of stretch.
    9.1. MANUFACTURER: As listed in the finish schedule.
10. DIRECT-GLUED CARPET: Double cut carpet seams , with accurate pattern match. Make cuts straight, true, and un-frayed. Apply seam adhesive to cut edges of woven carpet immediately. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
    10.1. MANUFACTURER: As listed in the finish schedule.

TILE CARPETING – 09 68 13

1. SCOPE OF WORK: Provide and install all carpet tiles as required by the finish schedule. Unless specifically noted otherwise, at a minimum the contractor shall include an allowance to provide and install:
    1.1. Carpet Tile in all: meeting room, office, lounge, lobby, corridor, nurse office in all common areas not receiving resilient flooring
    1.2. Tile Entryway system: all vestibule.
2. SECTION INCLUDES: Carpet tile, fully adhered. Tile Entryway System. Removal of existing carpet tile.
3. CARPET TILE:
    3.1. MANUFACTURER: Mannington Commercial
    3.2. PHYSICAL CONSTRUCTION: Patterned Loop
        a) FACE FIBER: Invista Antron Legacy Type 6,6 Four Hole, Hollow Filament Nylon, with Permanent Stain and Bleach Protection, Static Control, and Duratech Soil Resistant Treatment, and a Fiber Modification Ratio of <1.5
        b) DYE METHOD: Yarn / Solution
        c) GAUGE: 5/64
        d) STITCHES PER INCH: 10.66
        e) PILE THICKNESS: .137 Inches
        f) TUFTED YARN WEIGHT: 22 Ounces Per Square Yard

g) DENSITY: Average Density =5,781; Weight Density = 127,182

h) PRIMARY BACKING: 100% Synthetic

i) SECONDARY BACKING: Infinity RE Modular Reinforced Composite Closed Cell Polymer with Recycled Content

j) STANDARD SIZE: 24" X 24" Modular Tiles

k) INSTALLATION METHOD: Vertical Ashlar

3.3. ENVIRONMENTAL:

a) RECYCLED CONTENT: Minimum 25% Total Recycled Content by Total Product Weight;

b) Minimum 10% Post-Consumer Recycled Content by Total Product Weight*

c) MANUFACTURE LOCATION: Calhoun, Georgia 30701 USA

d) NSF / ANSI-140 CERTIFICATION: Platinum

e) CRI GREEN LABEL PLUS ID: 3rd Party Certified Product Specific Type III EPD GLP7616

3.4. WARRANTIES:

a) WARRANTY: Lifetime Limited Warranty, Including Face Wear, Moisture Barrier, Delamination, Tuft Bind, Unraveling, and Static Protection

b) BLEACH RESISTANT WARRANTY: ColorSafe with 15 Year Limited Warranty Against Color Loss from Bleach Spills

c) STAIN RESISTANT WARRANTY: XGUARD with 15 Year Limited Warranty Against Staining

3.5. PRODUCT TESTING:

a) RADIANT PANEL (ASTM E-648): Class I (Direct Glue)

b) SMOKE CHAMBER (ASTM-E-662): Less than 450 (Flaming Mode)

c) METHENAMINE PILL TEST (ASTM D-2859): Passes

d) DIMENSIONAL STABILTY AACHEN TEST: Passes

e) ELECTROSTATIC PROPENSITY (AATCC 134): Less than 3.0 KV

3.6. RECOMMENDED ADHESIVE:

a) RELEASEABLE ADHESIVE: Mannington Infinity Pressure Sensitive Adhesive

b) CRI GREEN LABEL PLUS ID: GLP70522

c) VOC LIMITS: Meets SCAQMD Rule #1168

d) BOND WARRANTY: Lifetime Limited Warranty When Used With Mannington Carpet

4. TILE ENTRYWAY SYSTEM:

4.1. MANUFACTURER: Mannington Commercial

4.2. PHYSICAL CONSTRUCTION: Tip-Sheared Loop

a) FACE FIBER: Type 6,6 Nylon

b) DYE METHOD: Solution / Yarn

c) GAUGE: 5/32

d) STITCHES PER INCH: 9.0

e) PILE THICKNESS: .142 Inches

f) FINISHED YARN WEIGHT: 38 Ounces Per Square Yard

g) DENSITY: Average Density = 9,633; Weight Density = 366,084

h) PRIMARY BACKING: 100% Synthetic

i) PRIMARY PRECOAT: 100% Non-Aqueous Closed Cell Polymer, Providing Lifetime Warranty Against Stain Wick-Back

j) SECONDARY BACKING: Infinity RE Modular Reinforced Composite Closed Cell Polymer with Recycled Content

k) STANDARD SIZE: 24" X 24" Modular Tiles

l) INSTALLATION METHOD: Quarter Turned

4.3. ENVIRONMENTAL:

a) RECYCLED CONTENT: Minimum 25% Total Recycled Content by Total Product Weight; Minimum 10% Post-Consumer Recycled Content by Total Product Weight

b) MANUFACTURE LOCATION: Calhoun, Georgia 30701 USA

c) NSF / ANSI-140 CERTIFICATION: Platinum

d) CRI GREEN LABEL PLUS ID: GLP7616

e) 3rd Party Certified Product Specific Type III EPD

4.4. WARRANTIES:

a) WARRANTY: Lifetime Limited Warranty, Including Face Wear, Moisture Barrier, Wick-Back, Delamination, Tuft Bind, Unraveling, and Static Protection

b) BLEACH RESISTANT WARRANTY: ColorSafe with 15 Year Limited Warranty Against Color Loss from Bleach Spills

c) STAIN RESISTANT WARRANTY: XGUARD with 15 Year Limited Warranty Against Staining

4.5. PRODUCT TESTING:

a) RADIANT PANEL (ASTM E-648): Class I (Direct Glue)

b) SMOKE CHAMBER (ASTM E-662): Less than 450 (Flaming Mode)

c) METHENAMINE PILL TEST (ASTM D-2859): Passes

d) DIMENSIONAL STABILTY AACHEN TEST: Passes

e) ELECTROSTATIC PROPENSITY (AATCC 134): Less than 3.0 KV

4.6. RELEASEABLE ADHESIVE: Mannington Infinity Pressure Sensitive Adhesive

a) CRI GREEN LABEL PLUS ID: GLP70522

b) VOC LIMITS: Meets SCAQMD Rule #1168

c) BOND WARRANTY: Lifetime Limited Warranty When Used With Mannington Carpet

5. SUBMITTALS: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

6. SAMPLES: Submit two carpet tiles illustrating color and pattern design for each carpet color selected. Manufacturer's Installation Instructions: Indicate special procedures. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

7. QUALITY ASSURANCE: Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

8. FIELD CONDITIONS: Store materials in area of installation for minimum period of 24 hours prior to installation.

9. EXAMINATION: Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

10. PREPARATION: Remove existing carpet flooring. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured. Vacuum clean substrate.

11. INSTALLATION: Starting installation constitutes acceptance of sub-floor conditions. Install carpet tile in accordance with manufacturer's instructions. Blend carpet from different cartons to ensure minimal variation in color match. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines. Fully adhere carpet tile to substrate. Trim carpet tile neatly at walls and around interruptions. Complete installation of edge strips, concealing exposed edges.
12. CLEANING: Remove excess adhesive without damage, from floor, base, and wall surfaces. Clean and vacuum carpet surfaces.

ACOUSTICAL HOMASOTE – 09 80 00

1. SCOPE OF WORK: As an alternate to the base bid, provide and install homasote underlayment at all locations where poured concrete topping is used. Provide this as a separate add/deduct price to the base bid.
2. REFERENCES
   - 2.1. APA The Engineered Wood Association (APA): APA AFG-01 – Specification for field gluing subfloors.
   - 2.2. American Society for Testing and Materials (ASTM):
   - 2.3. ASTM C 209 - Test Methods for Cellulosic Fiber Insulating Board.
   - 2.4. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
   - 2.5. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
   - 2.6. UL listed, File R16381.
   - 2.7. Forest Stewardship Certification (FSC): CoC Cert no. 5682.
   - 2.8. ICC-ES Report ESR-1374.
3. SUBMITTALS: Product Data: Manufacturer's data sheets on each product to be used, including: Preparation instructions and recommendations. Storage and handling requirements and recommendations. Installation methods.
4. QUALITY ASSURANCE: Manufacturer Qualifications: Minimum 10 years experience in producing sound-deadening boards.
5. DELIVERY, STORAGE, AND HANDLING: Store products in manufacturer's unopened packaging with labels intact until ready for installation. Inspect the materials upon delivery to assure that specified products have been received. Report damaged material immediately to the delivering carrier and note such damage on the carrier's freight bill of lading. Store materials in a dry place, indoors, on raised platform protected from weather damage.
6. PROJECT CONDITIONS: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits. Climatize panels to existing moisture conditions and for not less than 24 hours before installation. Comply with manufacturer’s recommendations for acclimatization.
7. MANUFACTURERS: Homasote Company. Substitutions are not permitted.
8. MATERIALS: 440 SoundBarrier: Class C fire-rated. Molded, recycled post-consumer paper, cellulose fiber structural panel. Thickness: 1/2 inch (13 mm).
9. ACCESSORIES
   - 9.1. Adhesive: APA AFG-01 specification sub-floor adhesive.
   - 9.2. Floor Panel Fasteners:
     a) Nails, Wood Framing: annular thread type (ring shank) of length required to penetrate not less than 3/4 inch (19 mm) into subfloor.

b) Screws: Coarse thread drywall type wood screw of length required to penetrate not less than 3/4 inch (19 mm) into sub-floor.

9.3. Wall Panel Fasteners:

a) Nails, Wood Framing: Length required penetrating wood framing 3/4 inch (19 mm) minimum.

b) Screws:

- General: 20 gauge or heavier, self-tapping drywall type steel screw.
- Wood Framing: Coarse thread drywall type wood screw, length as required to penetrate framing 3/4 inch (19 mm) minimum.
- Metal Framing: 22-25 gauge, drywall type steel screw.

9.4. Drywall fastener for decoupled wall installation.

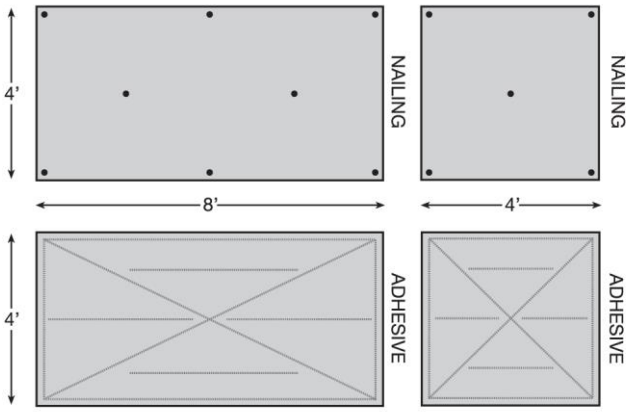
a) #10 drywall screw or laminating screw.

10. EXAMINATION: Examine substrates upon which work will be installed. Verify framing member spacing complies with manufacturer's requirements depending on substrates and installation methods. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding. Verify what environmental conditions are, and will continue to be maintained in accordance with manufacturer's recommendations. Starting work by installer is acceptance of substrate and environmental conditions.

11. PREPARATION: Follow manufacturer's instructions by separating and allowing panels to be exposed to environmental temperature and humidity conditions for not less than 24 hours before start of installation.

12. INSTALLATION: Install in accordance with manufacturer's instructions. Install only clean dry panels. Do not install wet panels.

12.1. Floor Panel Installation: Space panel joints 3/16 inch (5 mm) apart; 3/8 inch (10 mm) space at walls and partitions. Stagger joints.



12.2. Wall Panel Installation: Space panel joints 1/8 inch (3 mm) apart; 1/4 inch (6 mm) space at floors, ceilings, and window and door frames. Install gypsum wallboard or other wall finish panels so that finish panel joints are staggered and do not coincide with sound barrier panel joints. Install in accordance with finish panel manufacturer's installation recommendations.

13. PROTECTION: Protect installed products until completion of project. Touch-up, repair, or replace damaged products before Substantial Completion.

14. CLEANING: Comply with manufacturer's recommendations for repairing damaged panels. Replace panels that cannot be repaired.

PAINTING AND COATING – 09 90 00

1. SCOPE OF WORK: Interior and Exterior: All unfinished surfaces to receive a full, warrantied, primer and

paint system, unless specifically excluded in the contract documents.

2. LOCATION: Where areas are identified to be finished: Finish all interior and exterior surfaces exposed to view with minimum 1-coat of primer and 2-coats of finish paint, unless fully factory-finished and unless specifically otherwise indicated.
   2.1. Do Not Paint or Finish the Following Items:
      a) Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
      b) Items indicated to receive other finishes.
      c) Items indicated to remain unfinished.
      d) Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
      e) Floors, unless specifically so indicated.
      f) Glass.
      g) Concealed pipes, ducts, and conduits.
3. SUBMIT SAMPLES: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified. Where sheen is specified, submit samples in only that sheen.
4. MANUFACTURERS: Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions: Sherwin Williams unless listed otherwise in the Finish Schedule.
5. MOCK-UP:
6. PAINTS AND COATINGS – GENERAL: Ready mixed, unless intended to be a field-catalyzed coating. Supply each coating material in quantity required to complete entire project's work from a single production run. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions. Provide coatings that comply with the most stringent requirements specified in the following:
   6.1. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   6.2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
7. PAINT SYSTEMS - EXTERIOR
   7.1. Paint WE-OP-3L - Wood, Opaque, Latex, 3 Coat:
      a) One coat of latex primer
      b) 2 Coat: B20WJ8651 - Solo Satin VOC 100% Acylic Int/Ext Block resistant enamel
   7.2. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
      a) One coat of alkyd primer
      b) 2 Coat: B66W00651 - Pro Industrial 0 VOC Acrylic Semi-Gloss
8. PAINT SYSTEMS - INTERIOR
   8.1. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
      a) One coat of latex primer sealer.
      b) Eggshell: Two coats of latex enamel .
   8.2. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain:
      a) Filler coat (for open grained wood only).
      b) Two coats of stain .

c) One coat sealer .

8.3. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:

a) One coat of block filler.

b) Satin: Two coats of latex enamel .

8.4. Paint MI-OP-2L - Ferrous Metals, Primed, Latex, 2 Coat:

a) Touch-up with latex primer.

b) Semi-gloss: Two coats of latex enamel .

8.5. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:

a) One coat of latex primer sealer.

b) Eggshell: Two coats of latex enamel

8.6. Steel Handrail:

a) Prime Coat: B66W00310 - Pro Industrial Pro-Cryl Universal Primer Off White.

b) Top Coat: B66T00354 - Sher-Cryl HPA High Performance Acrylic Semi-Gloss Coating Ultradeep/Clear Tint Base.

9. PREPARATION: Clean surfaces thoroughly and correct defects prior to coating application. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

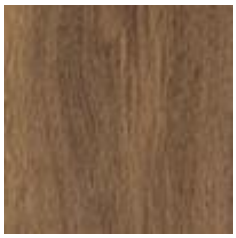
9.1. Tape, spackle, sand smooth and clean all gypsum board joints.

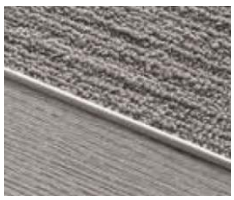
10. APPLICATION: Apply products in accordance with manufacturer's instructions. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

11. FINAL UNIT FINISH SELECTION: Finishes listed below shall be approved by the Client prior to installation. Mock-up to be approved prior to full installation.

FINISH SCHEDULE – 09 90 05		
ID CODE	**DESCRIPTION**	**LOCATION**
	INTERIOR FINISHES	
P1	Product: Paint Mfg: Sherwin Williams Color: SW7043 Worldly Gray Finish: P1A: Eggshell (Walls)	Unit walls
P2	Product: Paint Mfg: Sherwin Williams Color: SW7030 Anew Gray Finish: Eggshell	Field Color - All common area walls unless otherwise specified.
P3	Product: Paint Mfg: Sherwin Williams Color: SW7018 Dovetail Finish: Eggshell	Accent Color (See finish floor plan for locations)
P4	Product: Paint Mfg: Sherwin Williams Color: SW6235 Foggy Day Finish: Eggshell	Accent Color (See finish floor plan for locations)
P5	Product: Paint Mfg: Sherwin Williams Color: SW9186 Caramelized Finish: Eggshell	Accent Color (See finish floor plan for locations)
P6	Product: Paint Mfg: Sherwin Williams Color: SW7570 Egret White Finish: Satin Enamel	Painted trim & casing
P7	Product: Paint Mfg: Sherwin Williams Color: SW7006 Extra White Finish: Flat (Ceilings) Eggshell (Walls)	All ceilings Maintenance Mechanical

WT 	Wall & Ceiling Texture: Knock Down Knock Down Procedure: Apply as spatter as described except use material at heavy latex-paint consistency. After spattering surface, wait about 10-15 min., then very lightly flatten only tops of spatters with flat blade or flat hand trowel. Size of spatters depends on pressures used. Application: Spray Equipment: Pole gun, hopper, or Binks 7D, Binks 7E2 gun or equivalent Sample: Provide a 2' x 2' sample for approval prior to starting any work.	
C1 	Product: Carpet Broadloom Mfg: Shaw Contract Collection: Quiet Canvas Style: Sentiment 60775 Color: Emotion 00753 Contact: Nora Lewandowski (612) 865-1818 nora.lewandowski@shawinc.com	Unit Bedrooms & bedroom closets.
C2 	Product: Carpet Tile Mfg: Shaw Contract Collection: Bright Work Style: Allure 59327 Color: Gloss 27761 Contact: Nora Lewandowski (612) 865-1818 nora.lewandowski@shawinc.com	Corridors
C3 	Product: Carpet Tile Mfg: Shaw Contract Collection: Space Worx Style: Primary Tile 5T123 Color: Slate 17760 Contact: Nora Lewandowski (612) 865-1818 nora.lewandowski@shawinc.com	Community Room, Office
C4 	Product: Carpet Tile Mfg: Shaw Contract Style: TruColours Tile 59368 Color: Slate 68481 Contact: Nora Lewandowski (612) 865-1818 nora.lewandowski@shawinc.com	Corridor accent at unit entries

C5 	Product: Carpet Tile Mfg: Shaw Contract Collection: All Access Style: Path Tile 5T034 Color: Ebony 34500 Contact: Nora Lewandowski (612) 865-1818 nora.lewandowski@shawinc.com	Vestibules
LVT1 	Product: Luxury Vinyl Plank – Glue Down Mfg: Shaw Contract Collection: Terrain II Style: Terrain II 12 Mil 0453V Alternate: Terrain II 20 Mil 0454V Color: Pirch 00684 Plank Size: 6" x 48" x 2.5mm Wear Layer: 12 Mil. / Alt: 20mil Contact: Nora Lewandowski (612) 865-1818 nora.lewandowski@shawinc.com	Unit all rooms except bedrooms and bedroom closets
LVT2 	Product: Luxury Vinyl Plank – Glue Down Mfg: Shaw Contract Collection: Terrain II Style: Terrain II 20 Mil 0454V Color: Aspen 05019 Plank Size: 6" x 48" x 2.5mm Wear Layer: 20mil Contact: Nora Lewandowski (612) 865-1818 nora.lewandowski@shawinc.com	Common areas – Lobby, Community Room, Nurse
SV1 	Product: Sheet Vinyl Mfg: Mannington Commercial Collection: Paradigm CStyle: Streamline Color: Foundation PAR203	Laundry Room
VB1 	Product: Vinyl Wall Base Mfg: Johnsonite Style: 4" Traditional Cove Color: Zephyr #31	Unit wall base – exception bedrooms & bedroom closet Laundry Room
VB2 	Product: Vinyl Wall Base Mfg: Johnsonite Style: 4" Traditional Cove Color: Burnt Umber #63	Wall base for - aintenance - echanical

RT1 	Product: Rubber Stair Treads with integrated Riser + Stair Landings Mfg: Johnsonite Texture: Bamboo Color: Burnt Umber #63	Stair treads, risers & stair landings
VT1 	Product: Vinyl Floor Transition Mfg: Tandus Collection: Tandus/Metal Edge Collection Color: TBD Item: Transition Strip Size: ME002	Floor transition between LVT & Carpet where that condition exists.
T1 	Product: Porcelain Filed Tile Mfg: Daltile Collection: Timber Glen Color: Thatch Size: 12" x 24" Grout: Mapei – Pewter #02	Women's & Men's Restroom – Floor + Hall at drinking fountains.
T2 	Product: Porcelain Wall Tile Mfg: Daltile Collection: Modern Dimensions Color: Matte Artic White Size: 4" x 8" Grout: Mapei – Pewter #02	Women's & Men's Restrooms – Wall Tile
T3 	Product: Porcelain Wall Tile Mfg: American Olean Collection: Strategies Mosaics Color: Metal Method ST73 Size: 13" x 13" Sheet Grout: Mapei – Pewter #02	Community Room Kitchenette Backsplash
T4 	Product: Porcelain Wall Tile Mfg: Daltile Collection: Modern Dimensions Color: Artic White – Semi Gloss Size: 4" x 4" Grout: Mapei – White	Unit #02 – Roll-In Shower Walls

MT1 	Product: Metal Trim Mfg: Schluter Systems Item: Dilex Finish: Brushed Nickel Anodized Aluminum	Women's & Men's Restroom – Cove between walls & floor
MT2 	Product: Metal Trim Mfg: Schluter Systems Item: Rondec Finish: Brushed Nickel Anodized Aluminum	Women's & Men's Restroom –Trim to be used at exposed wall tile edges. – Edges where tile meets painted gyp. bd.
MT3 	Product: Metal Transition Mfg: Schluter Systems Item: Schiene Finish: Brushed Nickel Anodized Aluminum	Edge protection between carpet and tile in all areas where that condition exists.
SC1	Product: Sealed Concrete	Utility/Maintenance/ Mechanical Rooms
PL1 	Product: Plastic Laminate Mfg: Wilsonart Color: Sierra Cascade 5005 Finish: 38 Fine Velvet Texture (Standard)	Unit Kitchen countertops
PL2 	Product: Plastic Laminate Mfg: Formica Color: Mineral Spa 6920 Finish: Matte 58	Laundry Room folding table
PL3	Product: Plastic Laminate Mfg: Formica Color: Finish: Matte 58	Restroom Vanity valance & protection panels.

SS1 	Product: Quartz Mfg.: Silestone Color: Marengo Edge Style: Eased Edge	Community Room Kitchenette Countertop
SS2 	Product: Quartz Mfg.: Silestone Color: Blanco Maple Edge Style: Eased Edge Bowl Color: White	Women's & Men's Restroom – Vanity Tops
CM1 	Product: Cultured Marble Mfg.: Central Marble Products, Inc. Color: Pure White (145) Edge Style: Eased Edge Integral Bowl: Same Color Finish: Gloss	Unit Bathroom vanity tops
CM2 	Product: Cultured Marble Mfg.: Central Marble Products, Inc. Style: Pure White (145) Edge Style: Eased Edge Finish: Matte	Window Sills
WB1	Product: Wood Base & Door Trim Mfg: TBD Profile: Square Color: Color to closely match Doors & LVT1 **Submit samples for architect/designer approval.**	Unit Bedroom wall base and door trim
WB2 	Product: Wood Base & Trim Mfg: TBD Profile: Square Wood: Poplar 4" Color: Primed & Painted P6	Common area wall base & unit entry trim
CAB1 	Product: Cabinets Mfg.: Smart Cabinetry Style: Squire (Shaker, Standard Overlay) Wood: Maple Finish: Pecan (Or approved equal by Architect/Designer)	Unit kitchen cabinets and bathroom vanities

CAB2 	Product: Cabinets Mfg.: Smart Cabinetry Style: Rockport (Flat, Standard Overlay) Wood: Maple Finish: Coffee (Or approved equal by Architect/Designer)	Community Room Kitchen Cabinets
HW1 (or approved equal)	Product: Hardware – Cabinet 96mm Pull Manufacturer: Jamison Collection by Charles McMurray Model: J444-SN Finish: Satin Nickel CTC: 3.75" Length: 4.25"	Unit & Common areas cabinet doors & drawers
BL1	Product: Window Blinds Manufacturer: SWF contract Style: 2" Composite Color: TBD from color selection submittals	
DR1	Product: Prefinished Interior Doors Note: GC to submit physical color samples for color selection & approval. - Color/Finish to be close in color to CAB1	Common area & unit doors
MF1	Product: Prefinished Metal Door Frames Note: GC to submit physical color samples for color selection & approval. - Color to be close to P7.	Common area & unit entry door frames

DIVISION 10

SIGNAGE – 10 14 00

1. SCOPE OF WORK: Provide and install all new signage as required in the contract documents including at a minimum:
   1.1. Exterior signage: Directional traffic signage, min. 3 locations; at each Accessible Parking Stall and Accessible Access Aisle; at the trash enclosure; at each visitor parking stall, at community room door, at storage room door, at rear exit door.
   1.2. Interior signage: As described in each sign type listed below and as illustrated in the contract documents.
   1.3. Building numbers: Metal letters located on front of building; location as indicated in contract drawings.

2. MANUFACTURERS: Teems, Inc., Sign Source, Designer Sign Systems or approved equal.
3. ACCESSIBILITY COMPLIANCE: Signs are required to comply with accessible standards indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
4. ROOM AND DOOR SIGNS: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
    4.1. Sign Type: Flat signs with engraved panel media as specified.
    4.2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
    4.3. Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.
5. LUMINOUS EGRESS PATH MARKING AND OTHER "GLOW-IN-THE-DARK" SIGNS: Photoluminescent media.
    5.1. Provide luminous egress path marking as required by local authority having jurisdiction.
    5.2. Allow for total of 50 directional signs, approximately 14 inches square.
6. EMERGENCY EVACUATION MAPS: Allow for one map per elevator lobby and stair landing. Map content to be provided by Owner. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.
7. UNIT IDENTIFICATION SIGNS: Use individual metal letters. Mount on outside wall adjacent to unit entry door in ADA compliant location. Provide mounting blocks.
8. COMMON ROOM IDENTIFICATION SIGNS: Use individual metal letters. Mount on outside wall adjacent to room entry door in ADA compliant location. Provide mounting blocks.
9. ENGRAVED PANELS: Laminated colored plastic; engraved through face to expose core as background color: Total Thickness: 1/16 inch. Base bid for signage package on all unit and room identification interior signs.
10. SILK SCREENED PLASTIC PANELS: Letters and graphics silk screened onto reverse side of plastic surface: Sign Color: Clear. Total Thickness: 1/8 inch. Provide alternate pricing for all unit and room identification interior signage.
11. BUILDING IDENTIFICATION METAL LETTERS: Mounting: Concealed screws.
12. CONCEALED SCREWS: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
13. EXPOSED SCREWS: Chrome plated.
14. TAPE ADHESIVE: Double sided tape, permanent adhesive. Do not use tape adhesive unless specifically approved by architect and owner.
15. EXAMINATION: Verify that substrate surfaces are ready to receive work.
16. INSTALLATION: Install in accordance with manufacturer's instructions. Install neatly, with horizontal edges level. Locate signs and mount at heights indicated in accordance with ADA Standards and ICC A117.1. Locate signs as required by Owner. Protect from damage and repair or replace damaged items.

TOILET, BATH AND LAUNDRY ACCESSORIES – 10 28 00

1. SCOPE OF WORK: Provide and install all new accessories as described in the contract documents. As a minimum the contractor should include one set of the items listed below for each room:
    1.1. Unit Bathroom: Toilet paper dispenser, two towel bars, hat and coat hook, mirror, medicine cabinet, horizontal and vertical grab bar, cabinet base protective tray and accessible tub surround. Provide roll-in shower in Unit #2.
    1.2. Unit Kitchen: Cabinet base protective tray.
    1.3. Common Bathroom: Toilet paper dispenser, hat and coat hook, mirror, horizontal and vertical grab bar, sanitary napkin disposal, soap dispenser, combination waste/paper towel dispenser, and toilet seat cover dispenser.
    1.4. Common Kitchen: Soap dispenser, cabinet base protective tray, and ten hat and coat hooks.

2. TOILET ROOM ACCESSORIES (provided and installed by Contractor): Provide blocking behind all accessories as indicated by the manufacturer's instruction.

2.1. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel. Model B-76857 manufactured by Bobrick.

2.2. Towel Bar: Satin-finish stainless steel, 18-gauge, 1" dia. bar with snap-flange mounting. With stands 900 lbs downward pull when properly installed. 24" length; verify location and appropriate length in field. Model B-530 manufactured by Bobrick.

2.3. Hat and Coat Hook: (Option to be installed adjacent to entry door) Satin finish stainless steel. Flange is 2" x 2". Hook 1" W, 6 1⁄2" H; projects 3 1⁄16" from wall. Concealed wall plate. Model B6827 manufactured by Bobrick.

2.4. Mirrors: Supplied and installed in size per Section 08 83 00.

2.5. Toilet Seat Cover Dispenser: Surface mounted. Model B-221 manufactured by Bobrick

2.6. Combination Paper Towel Dispenser/Waste Receptacle: Convertible Recessed. Model B-3944 manufactured by Bobrick

2.7. Soap Dispenser: Surface mounted. Model B-2111 manufactured by Bobrick

2.8. Sanitary Napkin Disposal: Surface mounted. Model B270 manufactured by Bobrick

2.9. Medicine Cabinet: Recessed. Model B-397 manufactured by Bobrick.

2.10. Grab Bars: Stainless steel, 1-1/4 inches outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar. Length and configuration shall be as indicated on drawings.

a) Horizontal: Model B-68137 (or equivalent two-bar system) manufactured by Bobrick.

b) Vertical: Model B-6806 manufactured by Bobrick.

2.11. Accessible Tub Surround: Modular design, Durable high gloss finish, Smooth walls with integrated shelves, In-tub removable seat mounts directly to the back of the bath, To include all ADA required 1-1/2" OD stainless steel grab bars, 17-1/4" bath depth, 60"x30"x74-1/4"complete unit finished dimensions. Model Accord #71240115 as manufactured by Sterling / Kohler.

2.12. Roll-In Shower: Full height tile on three sides and floor in the dimensions as illustrated on the contract documents and meet ADA clearance requirements. Slope floor to center drain with maximum 2% in all directions. Provide and install full width compressible threshold, heavy duty shower rod, adjustable shower head, ADA compliant controls within accessible reach zone and folding shower seat. Provide and install two-wall horizontal grab bar and vertical grab bar mounted as per ANSI A117.1, reference Grab bars above.

a) Threshold: Extruded mill finish aluminum with compressible neoprene gasket and end caps, roll over threshold for full width of shower; model number WASTxx by Gordon Glass Co.

b) Tile: Semi-gloss 4x4 Daltile, Color: Artic White 0190(1), include bullnose edge from floor to ceiling, include cove base on three sides.

c) Shower seat: Model B-5181 as manufactured by Bobrick; mount at accessible compliant height.

3. KITCHEN SINK & VANITY BASE ACCESSORIES: All kitchen sink and vanity base cabinets shall receive a protective tray by Slide N' Fit by Driptite. Installation shall include:

3.1. Slide in place

3.2. Remove seal on water proof tape at mid-point and seal 2 halves together

3.3. Set leading edge in silicone sealant

3.4. Seal 3 remaining sides with silicone sealant

4. SUBMITTALS: Submit data on accessories describing size, finish, details of function, and attachment methods.

5. MATERIALS Shop assembled, free of dents and scratches and packaged complete with anchors and

fittings, steel anchor plates, adapters, and anchor components for installation. Stainless Steel Sheet shall be ASTM A666 , Type 304.

6. FINISHES: Stainless Steel No. 4 Brushed finish , unless otherwise noted. Chrome/Nickel Plating: ASTM B456 , SC 2, satin finish , unless otherwise noted.
7. EXAMINATION: Verify existing conditions before starting work. Verify exact location of accessories for installation.
8. INSTALLATION: Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings. Install plumb and level, securely and rigidly anchored to studs or blocking. Mounting Heights shall be as required by accessibility regulations, unless specifically otherwise indicated.

MANUFACTURED FIREPLACES – 10 31 00

1. SCOPE OF WORK: Provide and install manufactured steel box gas fireplace with sealed combustion chamber and all required Insulated chimney flue and associated roof flashings.
2. MANUFACTURERS: Heat & Glo, Model number: 6000C Gas Fireplace:
   - 2.1. Controls: IntelliFire Plus RC100. Wall mount switch. Locate as directed by owner.
   - 2.2. Fronts-Doors: Graphite Arcadia Front.
   - 2.3. Refractory: Stratford Brick.
   - 2.4. Mantel Shelf: 48 inches, Gifford Shelf, Unfinished Maple
   - 2.5. Size: Unit Front Width: 41 inches. Framing Front Width: 42 inches. Unit Back Width: 28-1/2 inches. Framing Back Width: 42 inches. Unit Height: 39-7/8 inches. Framing Height: 40-1/8 inches. Unit Depth: 21 inches. Framing Depth: 22 inches. Glass Size: 32 inches x 21-1/2 inches.
   - 2.6. BTU/Hour Input: 30,000 (8.8 kW).
   - 2.7. Efficiency: Steady State 78.5%, AFUE 61.1%, Canada EnerGuide 63%
   - 2.8. Termination Cap: High-Rise Termination through chimney to above roof line.
3. REFERENCE STANDARDS: UL (DIR) - Online Certifications Directory; current listings at database.ul.com. UL 127 - Standard for Factory-Built Fireplaces; Current Edition, Including All Revisions.
4. DESIGN REQUIREMENTS: Fuel: Natural gas as specified elsewhere is the contract documents.
5. SUBMITTALS: Product Data: Provide fire box cabinet dimensions, clearances required from adjacent dissimilar construction, applicable regulatory agency approvals, electrical characteristics of fan. Manufacturer's Instructions: Indicate installation procedures and component installation sequence, clearances and tolerances from adjacent construction.
6. Shop Drawings: Indicate fire box rough opening dimensions, rough opening sizes for chimney flue, and fan size.
7. REGULATORY REQUIREMENTS: Conform to applicable code for clearances from adjacent materials, chimney height above roof line requirements, and unit UL approval. Listed by Underwriters Laboratories Inc. (UL) as complying with UL 127. Products Requiring Electrical Connection: Listed and labeled by UL (DIR) or testing firm acceptable to authorities having jurisdiction, as suitable for the purpose specified and indicated.
8. COMPONENTS: Fire Box: Formed insulated steel cabinet, rectangular shaped interior, configured to include chimney outlet and cleanout, refractory brick lining. Combustion Air Source: Ducted air with screened grilles and ducts. Exposed Cladding: Prepainted steel.
9. VERIFICATION OF CONDITIONS: Verify that prepared openings are ready to receive work and opening dimensions are as indicated on drawings.
10. INSTALLATION: Install unit assembly in accordance with manufacturer's instructions.

FIRE PROTECTION SPECIALTIES– 10 44 00

1. SCOPE OF WORK: Provide and install new fire extinguishers fire extinguisher cabinets and accessories as illustrated in the contract documents and as directed by the local code official.
   1.1. Contractor to include allowance for eight extinguishers and extinguisher cabinets as part of the base bid.
   1.2. Provide unit pricing for extinguisher and extinguisher cabinet.
2. SECTION INCLUDES: Fire extinguishers. Fire extinguisher cabinets. Accessories.
3. SUBMITTALS: Provide extinguisher operational features.
4. SHOP DRAWINGS: Indicate locations of cabinets and cabinet physical dimensions.
5. MANUFACTURERS:
   5.1. Fire Extinguishers: Ansul, a Tyco Business; Pyro-Chem or JL Industries, Inc
   5.2. Fire Extinguisher Cabinets and Accessories: Produced by the same manufacturer as extigusher.
6. FIRE EXTINGUISHERS: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   6.1. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
   6.2. Class: A:B:C type.
   6.3. Finish: Baked polyester powder coat, red color.
7. FIRE EXTINGUISHER CABINETS:
   7.1. Metal: Formed primed steel sheet; 0.036 inch thick base metal.
   7.2. Cabinet Configuration: Recessed type.
   7.3. Size to accommodate accessories.
   7.4. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.
   7.5. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
   7.6. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
   7.7. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.
   7.8. Finish of Cabinet Interior: White colored enamel.
8. EXTINGUISHER BRACKETS: Formed steel, chrome-plated.
9. EXAMINATION: Verify existing conditions before starting work. Verify rough openings for cabinet are correctly sized and located.
10. INSTALLATION: Install in accordance with manufacturer's instructions. Install cabinets plumb and level in wall openings. Secure rigidly in place. Place extinguishers in cabinets. Provide testing & inspection tags to all extinguishers when placed for operation.

MAIL BOXES – 10 55 23

1. SCOPE OF WORK: Provide two mailbox units in vestibule as illustrated in the contract documents
   1.1. Coordinate all numbering with postal service and owner prior to ordering.
2. PRODUCTS: Model numbers based on Salsbury Industries products.
   2.1. Rent Drop: Model 2255; provide alternate pricing to provide required installation, framing and finish work
   2.2. Recessed Box Units, Mailbox/Parcel - Model 3711D-15 and Model 3711D-09
3. ACCESSIBILITY: All new post office boxes shall be ADA compliant unless specifically noted otherwise in

the Contract Documents. Locate all accessible mailboxes within accessible reach range between 15” and 48” above finish floor.

1. LOCAL POST MASTER: The Contractor shall coordinate new post office boxes with the local postmaster for location, access, keying, numbering, etc. prior to purchase of new post office boxes.
2. SUBMITTALS: Provide data for components, Manufacturer's Instructions: Include installation procedures, special considerations, and maintenance information. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Boxes to be provided for all Units along with General Delivery and any other specific Owner requirements.
3. SHOP DRAWINGS: Indicate locations, construction and anchorage details, dimensions, rough-in openings sizes, quantity and arrangement of box sizes. Contractor to supply fully detailed drawings for approval by Owner and Architect prior to order and/ or fabrication.
4. U.S. POSTAL SERVICE: Comply with U.S. Postal Service "F" & "4C" Specifications for specific models listed above.
5. COMPONENTS: Front Loading Panel Frame with Aluminum with mill finish with Edges beveled, piano hinged jamb, prepared for Post Office lock cylinder. Box Door with Aluminum with mill finish.
6. BOX CONSTRUCTION: Sheet steel, zinc coated, 22 gauge thick, fabricated into modular stackable units, baked enamel flat black finish. Pre-punch bolt holes in box for stack bolting to each other and anchoring to adjacent construction; label plates for identifying each box.
7. POSTAL BOX LOCKS: USPS standard, two keys per box.
8. "OUT-GOING MAIL" LOCK BOX: Face plate to match front loading panel frame, box of galvanized steel construction , lockable with cylinder provided by Post Office , with bag hooks for rear unloading.
9. BOX INDENTIFICATION: Custom engraved door - color filled lettering to be selected by Owner.
10. INSTALLATION: Install in accordance with manufacturer's instructions and U.S. Postal Service regulations. Place anchor devices in correct position. Install and secure boxes in position, neatly, and accurately stacked. Install doors and adjust to operate smoothly. Label rear of box same as front door label identification.

WALL MOUNTED STANDARDS AND SHELVING – 10 56 17

1. SCOPE OF WORK: Provide and install all new shelving, brackets, rods and fasteners as illustrated in the contract documents. As a minimum the contractor should include the following in each type of room:
    1.1. Unit Linen Closet: Set of 5 shelves, brackets and standards. Shelves to be full depth and width of closet and equally spaced vertically along standards.
    1.2. Unit Bedroom Closet: Closet Rod: installed at 44” a.f.f. and 12” clear of back wall. Shelf: one 15” deep shelf installed at 48” a.f.f.
    1.3. Unit Storage Closet: Set of 5 shelves, brackets and standards. Shelves to be 15” deep by full width of closet and equally spaced vertically along standards.
    1.4. Common Laundry Room: Folding Shelf: one 12” deep shelf installed at 48” a.f.f. for full legth of folding table. Dryer Shelf: one 12” deep shelf installed at 48” a.f.f. for full length of equipment.
2. SECTION INCLUDES: Shelf standards, brackets, and accessories. Closet rods for mounting on brackets.
3. SUBMITTALS: Product Data: Manufacturer's data sheets on each product to be used. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns. Maintenance Materials: Furnish the following for Owner's use in maintenance of project. Extra Brackets: Ten of each size of standard straight bracket.
4. DELIVERY, STORAGE, AND HANDLING: Store products under cover and elevated above grade. Store products in manufacturer's unopened packaging until ready for installation.
5. MANUFACTURERS: Knape & Vogt Manufacturing Company

6. STANDARD DUTY SHELF STANDARDS: Single-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.
    6.1. Load Capacity: Recommended by manufacturer for loading of 120 to 320 pounds per pair of standards.
    6.2. Face Width: 5/8 inch.
    6.3. Material: 16 gage, 0.0598 inch sheet steel.
    6.4. Lengths: As indicated on drawings.
    6.5. Finish: Electroplated, chrome-look.
    6.6. Brackets: 14 gage, 0.0747 inch sheet steel, locking into slots; size to suit shelves; zinc coated finish.
    6.7. Bracket Quantity: Provide one bracket for each 12 inches of standard length.
7. CLOSET RODS: Steel tubing for wall mounting in flange fittings.
    7.1. Type: Round stainless steel, standard duty; 1-1/16 inch outside diameter, 0.087 inch wall thickness.
    7.2. Length: As required for application, up to 12 feet.
    7.3. Provide mounting fittings to suit application.
8. FASTENERS: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions.
9. EXAMINATION: Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
10. PREPARATION: Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
11. INSTALLATION: Install in accordance with manufacturer's instructions. Mount standards to solid backing capable of supporting intended loads. Install brackets, shelving, and accessories.
12. PROTECTION: Protect installed products until completion of project. Touch-up, repair or replace damaged products before Substantial Completion.

DIVISION 11

RESIDENTIAL APPLIANCES – 11 31 00

1. SCOPE OF WORK: Provide and install all new appliances as described in the contract documents. As a minimum the contractor should include one set of the items listed below for each room:
    1.1. Unit Kitchen: Refrigerator, range, range exhaust, microwave, grease shield, and dishwasher.
    1.2. Common Kitchen: Refrigerator, range, range exhaust, microwave, grease shield and dishwasher.
    1.3. Laundry Room: Four clothes washers, and four clothes dryers.
2. SUBMITTALS: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
3. WARRANTY: Provide manufacturer's standard warranty for all specified equipment.
4. ENERGY STAR: Provide all equipment eligible for Energy Star rating where applicable.
5. KITCHEN APPLIANCES: All appliances shall be supplied by the same manufacturer for entire project. Provide all required power, sanitary and supply connections as well as mounting and installation best practices as recommended by the manufacturer. All appliances are to be coordinated with the residential

cabinetry by the contractor for all clearances prior to ordering.

6. APPLIANCES: Provided and installed by the Contractor as part of the base bid:
   - 6.1. REFRIGERATOR: Frigidaire, Model: FFHT1814QB, Black
   - 6.2. RANGE: Frigidaire, Electric, Model: FFED3025PS, Stainless (BASE BID)
     - a) RANGE: Frigidaire, Electric, Model: FFEF3009PB, Black, (ALTERNATE)
   - 6.3. RANGE EXHAUST: Air King, Model: ESZ366ADA , Black, Vented to Exterior
   - 6.4. DISHWASHER: Frigidaire, Model: FDB2410HIC, Stainless
   - 6.5. MICROWAVE: Frigidaire, Model: FFCE1439LB, Black
   - 6.6. GREASE SHIELD: Air King, Model: SP2436S, Stainless
     - a) Installed flat to substrate with spray adhesive and screws. Verify in field if grease shield will fully protect wall behind top of range to bottom of cabinet/range-hood above. Install on both walls in corner range installation.
7. LAUNDRY EQUIPMENT: Coordinate with Owner's vendor for exact equipment and payment method prior to ordering specified equipment below. If card operation and payment method is to be provided other equipment shall be required.
   - 7.1. CLOTHES WASHER: Whirlpool, Model: CHW9050AW, White, Provide coin drop kit in lieu of coin-slide, power cord and ADA compliant pedestal as well as all accessories required for intended operation.
   - 7.2. CLOTHES DRYER: Whirlpool, Model: CEM2743BQ, White, Provide coin drop kit in lieu of coin-slide, power cord and ADA compliant pedestal as well as all accessories required for intended operation. Contractor to verify stable option prior to order.
8. EXAMINATION: Verify utility rough-ins are provided and correctly located. In existing structures contractor shall verify existing conditions & dimensions to determine that all equipment will meet manufacturer's clearance requirements. In existing structures contractor shall verify existing range receptacle location. Notify Architect if existing receptacle location does not meet manufacturer's installation guidelines.
9. INSTALLATION: Install in accordance with manufacturer's instructions. Anchor built-in equipment in place. Adjust equipment to provide efficient operation.
10. CLEANING: Remove packing materials from equipment and properly discard. Wash and clean equipment.

PLAYGROUND EQUIPMENT – 11 68 13

1. SCOPE OF WORK: Provide and install whole and complete playground as selected by owner. Include allowance and coordinate with subdrainage section.

DIVISION 12

VERTICAL LOUVER BLINDS – 12 21 16

1. SCOPE OF WORK: Provide and install complete blind system and accessories on all windows throughout common and apartment areas except those in common corridors and stairs.
2. MANUFACTURERS: Hunter Douglas. Vertical Solutions. 3-1/2” wide flame retardant vanes. Wand Control. Color: White. In width and height to fully fill window openings. Stack should occur on the non-operational side of windows; Contractor to coordinate with window provider.
3. SUBMITTALS: Manufacturer's data sheets on each product to be used, including: Preparation instructions and recommendations, Storage and handling requirements and recommendations, and Installation methods.
4. SELECTION SAMPLES: Contractor to submit samples to Owner for review and approval for vanes, color

chips or material samples representing manufacturer's full range of available colors and patterns.

5. VERTICAL LOUVER BLINDS: Color as selected by Owner from Contractor provided samples. Horizontal travel, vertical vane louver units complete with tracks, pivot and traversing mechanisms, and accessories as well as: Vanes: NFPA 701 compliant PVC vanes of size adequate and appropriate for opening size with Integrally colored, extruded smooth PVC; flat, 3-1/2 inches (80mm) wide, Operation Manual, and Wand operation.
6. BLIND RESTING POSITION: Over fixed pane of glass
7. MOUNTING: Inside (between jambs)
8. TRACKS: Channel tracks for type of operation, extruded aluminum with clear anodized finish, with end caps. Sized in a Manufacturer's standard dimension, selected for suitability for installation conditions, span, and weight of vanes.
9. PIVOT MECHANISM: Geared for synchronous 180 degrees rotation of vanes and type of operation indicated.
10. LOUVER CARRIERS: Injection molded PVC carriers with 8 prong rotation system carriers have self-lubricating wheels for reduced friction. Carriers allow for 180 degree simultaneous rotation.
11. BRACKETS AND MOUNTING HARDWARE: As recommended by manufacturer for the mounting configuration and span indicated; provide manufacturer’s standard L- bracket with clip for outside mounting and clip only for inside mounting.
12. FABRICATION: Field measure finished openings prior to ordering or fabrication.
13. INSTALLATION: Install in accordance with manufacturer's instructions using mounting style as indicated. Adjust blinds for smooth operation.
14. WARRANTY: Minimum 2-year manufacturer warranty.

RESIDENTIAL CASEWORK – 12 35 30

1. SCOPE OF WORK: Provide an install new cabinets in dwelling unit and common areas as illustrated in the contract documents. Including the following in all Units and Common Kitchen:
    1.1. New base & upper cabinets in kitchens.
    1.2. New vanity in bathrooms
    1.3. Meet all accessibility requirements, including 34” max. height to top of sink rim
    1.4. Removable base cabinets at sink & open work spaces allowed. Provide valance & concealment panel when cabinet faces removed.
    1.5. Toe kick shall not be continuous, so that easy removal of cabinet fronts is readily achievable.
    1.6. Flooring and wall finishes behind cabinets shall be complete.
    1.7. Upper cabinet heights shall be installed per drawing, which may vary from standard upper cabinet mounting heights.
    1.8. Install be pull hardware on all doors & drawers.
    1.9. Shelving that is provided but that is not immediately installed in the cabinets shall be stored in a location as directed by the Owner.
2. MANUFACTURERS: Smart Cabinets. Mortise and tenon door, veneer flat panel, solid drawer front, square edge profile, standard overlay.
3. GENERAL CABINET NOTES:
    3.1. Install Drip-Tite liners at all kitchen sink cabinets.
    3.2. Do not use cabinets that contain added urea-formaldehyde.
    3.3. Provide hardware at all cabinet doors and drawers.
    3.4. See finish schedule for product information

4. SUBMITTALS: Provide component dimensions and construction details.
5. SHOP DRAWINGS: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.
6. QUALITY ASSURANCE: Complying with ANSI/KCMA A161.1 and KCMA Certified.
7. CABINET CONSTRUCTION: Maple hardwood face framing and min. 1/2" plywood, tempered hardboard gables. Water resistant shelves with powder coating. Four sided 5/8" solid dovetail drawer with 1/4" captive matching laminate bottom.
8. COUNTERTOPS: As specified in Section 12 36 00.
9. DOOR AND DRAWER FRONTS: Solid wood.
10. BOLTS, NUTS, WASHERS AND SCREWS: Of size and type to suit application.
11. HARDWARE: BHMA A156.9, Types as recommended by fabricator. Drawer Slides shall be Extension arms, steel and ball bearing construction. Side mounted.
12. FABRICATION: Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate. Provide cutouts for plumbing fixtures. Prime paint contact surfaces of cut edges.
13. FINISHES: All surfaces exposed to view shall be Stain, seal, and varnish .
14. INSTALLATION: Install casework, components and accessories in accordance with manufacturer's instructions. Use anchoring devices to suit conditions and substrate materials encountered. Set casework items plumb and square, securely anchored to building structure.

COUNTERTOPS – 12 36 00

1. SCOPE OF WORK: Provide and install all new countertops as illustrated in the contract documents. Including the following:
   1.1. Unit Kitchens and Bathrooms: New plastic laminate countertops with eased front edge. Provide back & side splashes at walls, cabinets, and end panels as required for layout. Countertop height required to accommodate top of sink rim to be no higher than 34". Install low-profile blocking to meet this requirement. See finish schedule for product information.
   1.2. Common Kitchen: New plastic laminate countertops with eased front edge. Provide back & side splashes at walls, cabinets, and end panels as required for layout. Countertop height required to accommodate top of sink rim to be no higher than 34". Install low-profile blocking to meet this requirement. See finish schedule for product information.
2. SUBMITTALS: Manufacturer's data sheets on each product to be used, including: Preparation instructions and recommendations, Storage and handling requirements and recommendations, Specimen warranty.
3. SELECTION SAMPLES: Contractor to provide to Owner for review and selection for each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
4. PLASTIC LAMINATE COUNTERTOPS: High-pressure decorative laminate (HPDL) sheet bonded to substrate. Laminate Sheet to be NEMA LD 3, Grade HGS, 0.048 inch nominal thickness. Finish to be Matte or suede, gloss rating of 5 to 20. Surface Color and Pattern to be As selected by Owner from the manufacturer's full line.
   4.1. MANUFACTURERS: As listed in the finish schedule.
   4.2. EXPOSED EDGE TREATMENT: Post formed laminate; front edge substrate built up to minimum 1-1/4 inch thick with a no drip raised radius edge, integral cove backsplash with radius top edge.
   4.3. BACK AND END SPLASHES: Same material, same construction.
   4.4. FABRICATION: As per AWI/AWMAC/WI (AWS), Section 11 - Countertops, Custom Grade. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

4.5. PARTICLEBOARD FOR SUPPORTING SUBSTRATE: ANSI A208.1 Grade 2-M-2, 42-45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines. Shall meet California 93120.

4.6. ADHESIVES: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

4.7. INSTALLATION: Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch. Seal joint between back/end splashes and vertical surfaces.

SITE FURNISHINGS – 12 93 00

1. SCOPE OF WORK: Provide and install all new site furnishings as illustrated in the contract documents. At a minimum the contractor should include the following as part of the base bid:
   1.1. One picnic table, two benches, two trash cans, two bike racks, one smokers pole, one gazebo, four bollards at the trash enclosure.
   1.2. Include unit pricing for each item.
   1.3. Coordinate all bolt down locations and pad sizes with site concrete for correct mounting.
2. SECTION INCLUDES: Benches, Trash cans, Picnic tables, Grills, Bike racks, Smokers pole, Gazebo and Bollards.
3. SUBMITTALS: Provide manufacturers cut sheets and Erection Drawings. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
4. DELIVERY, STORAGE, AND PROTECTION: Deliver site furniture to project site in protective wrappings. Store site furniture under cover and elevated above grade.
5. WARRANTY: Correct defective Work within a five year period after Date of Substantial Completion. Provide five year manufacturer warranty for all items.
6. MANUFACTURER: Kay Park Recreation - Minnesota/Wisconsin Playground
7. BENCH: Kay Item #CRB72VP: 6'-0" length, Surface mount, Legs - black powder coated, Seat & back - PVC coated, Color to be selected.
8. TRASH RECEPTACLE: Kay Item #132LRVPIG: Include lids and liners, Expanded metal with PVC coating, In ground mounting post, Color to be selected.
9. PICNIC TABLE - ADA COMPLIANT: Kay Item #8J2GVP-EWC: 8'-0" in length w/ tabletop overhang, Expanded metal w/ PVC coating, Galvanized frame, Color to be selected.
10. GRILLS: Broilmaster - Gas grill Model P3-BL48G-1: In ground post - painted metal, Drop down - stainless steel SKSS, Flavor screen, Porcelain coated cast iron cooking grid.
11. BIKE RACKS: Kay Item #627GIG - Loop style, 88" length, Galvanized, In ground mounting post
12. SMOKERS POLE: United Receptacle, Inc Model - R1BK (black): Dimensions: 4" diameter x 41"H; 14.25" diameter base.
13. GAZEBO: Pre-engineered modular type, American or Traditional style, Single tier roof, Octogan - 12'-0" diameter, Natural cedar finish, Mounting type - concrete slab, Cedar shingles, Wood free of defects & knots
    13.1. Manufacturers: Vixen Hill Manufacturing Co.; Leisure Woods, Inc.; or Gazebo Creatings
14. BOLLARDS: ASTM A53/A53M, standard weight hollow steel pipe with plain shaft. 6 inches round. Domed concrete cap. Factory primed and painted finish. Mounted in ground.

14.1. Height Above Grade: 60 inches at trash enclosure gate; 42 inches elsewhere.

14.2. Depth Below Grade: 60 inches.

15. INSTALLATION: Install in accordance with manufacturer's instructions.

16. CLEANING: Clean site furnishings of all labels, stickers and dirt.

DIVISION 13 - 20

1. Not included on this specification.

DIVISION 21

FIRE PROTECTION DESIGN CRITERIA – 21 00 00

1. SCOPE OF WORK: Provide full design and installation of complete, full building fire protection system. Provide layouts, design, calculations and engineering for all items.
   1.1. Include complete system throughout building.
   1.2. Include any dry head system for under canopies, in parking garage or over balconies as required.
   1.3. Include dry system in attic space.
2. Shop drawings shall be required for the Owner's review and approvals. Shop drawings shall include all required drawings, equipment and fixture submittals and calculations. Include all required signed and sealed drawings and calculations prepared by a locally licensed engineer.
3. Each Contractor shall visit site to become fully informed as to existing conditions before submitting proposal. No additional compensation or allowances shall be granted to this Contractor for failure to fully understand existing conditions prior to design and construction.
4. Each Contractor shall coordinate closely with General Contractor and other Contractors to perform the work. Sufficient materials and labor shall be provided as required to maintain progress with all phases of construction.
5. Provide all submittals within the final O&M manuals and as required by NFPA.
6. Contractor to provide as built drawings of installed work.
7. INSTALLATION: Install in accordance with manufacturer's instructions and NFPA 13.
8. COORDINATION: The Fire Protection Contractor shall coordinate with all other trades to prevent interference between beams, joists, structures, wiring, ductwork, piping, etc.
9. Verify the location of all sprinkler devices, service access panels, supply/riser locations with the General Contractor prior to roughing in any work.
10. Placement of piping in exterior walls or other areas subject to freezing shall be avoided.
11. Provide shut-off valves, access panels, signage, etc. as required for per NFPA.
12. FINAL INSPECTION, TESTING, CLEANING AND ADJUSTING: At completion of work, all parts of the installation and equipment shall be inspected, tested, adjusted, cleaned, and left in a safe, proper operating condition to the satisfaction of the Owner.
13. GUARANTEE: All materials and equipment furnished for this project shall be new and free of defects. All work shall be of good quality, free of faults and defects. All work, materials and equipment shall be guaranteed for one (1) full year from the date of certificate of occupancy. All manufacturer's warranties shall be in excess of Contractor's guarantee.
14. STARTING EQUIPMENT AND SYSTEMS: Provide manufacturer's approved field representative to prepare and start equipment. Adjust for proper operation within manufacturer's published tolerances. Demonstrate proper operation of equipment to Owner's designated representative. Video tape demonstration and turn over to Owner.

Part 1. - GENERAL

1.1 SUMMARY

A. These plans and specifications constitute a 50% set of documents.

B. General and Supplementary conditions within Division 0 and 1 are hereby incorporated and become part of these Specifications, covering all work in Mechanical Division.

C. Before submitting a proposal on the project, the Contractor shall visit the site and familiarize themselves with the conditions and limitations affecting Mechanical Division work. No additional costs to the Owner shall be allowed for items verifiable during site visits.

D. Contractor shall provide sufficient workers and materials to keep pace with the construction schedule. Contractor shall place orders for equipment such that job progress is not slowed due to late delivery and shall confirm delivery dates with suppliers.

E. The Contractor shall provide office space and storage for materials and equipment supplied. Location shall be as directed by the General Contractor or the Architect/Engineer.

F. Upon completion of the work shown and specified under Mechanical Division and prior to final close out of the Project, the Contractor shall verify in writing that all systems are 100% complete and operating properly. This notification shall include copies of all Subcontractor notifications. Any system not operating properly at final inspection shall be immediately repaired and demonstrated to the Engineer.

G. Rebates or credits provided by utility companies or equipment manufacturers shall be directly credited to the Owner.

1.2 MECHANICAL PLANS

A. The Mechanical Drawings and Specifications shall form a set of Plans for the mechanical work. Neither the Drawings nor the Specifications shall be complete without the other. Any item shown on the Drawings or specified in the Specifications shall be considered as shown and specified on both.

B. Any questions regarding the intent of the Drawings or Specifications shall be brought to the Engineer's attention as soon as possible. If direction from the Engineer cannot be obtained due to time or communication limitations, the greater quantity, higher quality or condition most favorable to the Owner shall be assumed. Contractor shall provide all labor, materials, equipment, and miscellaneous items necessary for a complete and operational mechanical installation, as shown on the Drawings and called for in these Specifications.

C. Drawings:

1. Contractor shall familiarize themselves with Architectural, Civil, Structural and Electrical Drawings and Specifications. Coordinate all shafts, chases, furred spaces, suspended ceilings, locations of equipment, etc.
2. Mechanical Contractor shall coordinate routing of all piping and ductwork within soffits provided by the General Contractor. The Mechanical Contractor shall provide all soffiting required to cover installations not coordinated or specifically approved by the Architect and Engineer.
3. Mechanical Drawings are diagrammatic and are intended to show approximate location only. Placement of mechanical equipment and devices shall not interfere with locations or clearances of other trades' materials or equipment.
4. Contractor shall verify locations with architectural elevations.
5. Dimensions given on the Drawings shall take precedence over scaled dimensions. Dimensions, whether given in figures or scaled, shall be verified in the field.

6. Contractor shall verify that the equipment to be furnished under Contract will fit within the available space.
7. Notify the Architect and Engineer of any discrepancies between Electrical, Architectural and Mechanical Drawings.
8. Verify items such as door swings, window locations, casework, etc., before installing any mechanical equipment or devices. All devices conflicting with other trade's work due to lack of coordination shall be relocated at no additional cost to the Owner.

D. The following terms used in the Drawings and Specifications shall be defined as follows:

1. Contractor: Shall mean Mechanical Contractor or any of their Subcontractors.
2. Work: Shall mean labor and/or materials of the Mechanical Contractor or any of their Subcontractors.
3. Furnish: Shall mean purchase, submit for Engineer approval, coordinate with Contract Documents and deliver to site in new, undamaged condition.
4. Connect: Shall mean to bring mechanical service and/or control wiring to equipment, make all final connections, provide all necessary miscellaneous materials required and do final check out to ensure proper equipment connections.
5. Install: Shall mean to store as directed, protect from damage, set in place, connect, test and turn over to the Owner in full operating condition.
6. Provide: Shall mean furnish and install.

E. CAD and Drawing Files:

1. Mechanical CAD drawings prepared by Steen Engineering, Inc. for this Project are instruments of Steen Engineering, Inc. for use solely with respect to this Project. During the course of the implementation of the Project, and with Steen Engineering, Inc. approval, copies may be obtained of CAD drawings for the preparation of Shop Drawings. These CAD drawings shall not be used on other projects, for additions to this Project, or for completion of this Project by others. Any revisions, additions and/or deletions to these CAD drawings, either intentional or unintentional, shall be made at the full risk of the person(s) making such revisions, additions and/or deletions. Such person(s) shall hold harmless and indemnify Steen Engineering, Inc. of any and all responsibilities and liabilities.
2. CAD drawings files of Architectural floor plans, elevations, sections, etc, shall be requested directly from the Architect.

1.3 COORDINATION OF DRAWINGS

A. For typical or repetitive unit installations, contractor shall schedule an inspection with local and/or state AHJ to review a complete mock-up example installation and receive approval prior to proceeding with additional installations. Installation shall meet all code and manufacturer's service clearance requirements. Contractor shall coordinate installation and subsequent inspection with general contractor and any related trades.

B. Contractor shall submit a ¼-inch scale drawing to the Engineer indicating placement of all mechanical and electrical systems and equipment. Indicate proposed locations of all major equipment and materials, including but not limited to service equipment, exterior wall and foundation penetrations, fire-rated wall and floor penetrations, sizes and location of required concrete pads and bases, and mechanical/electrical equipment room layouts. This effort will require each trade to closely work together to produce a ¼-inch set of coordination drawings for each area of the building.

C. Coordinate scheduling and sequencing required for movement and positioning of large equipment into the building with all other Contractors to minimize impact on their work.

D. This Contractor shall provide any and all input required to complete these drawings.

1.4 MATERIALS AND EQUIPMENT

A. Materials:

1. All materials shall be new and of the type and quality specified herein.

2. Specific materials and equipment specified is intended to establish a minimum standard of required quality. Where specified materials and equipment fail to meet minimum standards of existing federal, state and local codes and ordinances, the governing codes and ordinances shall prevail.
3. The Contractor shall provide all minor miscellaneous materials necessary for the complete mechanical installation.
4. For materials and equipment specified by description only, the Contractor shall provide materials or equipment suitable for the purpose intended. These shall be in conformance with all governing codes, these Specifications and normal trade practice.
5. Supply materials and equipment to the site in original packages, containers or crates insofar as is practical. It shall be the Contractor's responsibility to schedule deliveries in accordance with the overall Project schedule. The Contractor shall closely coordinate all deliveries with other Contractors and the Engineer.
6. Provide for proper receipt, handling, storage, and protection from the elements for all materials and equipment to be used on this Project so as to effectively prevent damage or deterioration. Materials or equipment sustaining damage or undue deterioration from any cause whatsoever shall be replaced or repaired by Contractor.
7. The Contractor shall properly protect all equipment from damage during construction. Thoroughly clean all fixtures, equipment and other supplied materials. Make all necessary repairs and apply touch up paint prior to final inspection and contract close out.
8. All materials and equipment shall be listed by Underwriters' Laboratories, Inc. (UL). Materials and Equipment shall meet the UL requirements of each standard in every case where such a standard has been established for that particular type of material. Equipment shall be UL listed as an entire assembly or system.

B. Prior Approvals:

1. All requests for prior approvals must be received by the Engineer at least seven working days prior to bid date. Applications for prior approval shall be considered only from Contractors submitting bids on the Project. Contractors shall determine whether materials receiving prior approval are actually in accordance with details of the Specifications.
2. The Contractor shall be responsible for all deficiencies that may exist from the use of substituted products or equipment, including all additional labor and materials required to complete the work. All dimensions and characteristics of substituted products shall be verified and coordinated with all affected trades and Subcontractors. Any required changes or modifications to the work of any other trade or Subcontractor incurred due to using accepted substituted products shall be coordinated and performed by this Contractor at no additional cost to the Owner.

1.5 SUBMITTALS

A. Submittal and Approvals:
1. Prepare drawings of fire protection systems indicating pipe sizes, pipe locations, head layouts and type, fittings, shutoff valves, equipment, fire department connections, etc. The design, hydraulic calculations and subsequent drawings shall reflect all modifications and extensions to existing piping equipment and head layout. Indicate elevations, slopes, floor and wall penetrations, drains, etc.
2. Submit to all Agencies having jurisdiction for approval. Submit to Owner insurance carrier for approval if required. After the documents have been approved by all reviewing agencies, submit the approved copies bearing stamps and/or signatures of Fire Marshal or agency having jurisdiction to the Architect for their use, before proceeding with installation.

1.6 WORKMANSHIP AND CONSTRUCTION PROCEDURES

A. Installation of all materials specified herein shall be performed in a neat and workmanlike manner by workers experienced and skilled in the trade. Only the best quality workmanship will be accepted.

B. The Contractor shall regularly clean their work area of debris. Removal of all Contractor generated debris and rubbish caused by their work shall be at the Contractor's expense.

C. Contractor shall coordinate with the Owner any interruptions necessary to existing systems prior to shut down.

D. Coordination:

1. Contractor shall give careful consideration to work of other Contractors on the Project and shall organize work as detailed in the Contractor's ¼" coordination drawings so as to not interfere with or delay the work of other trades.
2. This Contractor shall provide a complete installation manual to the Electrical Contractor for each piece of equipment requiring electrical power/control connections scheduled to be performed by the Electrical contractor. This shall be done prior to any rough-ins by the Electrical Contractor to insure proper power/control wiring has been provided. Notify the Engineer of any discrepancies between the installation manuals, the electrical plans and the mechanical specifications for each piece of equipment.
3. Contractor shall consult all Architectural, Structural and Electrical Drawings and Specifications that apply for correlating information.
4. Conflicts or interference with work of other trades shall be brought to the attention of the Engineer, in writing, before installation.
5. Should the Mechanical Contractor not follow above procedures and install work that interferes with work of other Contractors, the Mechanical Contractor shall make all necessary changes as directed by Engineer to eliminate the interference or conflict at the Mechanical Contractor's expense.

E. Protection of Equipment:

1. Until final acceptance of the work by the Owner, the Contractor shall be responsible for the safety, good condition, and protection from damage of all materials and equipment installed.
2. If, during shipment or installation, the finish of equipment becomes chipped or scratched, the Contractor shall touch up or refinish surfaces to match original finish.

F. The Contractor shall complete all safety forms required by General Contractor.

1.7 LICENSES, CODES AND FEES

A. The Contractor shall be a licensed Contractor in the State where the project is being constructed. The Contractor shall employ all Licensed Professional Tradesmen required for each type of work covered under these Drawings and Specifications.

B. The Contractor shall procure all necessary certificates and permits and pay all required fees. The Contractor shall pay all fees and installation charges by the utility company for the permanent services.

C. Codes and Ordinances: All work and materials shall meet the requirements of national, state and local codes and ordinances, in every respect. This requirement shall not relieve the Contractor from meeting the requirements of Drawings and Specifications that may be in excess of all codes and ordinances and not contrary to them.

D. Inspections: Regular inspections shall be requested by the Mechanical Contractor to meet all state and local requirements. Contractor shall furnish a certificate of final inspection and approval from all enforcement agencies to the Owner.

1.8 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall deliver two sets of Operation and Maintenance (O&M) manuals to the Owner prior to final close out. O&M manuals shall consist of approved shop drawings, manufacturer's bulletins, equipment manuals, a list of manufacturers with telephone numbers for all equipment that contains replaceable parts and all other data covering the care, maintenance and operation of each piece of furnished equipment. O&M manuals shall be neatly bound in 3-ring binders, contain an index and section tabs and be labeled with the Project name.

B. Name, address, and telephone number of each Contractor installing equipment and systems, local representative for each item of equipment and each system. Table of contents shall correspond to the Specifications with the Section tab sheets placed before the respective Shop Drawings and operation and maintenance instructions.

1. Warranties for more than 1 year shall be included in appropriate section.

2. A maintenance and lubrication schedule shall include each motor, function, control location, fuse location, belt sizes type of lubricant, and rate of lubrication in accordance with manufacturer.
3. A filter maintenance schedule shall include filter size and quantity for each unit, located by room number.

1.9 OPERATING INSTRUCTIONS AND TESTING

A. The Contractor shall fully instruct the Owner in the operation of mechanical equipment prior to final close out. Contractor shall provide, without additional expense to Owner, services of competent instructors who will give full instruction in the care, adjustment, operation and maintenance of all mechanical systems provided by this Contractor to Owner's permanent employees. Instructor shall be thoroughly familiar with all parts of the installation that they are to give instructions and shall be trained in operating theory, as well as in practical operation and maintenance work. Factory trained instructors shall be employed wherever they are available. Instruction shall be given during regular work week and at a time just prior to the time the equipment is accepted and turned over to Owner for regular operation.

B. The Contractor or his representative shall provide a minimum of five days instruction period for Owner's personnel.

C. Contractor shall test all equipment installed under this Specification and shall demonstrate its proper operation to the Engineer. No equipment shall be tested or operated for any purpose until it has been fully prepared, connected and made ready for normal operation. Damage to equipment due to improper or ill-timed operation or testing shall be repaired, at Contractor's expense, before final inspection and acceptance.

1.10 WARRANTY

A. The Contractor shall guarantee all materials and equipment to be free of defects that may develop in any part of their work, caused by faulty workmanship, material or equipment failures, for a minimum of one year from the date of final completion of the Project or for as long as normal equipment manufacturer warranties are in effect from the date of final completion of the Project, whichever is later.

B. During the guarantee period, notification by letter, personal contact or telephone conversation of a problem with any mechanical system, shall cause the Contractor to respond within one week, making repairs or corrections as necessary. After all repairs and corrections are complete, the Contractor shall notify the Engineer.

C. During the guarantee period, the Contractor shall agree to provide 24 hour service on call for emergency.

Part 2. – PRODUCTS

N/A

Part 3. - EXECUTION

N/A

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. The Contract for the fire protection installation must be a qualified Fire Protection Contractor regularly engaged in the installation of automatic fire sprinkler systems. Provide a fire protection technician certified with the National Institute of Certified Engineering Technicians (NICET level IV), to certify direct and supervise the work or if required by governing authorities, a registered professional engineer.

B. Codes and Standards:

1. NFPA compliance: Install fire protection systems in accordance with the latest edition of the NFPA. Verify with Local Inspector.
2. UL Compliance: Provide fire protection products in accordance with pre approval guide UL standards; provide UL label on each product.
3. Fire Department/Marshal Compliance: Install fire protection systems in accordance with local and/or state regulations of fire department or fire marshal.
4. Latest applicable State and Local Codes.
5. City Water Department Compliance: The water service connection and sprinkler system valve assembly shall comply with all City Water Department Requirements. Contractor shall coordinate with the Civil Engineer and the local utility to provide any post indicating valves required on site or on the building.
6. Provide a double check valve assembly ahead of the fire sprinkler connection.
7. Obtain all required approvals and permits. Permits shall be obtained from the city or municipality in which the system will be installed. If permits are not issued by the city or municipality, a permit shall be obtained from the State Fire Marshal.

C. Description of Work:

1. The sprinkler contractor is responsible for verifying and complying with State, City and Local municipalities any and all code requirements related to the fire sprinkler system.
2. Fire sprinkler contractor shall do a water flow and pressure test at the site of construction. Static pressure and residual pressure at given flow rated shall be obtained per NFPA 13, Chapter 9, Water Supplies.
3. Verify need if applicable to provide fire sprinkler protection in wood construction ceiling space with local inspectors. It is the sole responsibility of the sprinkler contractor to review all construction documents and verify with local inspectors the need for any special coverage, dry fire sprinkler protection for unheated spaces, pressure and flow requirements prior to submitting a bid.
4. Additional compensation will not be allowed for modifications to the bid documents to meet any additional code requirements.
5. If applicable include work for remodeled area. Refer to Demolition Specification Section 21 00 20.
6. Provide all labor and materials and perform all operations required in connection with the installation of the fire extinguishing systems.
7. **For system notification, coordinate with Electrical Contractor for connection of signaling devices to Fire Alarm and Detection System, provided by electrical.**

D. Submittal and Approvals:

1. Prepare drawings of fire protection systems indicating pipe sizes, pipe locations, head layouts and type, fittings, shutoff values, equipment, fire department connections, etc. The design, hydraulic calculations and subsequent drawings shall reflect all modifications and extensions to existing piping equipment and head layout. Indicate elevations, slopes, floor and wall penetrations, drains, etc.
2. Submit to all Agencies having jurisdiction for approval. Submit to Owner insurance carrier for approval if required. **AFTER THE DOCUMENTS HAVE BEEN APPROVED BY ALL REVIEWING AGENCIES, SUBMIT THE APPROVED COPIES BEARING STAMPS**

AND/OR SIGNATURES OF FIRE MARSHAL OR AGENCY HAVING JURISDICTION TO THE ARCHITECT FOR THEIR USE, BEFORE PROCEEDING WITH INSTALLATION.

Part 2. – PRODUCTS

2.1 GENERAL

A. The following is a general guideline on types of sprinkler heads and their recommended usage. Final design will need to be approved by local inspector and coordinated with Architect and Owner.

1. In all standard spaces with finished ceilings: Recessed with white escutcheon.
2. Decorative lobbies, meeting rooms, executive offices: Fully concealed sprinkler heads with only ceiling plate visible. Cover plate shall be factory finished in white.
3. High areas with/finished ceilings: Exposed sprinklers, chrome finish with matching escutcheon.
4. All areas where piping will be exposed without finished ceilings: Exposed sprinklers, brass finish.
5. Areas exposed to pool areas, high humidity or weather: Corro-proof (polyester coated) sprinklers with matching escutcheon.
6. Extended coverage where possible on concealed piping in areas with finished ceilings.
7. Sidewall heads shall be recessed, white with white escutcheon for concealed piping.
8. Areas such as decks, canopies, small unheated interior spaces and attics enclosed entrances, elevator shafts, overhead doors vehicle parking areas, storage areas, loading docks, exhaust ducts, vestibules, coolers, freezers, entry way, etc, subject to freezing conditions, shall provide with a non-freeze system that meets NFPA standards and all state and local codes. Dry type sprinklers pendent, recessed concealed or horizontal sidewall, or fast response: All areas requiring more than two sprinklers shall be designed with complete dry pipe sprinkler systems.
9. Areas of high heat potential such as boiler rooms, furnace rooms and laundry rooms/closets shall use intermediate temperature class sprinklers.
   Provide black steel galvanized or 'Blaze Master' CPVC pipe and pipe fitting in accordance with the Codes and standards specified herein and as approved by the Authority Having Jurisdiction.
10. Dry sprinkler piping in attic shall be at a minimum schedule 10 black steel pipe with antimicrobical-coating with dry seal couplings and fittings. Locate air compressor in lower level parking area for dry sprinkler. Compressed air system shall be furnished with an air dryer equal to General Air Projects day Series. Allied XL threadable pipe not allowed in dry system.
11. Threaded pipe, if used, shall be minimum Schedule 30 black steel with malleable black iron fittings. For 8" and larger and Schedule 40 black steel with malleable iron fittings for sizes less than 8".

Part 3. – EXECUTION

3.1 GENERAL

A. The design of the sprinkler system shall be dictated by the building construction and usage and as specified herein. Piping shall be concealed above suspended ceilings.

1. The design and method of installation of the fire protection work shall be in accordance with National Fire Protection Association Standards and National Fire Protection Association Standards and The Architect Codes that contain reference to or supplementary material on sprinkler systems along with the requirements of the Owner's insurance authority, the State, and the local Fire Department.
2. The sprinkler systems shall be hydraulically calculated.

B. Coordination:

1. The successful contractor must coordinate with the existing conditions, all other, building components, all new construction, and make all necessary modifications to the pipe routing before submitting for approval. Provide hydraulic calculations for all areas of the building including supplemental hydraulic calculations for all modification.
2. Additional compensation will not be allowed for modifications to the bid documents for additional sprinklers, coordination, or for additional hydraulic calculations.

3. Sprinkler head locations and all pipe routing shall be coordinated with all mechanical and electrical equipment and all structural and architectural components to avoid obstructions. All head locations shall be coordinated with architectural reflective ceiling plan.
4. This contractor shall carefully review all of the bid documents from all disciplines (architectural, structural, kitchen equipment, electrical and mechanical) and design the sprinkler systems to properly protect all areas of the facility.
5. The sprinkler system shall be installed in a manner that is aesthetically unobtrusive, with all sprinkler heads symmetrically aligned and centered in lay-in ceiling tile. System shall not interfere with existing equipment and building components (clocks, speakers, lights, etc.), and is not to be subject to damage by the building occupants.
6. **Prior to installing any mains or branches, the Sprinkler Contractor shall coordinate routing with all other trades to avoid conflicts. Contractor coordination details and sections shall be signed-off on by all Contractors prior to installation. Any installation that hinders another Contractor from installing their conduits, piping, ductwork, etc., shall be immediately removed to allow for their installation at no additional cost to the Owner or other Contractors.**
7. Contractor shall coordinate the routing of all sprinkler piping to maintain 8" minimum clearance from outside air ductwork and ducts or vents that communicate directly with the outdoors within a twenty foot distance from the outside wall penetration.
8. Prior to piping fabrication, the contractor shall submit to the architect, plans showing the routing of the sprinkler mains and branches. Approval of the architect must be obtained prior to fire sprinkler installation.
9. Sprinkler Contractor shall insulate all fire sprinkler piping within 15 feet of any exterior opening within the mechanical room with a minimum 1" fiberglass. Refer to plumbing insulation Specification Section 22 07 00.
10. Under no circumstances shall wet systems be installed in unheated spaces or attics.

END OF SECTION

DIVISION 22

PLUMBING DESIGN CRITERIA – 22 00 00

1. SCOPE OF WORK: Provide and install a complete plumbing system including all materials and labor as illustrated in the contract documents, including:
   - 1.1. Unit Bathrooms: Vanity sink with faucet, toilet, tub with spigot and shower head on adjustable mounting.
     - a) Unit #2 to receive a roll-in shower with showerhead on adjustable mounting in lieu of tub.
   - 1.2. Unit Kitchen: Kitchen sink and faucet, connection to dishwasher.
   - 1.3. Common Bathrooms: Vanity sink with gooseneck faucet and toilet.
   - 1.4. Common Laundry: Utility sink with gooseneck faucet, washers as listed in Section 11 31 00.
   - 1.5. Common Kitchen: Kitchen sink with gooseneck faucet and connection to dishwasher.
   - 1.6. Common Corridor and Exterior: Hi-Lo accessible electric water closet, and hose bibbs
   - 1.7. Common Mechanical: Water heaters, water softeners, boilers, pumps, backflow preventer, and meters.
   - 1.8. Sanitary line, supply and return lines, drains, condensate, venting for all fixtures, equipment and appliances as required.
   - 1.9. Whole and complete gas piping, valves, hangers and metered system. Including natural gas connection to fireplace.
2. CODE: All plumbing work shall be designed and installed by the Contractor in accordance with all governing authorities, ordinances and codes.
3. ACCESSIBILITY COMPLIANCE: All plumbing fixtures within accessible apartments, amenity spaces, restrooms, common areas, corridors, or otherwise required to comply with accessibility codes shall be, if new, located as required by the governing accessibility code or if existing, relocated to meet the governing accessibility code. If there is found to be a conflict in the field or manufacture's or suppliers specified fixture and the governing accessibility code, provide a compliant fixture installed as required by the governing code and notify the architect immediately. Reference the typical accessibility mounting heights and clearances within the contract documents for all new and existing fixture locations.
4. Shop drawings shall be required for the Owner’s review and approvals. Shop drawings shall include all required drawings, equipment and fixture submittals and calculations.
5. Each Contractor shall visit site to become fully informed as to existing conditions before submitting proposal. No additional compensation or allowances shall be granted to this Contractor for failure to fully understand existing conditions prior to design and construction.
6. Each Contractor shall coordinate closely with General Contractor and other Contractors to perform the work. Sufficient materials and labor shall be provided as required to maintain progress with all phases of construction.
7. Provide all submittals within the final O&M manuals.
8. Contractor to provide as built drawings of installed work.
9. INSTALLATION: Install in accordance with manufacturer's instructions.
10. COORDINATION: The plumbing Contractor shall coordinate with all other trades to prevent interference between beams, joists, structures, wiring, ductwork, etc.
11. Verify the location of all plumbing fixtures and devices with the Owner prior to roughing in any work. Actual and final locations of fixtures are subject to Owner's approval.
12. Placement of piping in exterior walls or other areas subject to freezing shall be avoided. However, where such placement is necessary, the piping shall be placed on the warm-in-winter side of insulation or other acceptable measures as proposed by the Contractor and approved by the Owner to ensure no pipe freezing may be accepted.

13. Pitch all laterals to drain at or greater than as required by the local governing plumbing code.
14. All floor drains are to have associated air break and trap.
15. Provide thermostatic mixing valve at all hand sinks and lavatories.
16. New plumbing shall be connected to existing waste & vent line where possible, verify in field.
17. Insulate all hot water piping and place all piping on the warm-in-winter side of wall, floor and/or ceiling insulation.
18. Provide new shut-off valves at all fixtures and units.
19. All new supply piping shall be minimum of 1/2" dia. Unless specifically noted otherwise.
20. FINAL INSPECTION, TESTING, CLEANING AND ADJUSTING: At completion of work, all parts of the installation and equipment shall be inspected, tested, adjusted, cleaned, and left in a safe, proper operating condition to the satisfaction of the Owner.
21. GUARANTEE: All materials and equipment furnished for this project shall be new and free of defects. All work shall be of good quality, free of faults and defects. All work, materials and equipment shall be guaranteed for one (1) full year from the date of certificate of occupancy. All manufacturer's warranties shall be in excess of Contractor's guarantee.
22. STARTING EQUIPMENT AND SYSTEMS: Provide manufacturer's approved field representative to prepare and start equipment. Adjust for proper operation within manufacturer's published tolerances. Demonstrate proper operation of equipment to Owner's designated representative. Video tape demonstration and turn over to Owner

Part 1. - GENERAL

1.1 SUMMARY

A. These plans and specifications constitute a 50% set of documents.

B. General and Supplementary conditions within Division 0 and 1 are hereby incorporated and become part of these Specifications, covering all work in Mechanical Division.

C. Before submitting a proposal on the project, the Contractor shall visit the site and familiarize themselves with the conditions and limitations affecting Mechanical Division work. No additional costs to the Owner shall be allowed for items verifiable during site visits.

D. Contractor shall provide sufficient workers and materials to keep pace with the construction schedule. Contractor shall place orders for equipment such that job progress is not slowed due to late delivery and shall confirm delivery dates with suppliers.

E. The Contractor shall provide office space and storage for materials and equipment supplied. Location shall be as directed by the General Contractor or the Architect/Engineer.

F. Upon completion of the work shown and specified under Mechanical Division and prior to final close out of the Project, the Contractor shall verify in writing that all systems are 100% complete and operating properly. This notification shall include copies of all Subcontractor notifications. Any system not operating properly at final inspection shall be immediately repaired and demonstrated to the Engineer.

G. Rebates or credits provided by utility companies or equipment manufacturers shall be directly credited to the Owner.

1.2 MECHANICAL PLANS

A. The Mechanical Drawings and Specifications shall form a set of Plans for the mechanical work. Neither the Drawings nor the Specifications shall be complete without the other. Any item shown on the Drawings or specified in the Specifications shall be considered as shown and specified on both.

B. Any questions regarding the intent of the Drawings or Specifications shall be brought to the Engineer's attention as soon as possible. If direction from the Engineer cannot be obtained due to time or communication limitations, the greater quantity, higher quality or condition most favorable to the Owner shall be assumed. Contractor shall provide all labor, materials, equipment, and miscellaneous items necessary for a complete and operational mechanical installation, as shown on the Drawings and called for in these Specifications.

C. Drawings:

1. Contractor shall familiarize themselves with Architectural, Civil, Structural and Electrical Drawings and Specifications. Coordinate all shafts, chases, furred spaces, suspended ceilings, locations of equipment, etc.
2. Mechanical Contractor shall coordinate routing of all piping within soffits provided by the General Contractor. The Mechanical Contractor shall provide all soffiting required to cover installations not coordinated or specifically approved by the Architect and Engineer.
3. Mechanical Drawings are diagrammatic and are intended to show approximate location only. Placement of mechanical equipment and devices shall not interfere with locations or clearances of other trades' materials or equipment.
4. Contractor shall verify locations with architectural elevations.
5. Dimensions given on the Drawings shall take precedence over scaled dimensions. Dimensions, whether given in figures or scaled, shall be verified in the field.

6. Contractor shall verify that the equipment to be furnished under Contract will fit within the available space.
7. Notify the Architect and Engineer of any discrepancies between Electrical, Architectural and Mechanical Drawings.
8. Verify items such as door swings, window locations, casework, etc., before installing any mechanical equipment or devices. All devices conflicting with other trade's work due to lack of coordination shall be relocated at no additional cost to the Owner.

D. The following terms used in the Drawings and Specifications shall be defined as follows:

1. Contractor: Shall mean Mechanical Contractor or any of their Subcontractors.
2. Work: Shall mean labor and/or materials of the Mechanical Contractor or any of their Subcontractors.
3. Furnish: Shall mean purchase, submit for Engineer approval, coordinate with Contract Documents and deliver to site in new, undamaged condition.
4. Connect: Shall mean to bring mechanical service and/or control wiring to equipment, make all final connections, provide all necessary miscellaneous materials required and do final check out to ensure proper equipment connections.
5. Install: Shall mean to store as directed, protect from damage, set in place, connect, test and turn over to the Owner in full operating condition.
6. Provide: Shall mean furnish and install.

E. CAD and Drawing Files:

1. Mechanical CAD drawings prepared by Steen Engineering, Inc. for this Project are instruments of Steen Engineering, Inc. for use solely with respect to this Project. During the course of the implementation of the Project, and with Steen Engineering, Inc. approval, copies may be obtained of CAD drawings for the preparation of Shop Drawings. These CAD drawings shall not be used on other projects, for additions to this Project, or for completion of this Project by others. Any revisions, additions and/or deletions to these CAD drawings, either intentional or unintentional, shall be made at the full risk of the person(s) making such revisions, additions and/or deletions. Such person(s) shall hold harmless and indemnify Steen Engineering, Inc. of any and all responsibilities and liabilities.
2. CAD drawings files of Architectural floor plans, elevations, sections, etc, shall be requested directly from the Architect.

1.3 COORDINATION OF DRAWINGS

A. For typical or repetitive unit installations, contractor shall schedule an inspection with local and/or state AHJ to review a complete mock-up example installation and receive approval prior to proceeding with additional installations. Installation shall meet all code and manufacturer's service clearance requirements. Contractor shall coordinate installation and subsequent inspection with general contractor and any related trades.

B. Contractor shall submit a ¼-inch scale drawing to the Engineer indicating placement of all mechanical and electrical systems and equipment. Indicate proposed locations of all major equipment and materials, including but not limited to service equipment, exterior wall and foundation penetrations, fire-rated wall and floor penetrations, sizes and location of required concrete pads and bases, and mechanical/electrical equipment room layouts. This effort will require each trade to closely work together to produce a ¼-inch set of coordination drawings for each area of the building.

C. Coordinate scheduling and sequencing required for movement and positioning of large equipment into the building with all other Contractors to minimize impact on their work.

D. This Contractor shall provide any and all input required to complete these drawings.

1.4 MATERIALS AND EQUIPMENT

A. Materials:

1. All materials shall be new and of the type and quality specified herein.

2. Specific materials and equipment specified is intended to establish a minimum standard of required quality. Where specified materials and equipment fail to meet minimum standards of existing federal, state and local codes and ordinances, the governing codes and ordinances shall prevail.
3. The Contractor shall provide all minor miscellaneous materials necessary for the complete mechanical installation.
4. For materials and equipment specified by description only, the Contractor shall provide materials or equipment suitable for the purpose intended. These shall be in conformance with all governing codes, these Specifications and normal trade practice.
5. Supply materials and equipment to the site in original packages, containers or crates insofar as is practical. It shall be the Contractor's responsibility to schedule deliveries in accordance with the overall Project schedule. The Contractor shall closely coordinate all deliveries with other Contractors and the Engineer.
6. Provide for proper receipt, handling, storage, and protection from the elements for all materials and equipment to be used on this Project so as to effectively prevent damage or deterioration. Materials or equipment sustaining damage or undue deterioration from any cause whatsoever shall be replaced or repaired by Contractor.
7. The Contractor shall properly protect all equipment from damage during construction. Thoroughly clean all fixtures, equipment and other supplied materials. Make all necessary repairs and apply touch up paint prior to final inspection and contract close out.
8. All materials and equipment shall be listed by Underwriters' Laboratories, Inc. (UL). Materials and Equipment shall meet the UL requirements of each standard in every case where such a standard has been established for that particular type of material. Equipment shall be UL listed as an entire assembly or system.

B. Prior Approvals:

1. All requests for prior approvals must be received by the Engineer at least seven working days prior to bid date. Applications for prior approval shall be considered only from Contractors submitting bids on the Project. Contractors shall determine whether materials receiving prior approval are actually in accordance with details of the Specifications.
2. The Contractor shall be responsible for all deficiencies that may exist from the use of substituted products or equipment, including all additional labor and materials required to complete the work. All dimensions and characteristics of substituted products shall be verified and coordinated with all affected trades and Subcontractors. Any required changes or modifications to the work of any other trade or Subcontractor incurred due to using accepted substituted products shall be coordinated and performed by this Contractor at no additional cost to the Owner.

1.5 SUBMITTALS

A. Within fifteen days after the award of the Contract, the Mechanical Contractor shall submit shop drawings on all major mechanical equipment to the Architect for approval. Shop Drawings shall be submitted by the Mechanical Contractor, not their Subcontractors. **Shop drawings shall be submitted separately per specification section. Multiple shop drawing sections received in a single submittal will be rejected.** These shop drawings shall cover such items as boilers, pumps, fittings, valves, plumbing fixtures, water heaters, water softeners, etc. The Contractor shall thoroughly review each item for compliance with these Specifications making any necessary corrections prior to submittal. Each shop drawing set shall be stamped, signed and dated indicating Contractor review. If the Contractor fails to properly review shop drawings, the Contractor shall reimburse the Engineer for all additional reviews on a time and material basis. No equipment shall be released for shipment or installed prior to final approval by the Engineer.

B. The Engineer will review all Shop Drawings submitted and will retain one copy for record file.

C. Approval Stamp: This review is to verify general conformance with the design concept of the Project and substantial compliance with the information provided in the Contract Documents. This review does not in any way relieve the Contractor or their suppliers of their responsibility to provide all materials and equipment as specified, in quantities, quality and dimensions required. Submittals will be reviewed with the following actions:

1. "No Exception Taken" indicates that the Submittal appears to conform to the design concept of the Work and that the Contractor, at his discretion, may proceed with fabrication and/or procurement and installation.
2. "Make Noted Corrections" indicates that the Submittal, after noted corrections are made, appears to conform to the design concept of the Work and that the Contractor, at his discretion, may proceed with fabrication and/or procurement and installation, if the corrections are accepted by the Contractor without an increase in Contract Sum or Time.
3. "Revised and Resubmit" indicates that the noted revisions are such that a corrected copy of the Submittal is required for review to confirm that the noted revisions have been understood and made. The Contractor, at his discretion, may proceed with fabrication and/or procurement and installation after submitting a corrected copy and verifying with the reviewer that the corrected copy is acceptable, if the corrections are accepted by the Contractor without an increase in the Contract Sum or Time.
4. "Rejected" indicates that the Submittal does not appear to conform to the specifications, a resubmission is required and fabrication or procurement is not authorized.

D. If the Engineer rejects (Revised and Resubmit or Rejected) the same section two times the engineer shall be compensated for additional reviews. Compensation will be incorporated by Change Order and will be deducted from the Contractor's application for payment. Contractor is responsible for all delays caused by the resubmittal process.

E. Provide samples of materials or equipment proposed to be furnished, if requested. Samples shall become the property of the Architect/Engineer and will be returned only when accompanied by a written request to do so.

F. Record Drawings: The Contractor shall provide and maintain an "As Built" set of bluelines on site, neatly notating routing, location or other field changes to the Contract Documents. Upon Project completion and prior to final close out, turn the "As Built" drawings over to the Owner. Provide a detailed transmittal indicating each sheet and other information turned over to the Owner and acquire their representative's signature. This information shall be included at the project close out.

1.6 WORKMANSHIP AND CONSTRUCTION PROCEDURES

A. Installation of all materials specified herein shall be performed in a neat and workmanlike manner by workers experienced and skilled in the trade. Only the best quality workmanship will be accepted.

B. The Contractor shall regularly clean their work area of debris. Removal of all Contractor generated debris and rubbish caused by their work shall be at the Contractor's expense.

C. Contractor shall coordinate with the Owner any interruptions necessary to existing systems prior to shut down.

D. Coordination:

1. Contractor shall give careful consideration to work of other Contractors on the Project and shall organize work as detailed in the Contractor's ¼" coordination drawings so as to not interfere with or delay the work of other trades.
2. This Contractor shall provide a complete installation manual to the Electrical Contractor for each piece of equipment requiring electrical power/control connections scheduled to be performed by the Electrical Contractor. This shall be done prior to any rough-ins by the Electrical Contractor to insure proper power/control wiring has been provided. Notify the Engineer of any discrepancies between the installation manuals, the electrical plans and the mechanical specifications for each piece of equipment.
3. Contractor shall consult all Architectural, Structural and Electrical Drawings and Specifications that apply for correlating information.
4. Conflicts or interference with work of other trades shall be brought to the attention of the Engineer, in writing, before installation.
5. Should the Mechanical Contractor not follow above procedures and install work that interferes with work of other Contractors, the Mechanical Contractor shall make all necessary changes as directed by Engineer to eliminate the interference or conflict at the Mechanical Contractor's expense.

E. Protection of Equipment:

1. Until final acceptance of the work by the Owner, the Contractor shall be responsible for the safety, good condition, and protection from damage of all materials and equipment installed.
2. If, during shipment or installation, the finish of equipment becomes chipped or scratched, the Contractor shall touch up or refinish surfaces to match original finish.

F. The Contractor shall complete all safety forms required by General Contractor.

1.7 LICENSES, CODES AND FEES

A. The Contractor shall be a licensed Contractor in the State where the project is being constructed. The Contractor shall employ all Licensed Professional Tradesmen required for each type of work covered under these Drawings and Specifications.

B. The Contractor shall procure all necessary certificates and permits and pay all required fees. The Contractor shall pay all fees and installation charges by the utility company for the permanent services.

C. Codes and Ordinances: All work and materials shall meet the requirements of national, state and local codes and ordinances, in every respect. This requirement shall not relieve the Contractor from meeting the requirements of Drawings and Specifications that may be in excess of all codes and ordinances and not contrary to them.

D. Inspections: Regular inspections shall be requested by the Mechanical Contractor to meet all state and local requirements. Contractor shall furnish a certificate of final inspection and approval from all enforcement agencies to the Owner.

1.8 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall deliver two sets of Operation and Maintenance (O&M) manuals to the Owner prior to final close out. O&M manuals shall consist of approved shop drawings, manufacturer's bulletins, equipment manuals, a list of manufacturers with telephone numbers for all equipment that contains replaceable parts and all other data covering the care, maintenance and operation of each piece of furnished equipment. O&M manuals shall be neatly bound in 3-ring binders, contain an index and section tabs and be labeled with the Project name.

B. Name, address, and telephone number of each Contractor installing equipment and systems, local representative for each item of equipment and each system. Table of contents shall correspond to the Specifications with the Section tab sheets placed before the respective Shop Drawings and operation and maintenance instructions.

1. Warranties for more than 1 year shall be included in appropriate section.
2. A maintenance and lubrication schedule shall include each motor, function, control location, fuse location, belt sizes type of lubricant, and rate of lubrication in accordance with manufacturer.
3. A filter maintenance schedule shall include filter size and quantity for each unit, located by room number.

1.9 OPERATING INSTRUCTIONS AND TESTING

A. The Contractor shall fully instruct the Owner in the operation of mechanical equipment prior to final close out. Contractor shall provide, without additional expense to Owner, services of competent instructors who will give full instruction in the care, adjustment, operation and maintenance of all mechanical systems provided by this Contractor to Owner's permanent employees. Instructor shall be thoroughly familiar with all parts of the installation that they are to give instructions and shall be trained in operating theory, as well as in practical operation and maintenance work. Factory trained instructors shall be employed wherever they are available. Instruction shall be given during regular work week and at a time just prior to the time the equipment is accepted and turned over to Owner for regular operation.

B. The Contractor or his representative shall provide a minimum of five days instruction period for Owner's personnel.

C. Contractor shall test all equipment installed under this Specification and shall demonstrate its proper operation to the Engineer. No equipment shall be tested or operated for any purpose until it has been fully prepared, connected and made ready for normal operation. Damage to equipment due to improper or ill-timed operation or testing shall be repaired, at Contractor's expense, before final inspection and acceptance.

1.10 WARRANTY

A. The Contractor shall guarantee all materials and equipment to be free of defects that may develop in any part of their work, caused by faulty workmanship, material or equipment failures, for a minimum of one year from the date of final completion of the Project or for as long as normal equipment manufacturer warranties are in effect from the date of final completion of the Project, whichever is later.

B. During the guarantee period, notification by letter, personal contact or telephone conversation of a problem with any mechanical system, shall cause the Contractor to respond within one week, making repairs or corrections as necessary. After all repairs and corrections are complete, the Contractor shall notify the Engineer.

C. During the guarantee period, the Contractor shall agree to provide 24 hour service on call for emergency.

Part 2. – PRODUCTS

N/A

Part 3. - EXECUTION

N/A

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Work included under this Division shall consist of furnishing labor and materials necessary for the installation of the work called for under the Mechanical, Fire Sprinkler Protection, Temperature Control and Mechanical Test & Balance contracts as listed in the Instruction to Bidders, as specified, and as shown on Drawings to provide a complete, operable and approved system.

1.2 REFERENCES

A. The following is a partial list of related standards:

1. American National Standard Institute (ANSI).
2. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE).
3. American Society of Mechanical Engineers (ASME).
4. American Society of Sanitary Engineers (ASSE).
5. American Society for Testing and Materials (ASTM).
6. American Water Works Association (AWWA).
7. Cast Iron Soil Pipe Institute (CISPI).
8. Manufacturer's Standardization Society (MSS of the Valve and Fittings Industry, Inc.).
9. National Electrical Manufacturers Association (NEMA).
10. National Fire Protection Association (NFPA).
11. Plastic Pipe Institute (PPI).
12. Steel Tank Institute (STI).

1.3 QUALITY ASSURANCE

A. Where equipment is specified by manufacturer, brand name or catalog number, this shall establish the standard of quality and style of the product to be provided under the Contract.

B. Where two or more units of the same kind of equipment are required, they shall be products of a single manufacturer. Mixing and matching of various manufacturers' like or similar components shall not be permitted.

C. The Contractor shall field verify and inspect existing buildings for connections to existing systems, equipment, and materials designated, on Drawings or in Specifications, to be used.

D. The Contractor shall have full responsibility of component parts of the mechanical system to ensure that new equipment, integrated with existing equipment and systems, will perform and operate in accordance with requirements of the Specifications without excessive or unusual service or maintenance requirements.

E. The Contractor shall be responsible for verifying locations of such things as piping, ductwork, equipment, door swings, heights of cabinets and counters, etc., prior to the installation of any mechanical equipment. Installed mechanical work that interferes with the work of other trades shall be relocated by the Mechanical Contractor at no additional cost to the Owner.

F. Contractors shall coordinate with all other trades and install their systems in the space provided/coordinated within the structure. Install systems and materials for ease of maintenance. Equipment arrangements shall provide at least the minimum clearances as recommended by equipment manufacturer to facilitate proper maintenance and servicing of system. Deviations in minimum clearance requirements shall be permitted only upon prior written authorization from the Architect/Engineer.

Part 2. - PRODUCTS

2.1 FIRE BARRIER PENETRATION SEALING SYSTEMS:

A. Approved Manufacturers: 3M, Transco Products, Nelson Flameseal Systems, Tremco, Inc.

B. Firestopping materials shall conform to local building code requirements and shall be tested according to UL 1479 and ASTM-E84 for through-penetration firestop systems.

C. Firestopping materials shall be furnished by a supplier who specializes in the selection and furnishing of firestopping materials for building systems.

D. Submit shop drawings including a penetration protection schedule which lists each fire resistive construction type for this project, its fire rating, item penetrating and insulation (if any) UL through-penetration firestop systems number, manufacturer and model numbers. Include installation diagrams and product data sheet.

E. Contractor shall submit all fire stopping methods to Local Authorities for approval. Provide copies of all approved fire stopping methods to the Engineer. Seal all penetrations and sleeves through floors and fire walls with high temperature, fire rated sealant. Fire stop material shall be 3M brand Fire Barrier Penetration System. In lieu of type system described above, modular component system shall be ProSet System Inc. may be utilized. Install the appropriate concrete or wood penetration system to comply with Code.

2.2 WALL, FLOOR, AND CEILING OPENINGS

A. General Requirements:

1. Contractor shall be responsible for exact sizes and locations of chases and openings required for mechanical work.

B. Chases and Openings:

1. General Contractor shall leave chases and openings in walls, floors, ceilings, and partitions where shown on Drawings or otherwise necessary to receive mechanical work. It is this contractor's responsibility to coordinate sizes and locations prior to framing, pouring or setting of precast.

2.3 SLEEVES

A. General Requirements:

1. Provide sleeves in conjunction with water tight piping passing through concrete or masonry walls, partitions, and slabs. Provide sleeves in mechanical equipment rooms and chases to prevent water flooding from floor to floor in addition to separating piping from building structure.
2. Sleeves shall extend 3" beyond the full thickness of walls and shall be at least 2 pipe diameters larger than or 2" larger than ducts piping passing through. Where piping with covering is installed, a minimum of 1" shall be provided between outside of pipe covering and inside surface of the sleeve.

B. Pipe Sleeves:

1. Exterior Walls: Sleeves shall be standard weight steel pipe. Install sleeves in exterior walls and floors below grade with approved caulking between sleeves and piping to make it waterproof. Plastic sleeves shall not be used.
2. Floors: Sleeves shall be standard weight steel pipe. Vertical pipe sleeves through floors shall have space between pipe and sleeve packed with an approved fire stop material flush with top of sleeve to make a watertight and fire rated joint.
3. Interior Sleeves: Sleeves shall be standard weight steel pipe. Piping through walls of adjacent rooms shall have soundproof packing in non-rated walls and an approved fire stop material in fire rated walls.

4. Fire Rated Wall and Floor Openings: Piping passing through fire rated walls and floors shall be provided with an Underwriter's Laboratories, Inc. listed pipe and pipe sleeve assembly. Pipe and pipe sleeve assembly shall meet or exceed fire rating of wall and floor which the pipe passes through.
5. Contractor shall provide all sleeves required through footings, foundation walls and floors. Underground water services as indicated on plans shall be sleeved with schedule 40 PVC sleeving. Sleeve to be (1) size larger than the pipe it serves. Extend sleeves 0'-3" beyond penetration. Coordinate with Structural Engineer.

2.4 ACCESS PANELS

A. The Contractor shall provide means of access for all equipment valves and fittings specified to comply with Local Code. Furnish wall and ceiling access panels to the General Contractor for installation. Access doors and panels required within rated separations shall carry the appropriate rating. Conform to Division 8 access panel specifications. Contractor to provide separate per unit price per access panel for pricing purposes.

Part 3. - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. On-Site Review: Contractor shall visit site to become thoroughly acquainted with existing conditions of site and services.
2. Existing Active Services: When encountered during construction, Contractor shall protect, brace or support pneumatic tubing, existing active sewers, water, gas, ductwork, or other services, for proper execution of Work.
3. Inactive Services: If encountered during construction, Contractor shall cap or plug inactive pipes, ducts, and temperature control tubing or wiring at no additional cost to Owner.
4. Responsibility: Liability for repairs or replacement of damaged or defective materials, including, but not limited to, property damage resulting from negligence or other causes, shall be the Contractor's sole responsibility until work has been accepted by Architect/ Engineer and Owner.

3.2 PREPARATION

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A. Protection: After delivery, and before and after installation, equipment shall be protected against theft or damage.

1. Contractor shall protect plumbing fixtures, metal heating enclosures and other equipment and all baked enamel or glazed surfaces from damage by covering or coating as recommended in Bulletin, "Handling and Care of Enameled Cast Iron Plumbing Fixtures", issued by Plumbing Fixture Manufacturers Association or by other methods approved by Architect/Engineer.
2. Coat polished or plate metal parts with vaseline immediately after installation. Protect equipment outlets, pipe and conduit openings with temporary plugs, caps or burlap to prevent filling with construction dirt.

3.3 EXCAVATION AND BACKFILL

A. Excavation: Contractor shall perform excavation boring, drilling, back filling and compaction at required depth for installation of work indicated or specified.

1. Excavated material not required or not suitable for backfilling shall be removed from site.
2. Protect excavation by grading and pumping to keep space clear of water during construction.
3. Provide shoring and sheeting as necessary for protection of work and safety of personnel. Protect bottom of excavation from frost.
4. Excavation in rock shall be 8-inch below invert of pipe to be installed and shall be backfilled to a depth of 8-inch with clean, washed sand before pipe installation.
5. Excavation terminating in unstable or organic material at pipe invert elevation shall be continued to 30-inch below pipe invert elevation and backfilled with pit run gravel to pipe invert. Soil boring reports are

available for inspection at Architect's office.

6. Pipe installation in backfilled areas shall not occur until backfill is 2 feet above pipe invert, at which time backfill shall be excavated to proper depth, pipe installed, and backfill replaced as specified.
7. All lines are to be properly capped to prevent the entrance of dirt or any other foreign matter. All debris and water shall be removed from the trench prior to final installation. Properly protect piping or ductwork until backfilling can be performed. Inspection of all installations by Local Inspection Authorities shall be completed prior to backfilling.

B. Backfilling Under Floors and Slabs: Backfill areas below concrete slabs on grade in horizontal layers not to exceed 8-inch in depth and compact with approved equipment until dry density is not less than 95 percent of Standard Proctor Density.

1. Backfill material shall be pit run gravel or coarse sand free of rubbish, compacted and leveled to receive slab. If natural earth is of similar structure with same material as specified above, no additional material will be required. Fill to raise subgrades to required elevation shall be accomplished as specified above.
2. Materials and methods of compaction shall be approved by Architect/Engineer before start of work.
3. Areas not below concrete or asphalt slabs and footings shall be backfilled with suitable excavated material, free of debris and rubbish.
4. Carefully backfill to a point 6” above piping or ductwork and thoroughly tamp. Complete backfilling in 8” lifts and compact each layer to 98% standard proctor density. Restore surface to its original condition, i.e. grass, concrete, blacktop, etc.
5. Contractor shall pay costs for testing of compacted backfill by an approved testing laboratory when tests are requested by Architect/Engineer.

C. Backfilling Outside: Backfill excavations below finished grades with materials similar to that removed in excavation, free from rubbish or other unsuitable material. Place backfill and compact to prevent settling.

1. Backfilling shall be done to finished grades indicated on Drawings. If no finished grading is done in excavated areas, Contractor shall backfill to existing grades and restore surface to original condition.
2. Compaction over ditches less than 3 feet in width and around walls and columns shall be done by the use of mechanical hand compactors.
3. Contractor shall pay costs for testing of compacted backfill by an approved testing laboratory when tests are requested by Architect/Engineer.

D. Pavement, Curb, and Sidewalk Replacement:

1. Contractor shall be responsible for the replacement of existing street pavement, curbs and sidewalks removed or damaged by Contractor or related subcontractors.
2. Make necessary arrangements to perform such repairs and pay incurred costs in connection with said repairs, including amount in Bid.

3.4 CUTTING AND PATCHING

A. Cutting and patching shall be held to practical minimum consistent with good construction practice by properly locating and leaving sleeves and boxes, or notifying General Contractor of openings, where required, as construction progresses. All cutting and patching shall be done with the prior approval of the Architect/Engineer.

1. Necessary cutting and patching of walls, floors, partitions and ceilings, for the proper installation of work under this Contract, shall be the sole responsibility of this Contractor. Perform cutting and patching in such a manner as to leave no visible trace and to return the part affected to the condition of undisturbed work. Cutting and patching shall be performed by men experienced, skilled, and licensed for the particular type of work involved. Inferior work will not be accepted.

B. Pavements and Concrete: Cutting shall be accomplished by saw cutting a minimum of 1 ½-inch deep prior to jack hammering. Contractor shall bore below the surface where indicated on Drawings or where required by Architect/Engineer.

C. Repair: Patch pavements and concrete to match existing conditions. All labor and materials required to replace and repair sections cut or damaged shall be furnished and installed by this Contractor.

3.5 INSTALLATION

A. Connection to Equipment Specified: Provide material and labor required to connect to the mechanical system of fixtures and equipment having mechanical connections and which are specified in other Sections or Divisions of the Specifications or furnished by Owner.

1. Provide piping supply connections with shut-off valves.
2. Drainage connections shall be properly trapped and vented.

B. The Mechanical Contractor shall provide concrete pads for all floor mounted equipment. Pads shall be 4" thick and extend a minimum of 2" beyond equipment.

C. Mechanical Contractor shall provide angle iron stands for all gas fired equipment located on the same level or below any enclosed parking garage floor where the mechanical room opens to that same level. Stands shall elevate burners above 18" to comply with Local Code. This includes all water heaters, boilers, etc. Verify exact requirements with the Local Inspector prior to performing any fabrication.

D. Floor, Wall and Ceiling Plates:

1. Where uncovered exposed pipes pass through floors, walls or ceilings in finished rooms and inside casework, fit with approved type chrome plated metal plate.
2. Plastic escutcheon plates shall not be permitted.

E. Mechanical Systems Painting: Exposed supporting iron and steel work, bare pipe, fittings, hangers, and supports shall be wire brushed, washed with mineral spirits to remove dirt and grease, and painted with one coat of metal primer followed by two finish coats of battleship gray paint.

F. Concealed Equipment location: Location of motor operated equipment, furnished under this Contract, installed above ceiling shall be identified by placing a color coded thumb tack (or adhesive applied dot) in the ceiling directly below item noted. Identification colors shall be as follows:

1. Pumps: Green
2. Control Valves: Yellow
3. Shut-off Valves: Orange

G. Chlorination of Domestic Water Lines: Contractor shall clean entire domestic water system in building, shall disinfect system in strict accordance with governing codes and State Health Department Requirements, and shall flush entire system clean with potable water.

1. The piping system shall be flushed with clean, potable water until no dirty water appears at the points of outlet.
2. The system or part thereof shall be filled with a water-chlorine solution containing at least 50 parts per million of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours.
3. The system or part thereof shall be filled with a water-chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for 3 hours.
4. Following the allowed standing time, the system shall be flushed with clean potable water until no chlorine remains in the water coming from the system.
5. Contractor shall provide written certification to Architect/Engineer that chlorination and flushing of domestic water system has been completed.

H. Filtration: At time of substantial completion, and prior to turning equipment over to Owner, Contractor shall install a complete set of unused, clean filters in each type of unit supplying filtered air to the building.

3.6 IDENTIFICATION

A. Exposed Piping: Bare and insulated, exposed new piping in Boiler Room, Mechanical Rooms, and unfinished rooms shall be identified with labels, painted on using metal stencils. Stencils shall have 1-inch high letters and shall include a directional arrow 3-inch long by 1/2-inch wide, indication direction of flow. Color of stenciling shall be black lettering on a yellow background.

1. Labels shall be located at each change in direction of pipe runs and at intervals not to exceed 20 feet.
2. Setmark snap-on pipe markers by Seton Nameplate Corporation or snap-on pipe markers by W. H. Brady Company, which are similar to above stencil description shall be acceptable.

B. Concealed Piping: Bare and insulated new piping running in ceilings and soffits shall be identified with labels painted on using metal stencils. Each stencil shall have 1-inch high letters and shall include a directional arrow 3-inch long by 1/2-inch wide indicating direction of flow. Color of stenciling shall be black lettering on a yellow background.

1. Labels shall be located at each change in direction of pipe runs and at intervals not to exceed 20 feet.
2. Labels shall be located on each side of wall, partition and floor penetrations.
3. Setmark snap-on pipe markers by Seton Nameplate Corporation or snap-on pipe markers by W. H. Brady Company, which are similar to above stencil description shall be acceptable.

C. Pipe Markers: Contractor shall label the piping as follows:

1.	Domestic Cold Water	CW
2.	Domestic Hot Water	HW
3.	Domestic Recirculating Hot Water	RHW
4.	Natural Gas	G
5.	Rain Water Leader	RWL
6.	Fire Sprinkler	FIRE

D. Equipment: All scheduled equipment under this Division shall be identified with stamped labeled placards matching the scheduled identification tags and adhere directly to the equipment.

E. Controls: Controls and switches furnished under this Division shall be clearly labeled and identified.

3.7 CLEANING

A. Housekeeping, Cleaning and Storage: Remove from the building and site, scrap material, temporary building, packaging material, miscellaneous debris and dirt on a regular schedule and in accordance with Architect/Engineer's direction, to maintain building in a reasonably clean, workable condition during construction.

1. Cutting oil and steel shavings shall be caught in a suitable container to ensure final finish material in building will not be marred or damaged.
2. Upon completion of work and before final inspection, Contractor shall remove plaster, paint, rust, stickers, and shipping tags from installed equipment.
3. Clean foreign matter from installed equipment and remove dirt and debris, in connection with work, from building.

3.8 PRE-OPERATIONAL SYSTEM CLEANOUT

A. Pre-Cleaning Chemicals: New piping systems and appurtenances shall be cleaned with a one percent solution of Ferrosol 345, neutral pH cleaner, to remove any iron deposits, oil-based coatings, mill scale and construction residues.

1. Follow manufacturers' directions regarding equipment.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Section includes testing, adjusting and balancing, plumbing and natural gas systems, measurement of final operating condition systems, sound measurement of equipment and vibration measurement of equipment during operating conditions.

1.2 REFERENCES

A. NEBB (National Environmental Balancing Bureau). Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

A. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

B. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

C. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

D. Provide reports in bound manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

E. Include detailed procedures, agenda, sample report forms and a copy of NEBB Certificate of Conformance Certification prior to commencing system balance.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

3.1 GENERAL

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Domestic Water Systems:

    a. Pumps are rotating correctly.
    b. Proper strainers are clean and in place or in normal positions.
    c. Service and balance valves are open.

B. Test and start-up all equipment supplied under this contract.

1. Provide all reports necessary to assure the Engineer and Owner that all functions of each piece of equipment have been thoroughly evaluated and deemed operable as designed.

2. Ensure recorded data represents actual measured or observed conditions.
3. Permanently mark settings of valves and other adjustment devices allowing settings to be restored. Set and lock memory stops.
4. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
5. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.2 WATER SYSTEM PROCEDURE

A. Plumbing:

1. Defects: Contractor shall be responsible for defects which develop in the systems caused by faulty workmanship, material or equipment and shall replace any such faulty workmanship, material or equipment during a period of 1 year from date of final acceptance. Acceptance of the work shall not waive the guarantee.
2. Approval: Inspect and test plumbing work for approval by Architect/ Engineer or a designated representative.
3. Tests: Tests shall be made in the presence of the Architect/Engineer or a designated representative. Tests shall be made, at Contractor's expense, and a certification furnished to the Architect/Engineer stating that satisfactory tests have been made.
4. Piping: Tests of piping systems, except final test of complete systems, shall be made before piping is covered or connected to fixtures and equipment. Tests required shall not be less than as specified in the following paragraphs, unless designated otherwise in specific sections.

    a. Storm and sanitary, waste and vent piping, inside the building shall be tested with air at 5 psi gauge pressure and shall hold this pressure for 15 minutes without addition of more air. Provide final test with fixtures including flammable waste trap, grease trap, floor and roof drains in place with 1" W.G. air pressure.
    b. Test Domestic water piping, tanks, valves and fittings with hydraulic pressure of 100 psig for a period of 24 hours.
    c. Test natural gas piping per 2003 International Fuel Gas Code, Chapter 4, Section 406.

        1) Piping shall be tested at a pressure of 25 psig minimum for 30 minutes.

3.3 START-UP AND COMMISSIONING

A. Following substantial completion, contractor shall return to the site on a quarterly basis including four (4) balancing/commissioning sessions. Commissioning shall consist of rebalancing domestic water systems to the extent required to verify proper operation of all system components and controls. Balancing contractor shall coordinate with all trades including controls contractor to make required adjustments.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Section Includes: Include labor, materials, equipment, and accessories to furnish and install supports, anchors, and seals for equipment, materials, and related work specified elsewhere.

1.2 SUBMITTALS

A. Submit shop drawings for all equipment provided under this section. Drawing shall include registered Structural Engineers Seal where required.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Guides manufactured by: Metraflex, Hyspan, Flexweld- Keflex, Flexicraft, Flexonic, Anvil International.

B. Supports and hangers manufactured by: B-Line, Grinnell, Michigan, Anvil International, NIBCO, National, Empire Industries and L.C. Penner.

C. Expansion anchors manufactured by: Hilti, Simpson, Illinois Tool Works.

D. Power driven fasteners manufactured by: Hilti, Simpson, Norbord.

E. Firestop material for penetration or construction manufactured by: 3M MP-1 Moldable Putty, Flamseal Putty, 3M Caulk CP-25WB, Dow Corning 3-6548 RTV Foam, Tremco.

2.2 PIPING INSERTS AND HANGERS

A. Hanger Supports and Inserts: Piping suspended from construction above shall be hung from concrete inserts in concrete construction, toggle bolts and rod coupling on prefabricated, reinforced hollow concrete slabs, I-beam clamps or hanger rod, washer and two nuts on bar joist construction. On other types of building construction a field approved type clamp or bracket shall be used.

B. Hangers, Clamps, and Collars: Piping shall be suspended from inserts, clamps or brackets by means of clevis type or roller type hanger and solid steel rods spaced not more than 10 feet apart on steel pipe and pipe rings spaced not more than 8 feet apart on copper pipe. Support vertical cast iron and steel pipes at each floor by heavy wrought steel riser clamps or collars. Support vertical copper pipes at each floor by riser clamps with asphalt felt lining under couplings placed in vertical copper piping. Support piping 4-inches and larger by single pipe roller assemblies with adjustable socket.

C. Support horizontal piping subject to expansion with adjustable roller hangers.

2.3 ANCHORS AND GUIDES

A. Anchor Fabrication: Construct anchors using I-beams, channel iron, tees, or angles or a combination thereof.

1. Tee iron shall be welded to side, top or bottom of pipe. Angle iron diagonal bracing shall be welded or bolted to tee iron and wall or ceiling. Anchors shall be welded or double clamped to pipe.
2. Where a group of pipes are to be anchored, but cannot be secured as above, the pipes shall be anchored to an assembly constructed of I-beams, channels or both, which shall be anchored to the building structure.

B. Guides: Guides shall be fabricated from carbon steel. Housing shall be of two piece design, connecting upper and lower housing with two bolt or by welding, after spider and pipe have been set in lower half of housing. Lower housing shall have two legs for support running the full length of housing. Two piece spider clamp shall be fastened around pipe (or pipe with insulation) with two bolts forming six legs which guide pipe inside housing. Legs may be on bottom, side or top of unit for bolting to floor or top of beam, wall or underside of structure.

1. Insulation inside the spider clamp shall be hydrous calcium chloride with vapor barrier from entering and exiting pipe continuing through the clamp.
2. Unit shall be furnished with a factory baked enamel finish.

C. For multi-level wood floor construction allow for wood shrinkage and movement. Provide clearance for piping near wood construction.

1. For metal piping, provide Josam #26200 expansion joints on vertical sanitary and storm. Expansion Joints with telescoping design with triple (3) EPDM or Vilon O-ring seals, including center pressure seal and outer debris seals and internal support piston. Maximum joint travel length shall be either 6" or 12". All Expansion Joints shall be pressure rated according to the manufacturer's specifications. All Expansion Joints shall be fabricated from PVC or CPVC material conforming to ASTM D1784. All sockets shall meet the dimensional requirements of ASTM D2467.
2. For horizontal take-offs from stacks use no-hub connections and on the inlet side and seal of traps provide slip joints. All mechanical joints shall be accessible.

2.4 BRACKETS, BRACES AND SUPPORTS

A. General Requirements: Furnish and install brackets, braces or reinforcing angles in partitions not sufficient in themselves to support piping or plumbing fixtures or other wall hung equipment included in this Specification. Bolts shall extend through walls, finished on opposite side, or one wall of a pipe chase, and shall be not less than 3/8-inch brass bolts with 3-inch cut washer on opposite side of wall.

B. Fasteners: Bolt head and washer shall be concealed under wall finish on finished walls. On hollow walls not finished on opposite sides, use toggle bolts. On solid walls use 3/8-inch brass bolt extending 4 inches into wall secured with molten lead poured around bolt. Secure floor mounted wall closets with 5/16-inch brass bolt with chrome plated cap, nut, and washer.

C. Support Racks: Support tunnel piping on Unistrut, Bee-Line, pipe racks assembled as indicated by details on Drawings. Unistrut steel products shall have prime bonderized finish coating.

D. Pipe Drop Supports: Brace exposed pipe drops to pumps and other equipment with angle iron framework to relieve strain on flexible connectors or equipment and anchor piping to eliminate movement.

PART 3. - EXECUTION

3.1 HANGER INSTALLATION

A. Hanger Location: Locate hangers to properly support pipes and ducts; relieve strain on pipe, duct, and fittings; and allow for ample expansion and contraction. Piping smaller than 4-inch size shall be hung with individual ring hangers where space prevents use of other type hangers.

1. Piping shall not be hung from the roof deck.
2. Except where trapeze hangers are used to support piping, all piping shall be individually supported. Do not support ducts or pipes from other pipes, ducts or equipment or conduit.
3. Place a hanger within one foot of each horizontal elbow.

B. Domestic Water Piping Support: Suspend and support domestic water piping as indicated above, except domestic water piping shall be supported over piping insulation saddles as indicated in Section 22 07 00 with no break in insulation vapor barrier.

C. Anchor Piping in Chases: Copper piping in pipe chases behind plumbing fixtures shall be anchored to waste and vent piping with angle iron and U-clamps with asphalt felt lining under clamps.

D. Trapeze Hangers: Groups of pipes at the same elevation and close together may, at the option of the Contractor, be supported by suitable trapeze hangers suspended from inserts, clamps or brackets by solid steel rods.

E. Bell and Spigot Support: Support bell and spigot pipe not underground from above hangers at each joint in the pipe run.

F. "No Hub" Pipe Support: "No hub" soil pipe runs shall have two hangers per joint, one on each side of joints.

G. Plastic Piping Support: Support plastic piping from above inserts, clamps or brackets with Grinnell Figure 269 adjustable ring hanger on 32-inch centers where conveying waste from dishwashers or similar hot water wastes it shall be supported on continuous metal or wood strips for its entire length.

H. Thoroughly and substantially support all piping from approved hangers. The design, selection, spacing and application of horizontal pipe hangers, supports, restraints, anchors and guides shall be in accordance with applicable standards. The power Piping Code ANSI B31.1 shall take precedence over the MSS SP-69 Standard.

3.2 PIPE HANGERS AND SUPPORT INSTALLATION

A. Support horizontal steel and copper piping with maximum spacing between supports as noted.

Nominal Pipe Size (In.)	Distance Between Supports (Ft.)	Hanger Rod Diameter (In.)
½ & ¾	6	3/8
1 to 1 ½	8	3/8
2 & 2 ½	10	½
3 & 4	12	5/8
5 to 12	14	7/8
14 to 18	20	1

B. Provide additional supports for valves or other concentrated loads between supports.

C. Install hangers to provide minimum ½ inch clear space between finished pipe insulation and adjacent work.

D. Use hangers which are vertically adjustable 1-1/2 inch minimum after piping is erected.

E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

F. Provide hanger spreaders on hangers for pipes 4 inches and larger.

3.3 ANCHORS AND GUIDES INSTALLATION

A. Boiler Room: Provide adequate anchors and guides on domestic piping in Mechanical Rooms and Boiler Room to prevent swaying of pipe.

B. Anchors: Install anchors approximately centered in every 70-foot run, blind ends, changes in pipe direction, except when elbow is used to absorb expansion and at major branch connections.

1. An expansion joint or loop or expansion elbow, but not more than one, with appropriate guides, shall be installed between each pair of anchors.
2. If expansion loops are installed in same line with expansion joints, the section containing the loop shall be isolated from the section containing the joint by means of an anchor.

C. Guides: Install 4 guides, 2 on each side, for each expansion loop or joint. On each side, install one pipe guide a maximum of 4 pipe diameters from expansion loop or joint and one pipe guide a maximum of 14 diameters from the first guide.

3.4 INSULATION PROTECTION AT PIPE HANGERS

A. Shield insulation shall be galvanized steel, 16 gauge for piping smaller than 4 inches, 14 gauge for piping 4 inches and larger and shall span an arc of 180 degrees. Lengths of shields shall be as follows:

Pipe Size	Shield Length
Up to 6”	12”
8”-12”	16”
Over 12”	20”

B. On cold water piping install a wood block at hanger points. Insulation jacketing shall be sealed where cut to install the block.

C. Provide offsets and transitions to plumbing and piping due to existing structure and trades work.

3.5 EXPANSION JOINTS

A. Provide Metraflex, Model HP axial expansion compensators rated for minimum 150 psi working pressure. Acceptable Manufactures: Flexicraft, Hyspan, Duraflex, Microflex, Flexonics.

B. Provide additional expansion joints and offsets for excessive expansion in plastic piping.

C. Installation of piping and expansion products shall be in strict accordance with manufacturer’s instructions.

D. No plastic piping vertical horizontal storm or sanitary stack may exceed 30 ft. in total height or length unless an approved expansion and contraction joint is installed at intervals not to exceed 30 ft. In lieu of expansion joints, offsets of 2’-0” at 45° every 30 feet may also be used.

3.6 ROOF PIPE SUPPORTS

A. MIFAB (MIRO Industries, Copper B Line) #C-Port Series rubber support with 14 ganged galvanized, 13/16” high steel channel. Material shall be 100% recycled rubber that is UV resistant and can be used as a curb (sleeper) replacement. Designed to support gas and domestic plumbing system.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Field applied insulation for thermal efficiency and condensation control for plumbing piping and equipment.

B. Definitions:

1. ASJ: All service jacket, white finish facing or jacket.
2. Air Conditioned Space: Space directly supplied with heated or cooled air.
3. Cold: Equipment or piping handling media at design temperature of 60° F or below.
4. Concealed: Piping above ceilings and in chases and pipe spaces.
5. Exposed: Piping and equipment exposed to view in finished areas or exposed to outdoor weather.
6. FSK: Foil-scrim-kraft facing.
7. Hot: Plumbing equipment or piping handling media above 105° F.
8. Density: Pcf - pounds per cubic foot.
9. Thermal conductance: Heat flow rate through materials.
10. Flat surface: BTU per hour per square foot.
11. Pipe or Cylinder: BTU per hour per linear foot.
12. Thermal Conductivity (k): BTU per inch thickness, per hour, per square foot, per degree F temperature difference.
13. PVDC: Polyvinylidene chloride vapor retarder jacketing, white.

Part 2. - PRODUCTS

2.1 SUMMARY

A. Materials:

1. All insulation shall have composite (insulation, jacket, and/or facing and adhesive used to adhere the facing or jacket to the insulation), fire and smoke hazard ratings as tested by Procedure ASTM E-84, NFPA 225 and U/LI 723 not exceeding Flame Spread 25 and Smoke Developed 50.
2. Jacket and Facing Descriptions:

    a. All purpose vapor barrier jackets.
    b. VB vapor barrier, white kraft bonded to 1 mil aluminum foil, reinforced with glass yarn. Water vapor permeability 0.02 perms.
    c. FSK reinforced foil and paper (Foil Scrim Kraft). Aluminum foil (minimum 0.75 mil thick) reinforced with fiberglass yard mesh and laminated to 40 lbs. chemically treated fire resistant Kraft UL rated.

3. Exterior Jacket:

    a. Venture Tape, Ventureclad 1557CW, (Alumaguard 60) 6 mil thickness, adhesive backed, aluminum finish jacket otherwise with zero permeability, shall be capable of being applied down to -20° F.

2.2 PIPING

A. Piping shall be insulated with Manville (IMCOA, Owens-Corning, Knauf) "FLAME SAFE" fiber glass insulation. The insulation shall have an average thermal conductivity not exceeding 0.22 BTU in. per sq. ft. per °F. hour at mean temperature of 75°F.

B. Provide galvanized steel shields at all pipe hangers on insulated piping except hot water heating piping where pipes bear directly on the clevis. Shields shall be 16 gauge for pipes 4" and larger diameter and 20 gauge for smaller pipes.

C. Exposed areas inside a building shall be furnished with factory applied "FLAME SAFE" All-Purpose Vapor barrier jacket.

D. All piping in concealed areas inside a building shall be provided with factory applied "FLAME SAFE" VB (Vapor Barrier Jacket or All-Purpose Jacket).

E. All piping that is located outside and directly or indirectly exposed to the weather and is insulated, shall be totally enclosed and wrapped with a PVC pre-formed jacket.

F. Fittings, valve bodies and flanges for pipe size 4" and smaller shall be provided with PVC jackets over fiberglass inserts.

G. Armstrong (Rubatex, Halstead) Armaflex II flame retardant elastomeric thermal insulation, installed according to manufacturer's recommendations and as allowed by Local Codes, shall be suitable for pipe temperatures between -40° and 220°.

Part 3. - EXECUTION

3.1 GENERAL

A. All piping shall be thoroughly cleaned and dry prior to the application of insulation.

B. Provide continuous vapor barrier over all seams.

3.2 PIPING:

A. On cold water piping all seam edges shall be additionally sealed with vapor barrier adhesive and ends wrapped with vapor barrier tape overlapped the adjacent jacket.

B. Domestic Water, above 40°F and Under 200°F:

1. Apply fiberglass insulation to provide a K-value of 0.27. If the K-value of a product is less 0.22, then the thickness must be adjusted to have an equivalent R-value. Runout branches 2" in diameter and less (not exceed 12 feet length) to individual terminal units: 0.5".

C. All domestic water piping within 15' of any exterior opening within the mechanical room shall be insulated with a minimum of 1" Fiberglass unless indicated otherwise in this specification section.

D. For piping exposed to outdoor air, see insulation thicknesses for specific piping types below. Increase insulation thickness listed by ½".

E. Plastic sealed combustion appliance vent piping shall be insulated in attic or cold spaces with 1" Armaflex foam insulation or per manufacturers minimum recommended thickness, whichever is greater.

F. All existing insulated piping that may have had its insulation removed as a result of new work shall be reinsulated to match existing.

G. <u>DOMESTIC COLD AND HOT WATER PIPNG:</u>

1. Domestic cold and hot water shall have fiberglass insulation in thickness as follows or per applicable State Energy Code, whichever is greater.

2. (0ºF - 140ºF):

a.	1/2" thru 1 1/4 "	1"
b.	1 1/2" and larger	1 1/2"

H. DOMESTIC RECIRCULATING HOT WATER:

1. (0ºF - 140ºF):

a.	1/2" thru 1 1/4 "	1"
b.	1 1/2" and larger	1 1/2"

3.3 JACKETS

A. Foil and Paper Jackets: Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1 1/2" laps at longitudinal joints and 3-inch-wide butt strips at end joints.

1. Seal openings, punctures and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
2. Install PVC fitting covers over insulated flanges, fittings and valves.

B. Exterior Exposed Insulation: Install continuous PVC jackets and seal all joints and seams with waterproof sealant.

C. Install the PVC jacket with 1” overlap at longitudinal and butt joints and seal with adhesive.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. All piping materials and methods of construction and workmanship shall be provided as per the requirements of local codes and regulations.

1. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer.
2. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

B. Lead pipe, solders, flux, etc., are not allowed. All piping and valves associated with the potable water system shall not exceed the 0.25% maximum lead content per U.S senate Bill No. S.3874 and NSF/ANSI 372.

C. The contractor is responsible for verifying all invert elevations with respect to building finished floor elevations and site provisions.

Part 2. - PRODUCTS

2.1 PIPING

A. Below Grade Sanitary, Vent and Waste:

1. Bell and spigot (SV) cast iron piping and fittings conforming to ASTM A74 (latest edition), manufactured by either AB & I Foundry, Charlotte Pipe, New Age Casting or Tyler Pipe, bearing the raised trademark on the piping of the Cast Iron Soil Pipe Institute and be listed by N.S.F. International. For other Manufacturers, in addition to meeting the ASTM A74, they must also submit through the contractor the following records: (1) Radiation screening, (2) Chemical Testing Records for every 4 hours, (3) Mechanical Tensile testing for every 4 hours, (4) Dimensional Inspection records done every 12 hours and (5) Certification Letter from Manufacturer. The Contractor shall select 3 random dates for the aforementioned tests. Provide Neoprene compression joints conforming to ASTM C564, latest revision. Pipe, fittings & gaskets to be installed per manufacturers recommendations.
2. Hubless cast iron pipe and fittings conforming to CISPI 301 and ASTM A888, (latest revision), manufactured by AB & I Foundry, Charlotte Pipe, or Tyler Pipe, New Age Casting, bearing the raised trademark on the piping of the Cast Iron Soil Pipe Institute and be listed by N.S. F. International. For other Manufacturers, in addition to meeting the ASTM A74, they must also submit through the contractor the following records: (1) Radiation screening, (2) Chemical Testing Records for every 4 hours, (3) Mechanical Tensile testing for every 4 hours, (4) Dimensional Inspection records done every 12 hours and (5) Certification Letter from Manufacturer. The Contractor shall select 3 random dates for the above mentioned tests. Provide Neoprene compression joints conforming to ASTM C564, latest revision. Pipe, fittings & gaskets to be installed per manufacturers recommendations. Contractor shall submit to engineer, pipe manufacturers the following records: (1) Radiation screening, (2) Chemical Testing Records for every 4 hours, (3) Mechanical Tensile testing for every 4 hours, (4) Dimensional Inspection records done every 12 hours and (5) Certification Letter from Manufacturer. The Contractor shall select 3 random dates for the aforementioned tests. Provide Standard stainless steel couplings, manufactured by Husky, Anaco or Ideal conforming to ASTM C1277, latest revision, or with heavy duty stainless steel couplings (Husky/Anaco/Ideal) third party certifying to ASTM C1540, latest revision. All cast iron pipe, fittings & couplings must be installed, supported & restrained using the installation procedures detailed in the CISPI handbook.
3. PVC Schedule 40, ASTM D2665-04a with mechanical ring, or fusion or solvent cement. Piping shall be laid on a continuous granular bed and installed per ASTM D2321.

B. Above Grade Sanitary, Vent and Waste:

1. Bell and spigot (SV) cast iron piping and fittings conforming to ASTM A74, (latest revision) bearing trademark of Cast Iron Soil Pipe Institute and be listed by N.S.F. International. For other Manufacturers, in addition to meeting the ASTM A74, they must also submit through the contractor the following records: (1) Radiation screening, (2) Chemical Testing Records for every 4 hours, (3) Mechanical Tensile testing for every 4 hours, (4) Dimensional Inspection records done every 12 hours and (5) Certification Letter from Manufacturer. The Contractor shall select 3 random dates for the aforementioned tests. Provide Neoprene compression joints conforming to ASTM C564, latest revision. Pipe, fittings & gaskets to be installed per manufacturers recommendations with neoprene compression joints conforming to ASTM C564, latest revision. Pipe, fittings & gaskets to be installed per the manufacturers recommendations.
2. Hubless cast iron pipe and fittings conforming to CISPI 301 Standards and ASTM A888, (latest revision), bearing trademark of Cast Iron Soil Pipe Institute and be listed by N.S.F. International. For other Manufacturers, in addition to meeting the ASTM A74, they must also submit through the contractor the following records: (1) Radiation screening, (2) Chemical Testing Records for every 4 hours, (3) Mechanical Tensile testing for every 4 hours, (4) Dimensional Inspection records done every 12 hours and (5) Certification Letter from Manufacturer. The Contractor shall select 3 random dates for the aforementioned tests. Provide Neoprene compression joints conforming to ASTM C564, latest revision. Pipe, fittings & gaskets to be installed per manufacturers recommendations with standard stainless steel couplings (Husky/Anaco), conforming to ASTM C1277, latest revision, or with heavy duty stainless steel couplings (Husky/Anaco), conforming to ASTM C1540, latest revision. All cast iron pipe, fittings & couplings must be installed, supported & restrained using the installation procedures detailed in ASTM C1277 or ASTM C1540, whichever applies.
3. PVC Schedule 40, ASTM D2665-04c with mechanical ring, or fusion or solvent cement.
4. ABS Schedule 40, ASTM D2661-02. Pipe and corresponding fitting installed per code limitations.
5. PVC Schedule 80 threaded, ASTM D2665. Pipe and corresponding fittings, installed per code limitations.
6. Plastic piping shall not be used in air plenum spaces.
7. Pressurized waste discharge (i.e. sump pumps, sewage ejectors, etc.) shall be schedule 40 galvanized steel.

C. Below Grade Domestic Water:

1. Ductile iron pipe with mechanical joints conforming to AWWA C 151/ANSI 21.51 with joints conforming to AWWA C 111 installed in accordance with AWWA C 600 and joint restraints to be MJ FIELD-LOK as manufactured by U.S. Pipe, Clow, McWane/Tyler Pipe or Gruvlok.
2. Provide anchor rods for bends tees and plugs use thrust blocks for all 45 degree or greater elbows or joint restraint MJ FIELD-LOK as or U.S. Pipe, Clow or McWane/Tyler pipe.
3. Cast iron mechanical joint fittings AWWA C110 or ductile iron mechanical joint fittings AWWA C 153/ANSI 21.51 with joints conforming to AWWA C111 installed in accordance with AWWA C 600 and joint restraints to be MJ FIELD-LOK as manufactured by U.S. Pipe, Clow or McWane/Tyler Pipe (only upstream of water meter).
4. Water service piping up stream of the meter and the fire sprinkler riser assembly shall utilize protective internal coatings meeting AWWA standards. No unlined pipe allowed.
5. For inside building, 2 ½" and smaller under slab on grade, tube Type 'K' or 'L', ASTM B-88 soft copper, seamless and no fittings. For water services outside the building, 3" and larger type K copper.
6. Chlorinated Polyvinyl Chloride (CPVC): Manufactured from Type IV Grade I CPVC compound with a cell classification of 23447 per ASTM D 2846.
7. Cross Linked Polyethylene (PEX): Manufactured in the PEX-A Engel Method by Uponer, Watts Water PEX, Nibco, Viega PEX Ultra, Zurn. Not allowed for water service outside the building.

    a. Contractor to formally submit product/installation package to local jurisdiction prior to bid, based on Minnesota Plumbing Code Section 4715.0330.
    b. Piping shall meet or exceed ASTM F876-04 and ASTM F877-02a and be certified by NSF International for use with potable water.
    c. Fittings shall be PEX-A cold expansion type manufactured to meet or exceed ASTM F1960-04 and by certified by NSF International for use with potable water. Provide color coded rings.

d. No fittings allowed below floor slab on grade.
e. Manifolds shall be provided with appropriate sized fittings on manifold supply outlets.
f. Provide angle stops, straight stops, bend supports, clips and/or pex rails as supplied by tubing manufacturer for supporting tubing.
g. Installation shall be by a factory trained installer per manufacturer's installation instruction. Provide Owner with 25 year manufacture's warranty.
h. Piping system will comply with ANSI/NSF Standard #61 for potable water.
i. Pex piping shall not be in contact with any other uninsulated piping.

D. Above Grade Domestic Water Piping:

1. Acceptable Manufacturers: Victaulic, Grinnell, Anvil-Gruvlok.
2. Type "L" seamless hard temper copper tubing with wrought copper fittings, using 95/5 solder or brazing.
3. Type "L" seamless grooved copper tube with copper-tube dimensioned grooved copper couplings and fittings.

   a. Fittings shall be ASME B16.22 wrought copper or ASME B16.18 cast bronze, with copper-tube dimensioned grooved ends. Victaulic Grinnell Copper-Connection conforming to NSF/ANSI 372, or Anvil-Gruvlok CTS.
   b. Couplings shall be installation-ready. Grade EHP, EPAM or EHT gasket rated to + 250° F, and zinc electroplated steel bolts and nuts.
   c. System shall be manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.)

4. Type "M" seamless copper hard and soft temper ANSI-H23.1 with wrought copper fittings using 95/5 solder or brazing. Type "M" shall not be used on domestic hot water circulating systems.
5. Grinnell Copper G-Press and Viega Pro-Press system may be used on type L and M hard copper tubing, sizes ½" to 4" and soft copper tubing in ½" to 1 ¼". System shall be approved for up to 200 psi operating pressure and 250ºF for joining copper tubing. These systems shall only be used on piping system containing fluids and gases as indicated in the manufacturers approved listing. All application shall include the proper factory standard or field installed specialty seals.
6. Chlorinated Polyvinyl Chloride (CPVC): Manufactured from Type IV Grade I CPVC compound with a cell classification of per ASTM D1784 of 24448 for pipe materials and 23447 for fitting materials. CPVC pipe and fittings shall be certified by NSF International and International Code Council, Evaluation Service, Plumbing, Mechanical and Natural Gas for use with potable water.
   a. Pipe and fittings 2" and smaller:

      (1) Pipe and fittings shall be copper tube size (CTS) SDR 11 and shall meet or exceed ASTM D2846.
      (2) The maximum water design velocity shall be 8ft./sec.
      (3) Pipe and fittings: FlowGuard Gold, Charlotte Pipe.

   b. Pipe and fittings larger than 2":

      (1) Pipe shall be iron pipe size (IPS) Schedule 80 and shall meet or exceed the requirements of ASTM F441.
      (2) Fittings shall be iron pipe size (IPS) Schedule 80 and shall meet or exceed the requirements of ASTM F437.
      (3) The maximum water design velocity shall be 5 ft./sec.
      (4) Pipe: Corzan, GFHarvel of IPEX.
      (5) Fittings: Corzan, NIBCO or IPEX.

   c. All socket type joints shall be made with solvent cements and primers shall meet or exceed current ASTM standards. Solvent cement and primer shall be listed by NSF International for use with potable water and approved for use with pipe and fittings manufacturer.
   d. Provide smooth pipe supports and bracing to allow for expansion and contraction. Spaced per manufacturer's recommendations.

e. Installation shall be by a factory trained installer per manufacturer's installation instruction. Provide Owner with minimum of 5 year manufacturer's warranty.
f. Plastic piping shall not be used in air plenum spaces.

7. Cross Linked Polyethylene (PEX): Manufactured in the PEX-A Engel Method by Uponor, PEX by Nibco, Viega PEX Ultra, ½" through 3", Zurn.

a. Contractor to provide and install PEX per [Local Code] Minnesota Plumbing Code 605.10.
b. Piping shall meet or exceed ASTM F876-04 and ASTM F877-02a and be certified by NSF International for use with potable water. Piping shall be rated at 100 psi at 180˚ F.
c. Fittings shall be PEX-A F1960 cold expansion type manufactured to meet or exceed current ASTM standards and by certified by NSF International for use with potable water. Provide color coded rings and or pipe.
d. Manifolds shall be provided with appropriate sized fittings on manifold supply outlets.
e. Provide angle stops, straight stops, bend supports, clips and/or pex rails as supplied by tubing manufacturer for supporting tubing. Support piping every 2'-8". Support piping can exceed 2' – 8" when using a listed support assembly such as PEX A pipe support
f. Individual piping shall maintain a 2" minimum spacing. Bundled hot and cold piping is not acceptable.
g. Installation shall be by a factory trained installer per manufacturer's installation instruction. Provide Owner with 25 year manufacture's warranty.
h. Shall not be used on systems exceeding 140ºF.
i. PEX piping or assembly shall be air plenum rated to meet ASTM E84.

E. Domestic Hot Water Circulation:

1. Acceptable Manufacturers: Victaulic, Grinnell, Anvil-Gruvlok.
2. Type "L" seamless hard temper copper tubing with wrought copper fittings, using 95/5 solder or brazing.
3. Type "L" seamless grooved copper tube with grooved copper fittings and couplings.

a. Fittings shall be ASME B16.22 wrought copper or ASME B16.18 cast bronze, with copper-tube dimensioned grooved ends. Grinnell Copper Grove System, Victaulic Copper-Connection and Anvil-GruvLok CTS.
b. Couplings shall be installation-ready, for direct stab installation without field disassembly. Couplings shall consist of two ductile iron housing segments cast with offsetting angle-pattern bolt pads, Grade EHP or EPDM gasket rated to +250° F, and zinc electroplated steel bolts and nuts. Victaulic Style 607, Grinnell Style 640 and Anvil-GruvLok 6400/6402.
c. System shall be manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.)

4. Grinnell Copper G-Press and Viega Pro-Press system may be used on type L and M hard copper tubing, sizes ½" to 4" and soft copper tubing in ½" to 1 ¼". System shall be approved for up to 200 psi operating pressure and 250ºF for joining copper tubing. These systems shall only be used on piping system containing fluids and gases as indicated in the manufacturers approved listing. All application shall include the proper factory standard or field installed specialty seals.
5. Chlorinated Polyvinyl Chloride (CPVC): Manufactured from Type IV Grade I CPVC compound with a cell classification of per ASTM D1784 of 24448 for pipe materials and 23447 for fitting materials. CPVC pipe and fittings shall be certified by NSF International for use with potable water.

a. Pipe and fittings 2" and smaller:

(1) Pipe and fittings shall be copper tube size (CTS) SDR 11 and shall meet or exceed ASTM D2846.
(2) The maximum water design velocity shall be 8ft./sec.
(3) Pipe and fittings: FlowGuard Gold, Charlotte Pipe.

b. Pipe and fittings larger than 2":

(1) Pipe shall be iron pipe size (IPS) Schedule 80 and shall meet or exceed the requirements of ASTM F441.
(2) Fittings shall be iron pipe size (IPS) Schedule 80 and shall meet or exceed the requirements of ASTM F437.
(3) The maximum water design velocity shall be 5 ft./sec.
(4) Pipe: Corzan, GFHarvel of IPEX.
(5) Fittings: Corzan, NIBCO or IPEX.

c. All socket type joints shall be made with solvent cements and primers shall meet or exceed current ASTM standards. Solvent cement and primer shall be listed by NSF International for use with potable water and approved for use with pipe and fittings manufacturer.
d. Provide smooth pipe supports and bracing to allow for expansion and contraction. Spaced per manufacturer's recommendations.
e. Installation shall be by a factory trained installer per manufacturer's installation instruction. Provide Owner with minimum of 5 year manufacturer's warranty.

6. Plastic piping shall not be used in air plenum spaces
7. Cross Linked Polyethylene (PEX): Manufactured in the PEX-A Engel Method by Uponor, Watts Water PEX, Nibco, Viega PEX Ultra, ½" through 3", Zurn.

a. Contractor to formally submit product/installation package to local jurisdiction prior to bid.
b. Piping shall meet or exceed ASTM F876-04 and ASTM F877-02a and be certified by NSF International for use with potable water. Piping shall be rated at 100 psi at 180°F.
c. Fittings shall be PEX-A cold expansion type manufactured to meet or exceed ASTM F 1960-04, ASTM 1807, ASTM 2098, ASTM 2080 and by certified by NSF International for use with potable water.
d. Provide angle stops, straight stops, bend supports, clip and/or pex rails as supplied by tubing manufacturing for supporting tubing. Support piping every 2'-8". Support pipping can exceed 2'-8" when using a listed support assembly such as a PEXA pipe support.
e. Installation shall be by a factory trained installer per manufacturer's installation instruction. Provide Owner with 25 year manufacture's warranty.
f. Shall not be used on systems exceeding 140ºF.
g. Individual piping shall maintain an 2" minimum spacing. Bundled hot and cold piping is not acceptable
h. PEX piping or assembly shall be air plenum rated to meet ASTM E84.

F. Rigid Natural Gas Piping:

1. Inside Building:

a. Schedule 40 black steel with threaded fittings, ASTM A 53/ASTM A 53M-04a.
b. Type L seamless soft copper, ASTM B 88-03 and copper fittings. Copper piping shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 standard cubic of gas.

2. In Ceiling Air Plenum:

a. Schedule 40 black steel with standard butt weld fittings.
b. Type L seamless soft copper and copper fittings. Copper piping shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 standard cubic of gas.
c. All welded or brazed connections in air plenum ceilings and concealed spaces. Use no valves, threads, unions or connectors in these locations. Concealed gas piping in solid partitions shall be inside a Schedule 40 black steel pipe sleeve capped at both ends and vented outside the building.

3. Inside Mechanical Room: Schedule 40 black steel with threaded fittings.
4. Exterior Underground (2 psig or less):

a. PE (polyethylene) plastic and shall be marked “gas” and “ASTM D 2513-04a” and shall be used with factory assembled steel riser.
b. Type L seamless soft copper, ASTM B 88-03 shall be used with factory assembled steel riser. Copper piping shall not be used if the gas contains more than an average of 0.3 grains of hydrogen sulfide per 100 standard cubic of gas.

5. Exterior Aboveground:

a. Schedule 40 steel, black, welded and seamless with threaded fittings, ASTM A 53.
b. Schedule 40 steel, hot dipped zinc-coated (galvanized welded and seamless with threaded fittings, ASTM A 53.

G. Flexible Gas Piping Systems:

1. FlashShield metallically shield corrugated stainless steel tubing (CSST), complying with the ANSI LC-1/CSA standard “Fuel Gas Piping System Using Corrugated Stainless Steel Tubing. Material to be FlashShield metallically shielded CSST manufactured from ASTM A240 Type 304 stainless steel with a minimum wall thickness of 0.01”. Tubing jacket to be multilayer, consisting of a metal mesh between two semi-conductive polymer layers being UV-Resistant and meeting ASTM E84 rating of 25 for flame spread and 50 for smoke. Mechanical tube fittings manufactured from ASTM B16 Type 360 brass. Brass fitting to include jacket-lock feature to provide a contact seal between the fitting assembly and outer polymer layer of the CSST. System shall be installed per the current version of the design and installation guide and per local code. FlashShield supplied training shall be obtained by all installer prior to installation. The gas piping system shall be pressure tested in accordance with all requirement of local code, ANSI LC-1 and the most current edition of the FlashShield Design and Installation Guide.

2.2 VALVES

A. Acceptable Valve Manufacturers:

1. Apollo, Titan FCI, Milwaukee, Victaulic, Nibco, Watts, Mueller, Hammond, Griswold, Anvil-Gruvlok, Grinnell, Anvil-International, Uponor.
2. All valves for potable water shall be low level lead 0.25 percent average lead content.

B. Gate Valves –Domestic Water Piping:

1. 2 inches and Smaller: Milwaukee Figure UP148 or Hammond Figure UPIB640, 125 pound bronze bodied valve with screwed end connections. The solid style disc and bonnet shall also be bronze, and the rising-type stem shall be copper-silicon alloy.
2. 2-1/2 inches and Larger: Milwaukee Figure 2885 or Hammond Figure IR 1140, 125 pound cast iron bodied valve with bronze fittings and flanged end connections. The solid style bronze disc shall be fully guided. The stem shall be steel with OS & Y construction.

C. Check Valves –Domestic Water Piping:

1. 2-1/2 inches and Smaller: Milwaukee Figure UP509, Hammond Figure UPIB904, 150 pound bronze, screwed ends, bronze disc, swing check.
2. 3 inches and Larger: Milwaukee Figure 29274-M13/Hammond IR1937, 150 pound check valve with 3 percent nickel cast iron body and disc, a stainless steel seat and pin and flanged connections.
3. 2 inches and Larger: Grooved end swing check valve, Victaulic Series 712, 300 psig CWP, with ductile iron body and cap, with stainless steel disc and shaft, for horizontal installation or Grinnell Style 590.
4. Non-Slam Check Valves - 3 inches and Larger: Mueller Steam Specialty 105 MAT, Titan FCI CJ50-DI-DBS, 125 pound globe style check valves with EPDM inserts.
5. Non-Slam Check Valves - 2-1/2 through 12 inches: Victaulic Series 716, 300 psig spring-actuated check valve, with stainless steel spring and shaft, for horizontal or vertical installation.

a. For sizes 14 through 24 inches, valves shall be Victaulic Series W715, rated to 230 psig, with stainless steel spring, shaft, and dual disc(s), and EPDM seat or Anvil-Gruvlok 7800.

D. Ball Valves –Domestic Water Piping:

1. 3" and smaller for domestic water: Milwaukee UPBA475/485 two piece full port forged brass body 600 WOG chrome plated ball, blow out proof stem, reinforced PTFE seats and where necessary, extended stems for insulation conforming to NSF 61 for potable water.
2. 3" and smaller for fuel oil: Milwaukee BA 475/485 two piece full port forged brass body 600 WOG chrome plated ball, blow out proof stem reinforced PTFE seats conforming to UL-YRBX for flammable liquids.
3. Grooved End Ball Valves: 1-1/2" and Larger, for domestic water service with steel piping systems, GRUVLOK Series 7500, Grinnell Fig BV835 or Victaulic Series 726 or Anvil-Gruvlok 7500 two-piece ductile iron body with chrome-plated steel or stainless steel standard port ball, blow out proof stem, PTFE seats, and lever handle or gear operator.
4. 4" and larger for domestic water: Milwaukee Series F20SS150R-02 flanged full port 150 lb. stainless steel ball valve with stainless steel ball and stem, reinforced PTFE seats and blow out proof stem. Provide extended stems for insulation or balancing stops for modulating services.

2.3 FLOW FITTINGS/BALANCE VALVE

A. Acceptable Manufactures:

1. Bell & Gossett, Nibco, Mueller, Victaulic/TA Hydronics, Anvil-Gruvlok, Grinnell.

B. Bell & Gossett "Circuit Setter" or Victaulic/TA Hydronics balance valve. All bronze/brass ball or copper-alloy/ductile iron globe type construction with memory stop and integral valved read-out ports. Provide metal identification tags indicating location, size, GPM and meter reading.

2.4 MIXING VALVES

A. Acceptable Manufacturers:

1. Symmons, Watts, Leonard, Powers, Lawler, Apollo.

B. Point of use Mixing Valve: Powers-Watts HydroGuard Lead Free Series LFe480 or LFG480 tempering valve. Adjustable temperature selection with locknut. Temperature controls to ASSE 1070, down to 0.5 gpm for the LFe480 and 0.25 gpm for the LFG480. Intergral check with screen to prevent cross flow and filter out debris. Provide painted recessed cabinets if there is no cabinet under the sink. Verify color of cabinet with Architect.

2.5 BACKFLOW PREVENTERS

A. Acceptable backflow preventer Manufacturers:

1. Watts, Conbraco, Febco, Ames, Lawler, Hersey, Wilkins, Apollo.

B. Contractor shall verify the availability of testing agency for reduced pressure zone backflow preventers in project area.

C. Commercial Laundry Washer, Therapy Tub - Watts #008PCQT, high pressure, continuous pressure, vacuum breaker, lead free, anti-siphon and spill resistant with tee handles and a left sided test cock.

D. Boiler, Irrigation - Watts #009-QT-Reduced Pressure Zone assemblies, high hazard, continuous pressure and quarter turn ball valves.

E. Ice Machine, Carbonator for Beverage Dispensers and Coffee Machines - Watts #SD-3 stainless steel, dual check valve, continuous pressure, lead free, low hazard, with intermediate atmospheric vent.

F. Residential Dishwasher Discharge Air Gap: Delta #72020-CH, chrome finish, 2 ¼" height above counter, 1 5/8" diameter, 5/8" dishwasher inlet and 7/8" outlet. Lifetime faucet and finish warranty.

2.6 WATER PRESSURE REDUCING VALVES

A. Acceptable Manufacturers:

1. Watts, Conbraco, Armstrong, Febco, Wilkins, Apollo.

B. Valves 1/2 inch to 2 inch: Watts, Model LFU5B, lead free, including nipple and bronze strainer. PSI regulating range: 25-75. Maximum working pressure of 250 psig. ASSE Standard No.1003.

C. Furnish and install a pressure reducing valve ahead of the dishwasher if required and set to provide 20 psi at the inlet. On dishwasher with built-in water heater consult with kitchen equipment supplier and provide watts U5LP 1" reducing valve with built-in thermal expansion bypass and pressure gauge on the booster water heater inlet piping. Set the reducing valve to provide 15 psig water during full flow conditions.

2.7 BACKWATER VALVES

A. Acceptable Manufacturers:

1. Josam, Wade, Zurn, J.R. Smith, Mifab.

B. Where shown on the drawings provide backwater valves shall be Josam 67500 Series, hub & spigot, swing-check type, cast iron body, bronze valve and stem.

2.8 GAS VALVES

A. Acceptable Manufacturers:

1. Apollo, Siemens, Asco, Backmann, Milwaukee, Hammond, Velan, Homestead.

B. 2" and Smaller: Milwaukee BA 475 threaded forged brass two piece ball valve with chrome plated ball, blowout, blowout proof stem and reinforced PTFE seats in accordance with UL-MHKZ (600#) CSA 3371-08/CSA3371-88 (1/2#), CSA 3371-92/CSA 3371-12 (5#), CSA 3371-94 (125#). Provide stem extensions where required.

C. Provide a natural gas pressure regulator shall be Maxitrol to reduce gas pressure to an acceptable limit at gas fired equipment. See plans for gas company meter outlet pressure. See mechanical equipment schedule for required capacities and operational manuals for pressure limits. Provide with code approved pressure limiting device or pipe pressure regulating valve relief vent individually to the outside. Verify with the local code authorities.

D. Gas Solenoid Valves: Asco #K3A4 Series, approved UL rated automatic gas shutoff valves. Normally closed, 24 volt D.C. with manual reset, sized to match gas piping service to equipment.

2.9 MISCELLANEOUS VALVES:

A. Drain Valves- Domestic Water Piping:

1. Nibco #C56-VB, ¾" male thread, tee handle and vacuum breaker.
2. Apollo Series 78-100 ball valve, 600 pound, bronze body, chrome plated brass ball and blow-out proff brass stem, reinforced Teflon seals and seats and ¾" hose thread outlet with cap or Milwaukee BAIOOH.
3. Milwaukee UPBA480BH, HoseXPress 200 lb. with blow off proof stem.
4. Domestic water drains shall be equipped with vacuum breakers.

2.10 PIPE TRACING

A. Acceptable Manufacturers: Ray Chem, Hesco, Nelson, Chromalox.

B. Electric Heat Pipe Tracing (Outside of Pipe):

1. Raychem "XL-Trace", U.L. listed self-regulating heat tracing strip with parallel circuit and able to be cut in field to desired length. Provide thermostat and contactor. Sized at 10 Watts per foot, 120 volt.
2. Use component kits provided by manufacturer to satisfy code requirements on grounding, control and marking and to ensure that installation instructions of the manufacturer are followed.
3. Test each circuit both prior to and after thermal insulation is installed.
4. When piping is buried in ground provide 1 ½" fiberglass pipe covering and insulation over pipe and tracing or provide the amount of insulation recommended by the manufacturer, which ever is greater.

Part 3. - EXECUTION

3.1 GENERAL

A. Provide offsets and transitions to plumbing piping due to existing structure and trades work.

B. Slope water piping 1" per 40' and arrange to drain at all low points.

C. All storm piping sloped 1/8" per foot and all sanitary piping sloped at 1/4/ft, 4" and larger may be sloped at 1/8" per foot where approved by AHJ, unless noted otherwise or if required to meet inverts. Notify engineer of any changes. All horizontal vent piping shall be sloped to allow internal moisture drain-off.

D. All underground sewer pipe within 10 feet of buried water supply piping shall be constructed in accordance with State and/or Local Code.

E. Provide all appropriate sanitary piping fittings, wyes and bends. No double-wye fittings for sanitary drainage in horizontal position shall be used.

F. Vent pipes passing through roofs shall terminate at least 12" above the roof line.

G. Above grade plastic drain and vent piping horizontal runs cannot exceed 30 feet, without allowance for expansion. Solvent welds shall be done with a contrasting primer to the color of the pipe and cement. Plastic piping shall not be installed in air plenum spaces including parking garage area.

H. Provide shut-off valves by Code and good installation practice for the proper isolation of equipment. All branch take offs shall have isolation shut off valves. Provide extended stem valves where required for insulation. Except as otherwise specified or shown on plans, valves 2-1/2 inch and smaller shall have screwed end connections and valves 3 inch and larger shall have grooved end or flange end construction. Install manual drain valves at every low point of each water piping system.

I. Mechanical formed tees connections as created by T-Drill shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the surface to form a collar having a height of not less than three times the thickness of the tube wall. Branch tube shall not obstruct the flow in the main line tube. All joints shall be brazed in accordance with the Copper Development Association. Soft soldered joints will not be permitted. Mechanical formed connections shall be listed by the National Standard Plumbing Code, B.O.C.A., I.A.M.P.O., S.B.C.C., H.U.D., U.S. Army corps of Engineers, Underwriters Laboratory, ASME Code for Pressure Piping and shall be acceptable to governing authorities.

J. All threaded nozzle fixtures to have atmospheric vacuum breakers.

K. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained

representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).

L. Installation of cross connection control devices and related valves shall maintain 1'-6" clear from wall or other obstructions, no more than 5'-0" above floor or closer than 2'-0" from floor.

M. Provide escutcheon plates at all wall, floor, or ceiling piping penetrations. This includes all mechanical piping systems. Escutcheon plates shall match the finish of the surrounding area.

N. Exposed PVC venting through roof shall be painted at the discretion of the Architect.

O. Provide a dielectric coupling or waterway fitting at all connections of dissimilar metals. Provide adequate clearance for insulation and for access to valves. All piping shall be concealed and shall maintain proper clearances for ceilings, ducts, walls, lighting, etc. except that piping may be exposed in mechanical areas. At all fixture and equipment connections where nipples are necessary between copper fixtures and tubing, such nipples shall be full size brass nipples with brass or copper adapters.

P. Ream pipe ends to remove burrs. Make joints smooth and unobstructed inside. Remove any obstructions or debris inside piping, blowing it out with compressed air or otherwise cleaning it internally immediately prior to assembly.

Q. Provide shut-off valve for all gas fired equipment. Locate valve in an easily accessible location.

R. Push-to-Connect Joints: Install Permalynx joints in accordance with the manufacturer's latest published installation instructions. Prepare and mark tubing ends using a tool supplied by the manufacturer and in accordance with the manufacturer's instructions.

S. Install Vic-Press 304™ in accordance with Victaulic recommendations. Pipe shall be certified for use with the Vic-Press 304™ system, square cut (+/-0.030"), properly deburred, and cleaned. Pipe ends shall be marked with a gauge supplied by Victaulic. Use a Victaulic 'PFT' series tool with the proper sized jaw for pressing.

T. Enclose the backwater valves in a tile pipe to allow access to the valve cover. Install suitable secured cover, flush with floor.

U. Provide 1/2" ethafoam on all above grade vertical piping for slab movement at wood floor penetrations.

V. Contractor shall comply with the CISPI Guide Lines Manual when installing piping.

W. Provide cleanouts where all sanitary and storm piping are connected to existing piping to facilitate testing.

X. **[**Heat tracing power connection by Electrical Division. Coordinate load voltage and connection point with Electrical Contractor**].**

Y. In the event plastic and/or PEX piping is approved and installed, contractor shall maintain a minimum of 2 inch spacing hot and cold water and individual floor penetrations shall be provided. Bundling of hot and cold piping is not acceptable.

Z. PEX piping shall not be installed within the first 1'-6' of piping connected to a water heater.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Contractor shall provide all labor and materials to provide a complete plumbing and fuel system for all fixtures and equipment shown on drawings. Contractor shall rough-in and make final connections to all fixtures and appliances supplied by others.

B. Contractor shall thoroughly review the manufacturer's installation instructions prior to installing any piece of equipment or its associated service, (domestic drains, water piping, etc.). Any conflicts between the manufacturer's installation instructions and the plans or specification shall be brought to the engineer at once for clarification. Contractor will not receive additional money for installations requiring modifications due to these conflicts.

C. All plumbing systems shall meet State and Local codes as well as ADA requirements.

D. Gas Service: Make arrangements with the local gas company and pay all costs and fees for firm gas service including gas meter with shut off valve on each side of the meter. Verify exact location of gas meter and provide a gas shut off valve at the first accessible point within the building. Provide a gas pressure regulator and shut off valve in an easily accessible location at each appliance or unit of equipment and identify valve. Vent gas pressure regulators per code. Coordinate with all gas firing equipment including equipment supplied by others for gas pressure compatibility with the gas company. Contractor to provide Gas Company with a list of gas fired equipment and requirements. Coordinate gas pipe locations with all other trades.

E. Water Service:

1. Provide a combination domestic and fire sprinkler service from a point 5'-0" outside of the building as shown on the drawings. Minimum earth cover to be 7' - 6". Coordinate exact location of new services with other utility services and civil engineer. Refer to civil engineer's plan for continuation of services on site and refer to building Engineer's plan for service into the building. [Provide 'Tee' fitting on sprinkler service in building, for domestic service connections.] Provide backflow prevention that complies with AWWA-M14, Section 6.3 (1990) if required by local authorities. Contractor shall excavate, install, backfill, compact and patch to match existing conditions.
2. Provide domestic water meter, as supplied by the city, purchased by the contractor. Installation shall conform to City requirements.
3. Coordinate with the Civil Engineer, City Water Department, City Fire Marshal and the Fire Sprinkler Contractor.
4. Coordinate with the General Contractor. Verify and provide any special irrigation system requirements.

F. Sanitary and Storm Service:

1. Provide sanitary and storm sewer service from a point 5'-0" outside of building where shown on the plans. Minimum earth cover to be 5' - 0". Contractor shall excavate, install, backfill, compact and patch to match existing conditions. Contractor shall coordinate with the city and civil engineer.

Part 2. - PRODUCTS

2.1 EQUIPMENT

A. Miscellaneous Plumbing Equipment:

1. Cleanouts:

a. Floor cleanouts in finished areas shall be Josam (Sioux Chief, MIFAB, Wade, Smith, Watts, Ancon, Zurn) Series 56000, with Nikaloy top. Provide carpet marker for carpeted floors. In unfinished areas, use Series 56000 floor cleanout with cast iron top. Install cleanouts at the bottom of all stacks, as indicated on drawings and by code.
b. All floor set fixtures further than 5 feet on a horizontal branch with separate concealed traps, such as a floor drain or trench drain receiving fouling waste shall have an integral cleanout or a cleanout as close as possible to the fixture
c. Bottom of stacks in unfinished areas shall be provided with a cleanout that has a plug with a seating flange, lead gasket and four square lugs for plug removal.
d. Access cover for wall cleanouts in finished rooms shall be Josam Series 58600 stainless steel round cover with screw.
e. Floor cleanouts in residences shall be 56010.
f. Clean-out plug or cover plates in walls shall not face public corridors or public areas.

2. Roof Jacks:
   a. Terminate all vents stacks 12" above roof in a frost-proof galvanized roof jack. Use lead top on cast iron and vinyl top on PVC vent pipe.
   b. All vents thru roof shall be 3" unless otherwise noted.
3. Floor Drains:
   a. Approved Manufacturers: Josam, Wade, Watts-Ancon, J.R. Smith, Zurn, Sioux Chief, MIFAB.
   b. Josam Series #30000-A complete with flashing and clamp and with adjustable nickel-bronze strainers.
   c. Floor drains located below grade level and on sanitary systems shall be Josam Series 67100-A with integral backwater valve in concrete floors.
   d. Floor drains in the mechanical rooms shall be Josam #32100 cast iron.
   e. Floor drains in separate producing areas such as car washes shall be Josam #32100-AE-81 adjustable cast iron, medium duty, “Superflo” with removable sediment bucket and anti tilting grate.
   f. Floor drain for garage area flammable waste system shall be Josam #32100, cast iron, medium duty, anti-tilting, cast iron grate. No trap.
   g. Floor drains in wood floors above grade shall be of the type which can be set with rim flush with gypcrete floor topping.
   h. Floor drains shall be provided with a separate deep seal P-trap.
4. Shock Arrestors:
   a. Approved Manufacturers: Josam, Zurn, Sioux Chief, Watts Drainage, MIFAB.
   b. Josam Absorbatron II 75000-S with wrought copper shell. Provide where required by Code, on flush valve systems and on the piping to any laundry unit or dishwasher. Size accordingly.

B. Flammable Waste Trap (FT): Flammable Liquids Interceptor (FW) (Polyethylene): Streim Flammable Liquids Interceptor Model # FLI-XXX, shall be lifetime guaranteed and made in USA of seamless rotationally-molded high density polyethylene. Intercepetor shall be furnished for below grade installation, with field adjustable riser system and vent connections. Interceptor shall come with built-in test caps and three outlet options. Composite cover shall be gasketed and constructed to a minimum H-20 traffic rating. The interceptor will have a TeleGlide fully adjustable riser system for below grade installations, molded-in lift handles, forklift ready underbelly and tie-down points for anchoring the unit to the substrate. Flammable liquid Interceptor shall have a xxx gallon holding capacity (xxx cu. Ft.), sand holding capacity of xxx gallons, and a flammable liquid holding capacity of xxxx gallons OR

   (Steel). Midwest Tank Company, PPF Metal Fabricating 35 cubic feet (min.) capacity. Steel 3/16" with bitumastic coating with 3/8" gas proof steel cover suitable for a vehicle service area. Tank shall be independently vented to the roof.

C. Sump Basin (SPX): Basin and cover shall be fiberglass Weil (Topp, Gould, Zoeller). Install flush with finished floor and provide durable cover capable of supporting foot traffic. Verify depth required.

D. Sump Pumps (SPXX): Weil (Enpo, Hydromatic, Gould, Swaby, Zoeller, ABS) as scheduled. Pump shall be submersible with permanently lubricated bearings, stainless steel shaft, cast iron housing and galvanized strainer.

1. Simplex: Provide with float switch and high water alarm.

E. Water Heater (WH) Sealed Combustion Combination Burner and Storage Tank Type [ASME]: Provide a (A.O. Smith, Lochinvar, Rheem, State, Richmond, Mor-Flo, Bradford-White, P.V.I., Bock, Reco) sealed combustion water heater, with capacities indicated in the mechanical equipment schedule. Unit shall be AGA certified and have intermittent electronic ignition, glass lined tank, dip tube, screw in magnesium anode rods, turbo shot combustion system. ASME T & P relief valve piped to the floor, 150 psig working pressure, 5 year tank warranty, ASHRAE 90.1b-1992 and NAECA III energy compliant, draft switch. [Provide NSF Standard #5 leg extension kit or water heater must be sealed to floor and be UL sanitation certified if water heater is installed in kitchen area].

F. Venting flues for condensing water heaters or domestic water heating boilers shall be resistant to deleterious effects of corrosive materials, such as chloride ion pitting, crevice corrosion and stress corrosion, cracking and general corrosion in oxidizing environments. Material shall be made of superferritic stainless steel, type AL29-4C. In lieu of stainless steel, Poly Propylene (PP) or Chlorinated Poly Vinyl Chloride (CPVC may be acceptable, but are subject to manufacturers instruction. Poly Vinyl Chloride (PVC) is not acceptable. Concentric venting is not acceptable.

G. Thermal Expansion Domestic Water Absorber: Provide an Amtrol ST Therm-X-Trol [XX-XX] (Rheem, ITT & PT) the domestic water heater. Tank shall have a NSF listed rigid polypropylene liner, heavy duty butyl diaphram and outer steel shell. Tank shall be precharged to 40 psig and be of adequate size. All internal wetted parts must comply with FDA regulations. An internal butyl diaphragm shall be used to isolate air charge from water.

H. Circulating Pump (CP): Provide all bronze circulating pump to a B & G Series (Taco, Grundfos, Armstrong, Thrush, Peerless, Paco, Mepco) as scheduled with lubricated bearings. Provide isolation valves, check valve, strainer and balancing valve with integral read-out port and memory stop. Balance system to between 3 and 6 feet per second velocity.

I. Aquastat: Provide a Honeywell, nonimmersion, 30 degree differential, strap on type aquastat to cycle the domestic hot water pump when return water temperatures drop below its setting. The aquastat shall be installed and wired by the Mechanical Contractor.

J. Water Filter (WF-1) (Drinking Water):

1. Approved Manufacturers: Culligan, 3M, Amtrol, Dow Chemical and Ecolab.
   a. Culligan #250A, Level 4, filter housing and filter cartridge, at sink under counter pont of use, replaceable preformed carbon filter for taste, odor and aesthetic chlorine. Rated NSF -53.

K. Ultraviolet Water Purification System: Unit shall be a Trojan UV max Pro 50, rated at 50 GPM with a flow dose of 40MJ per square centimeter. 2" connections, chamber material to be stainless steel single power connection at control panel. 120V/1, maximum current 2.4 amps, to be installed on the domestic cold water supply for the water heaters.

L. Domestic Water Conditioner (WS): Culligan as indicated on Mechanical Schedule (Wigen, Marlo, Robert B. Hill, North Star, Water Control Corporation, Water-Right) Duplex Parallel 50% capacity for each unit. All domestic hot water shall be softened. For duplex unit capacity indicated is for [each tank].

1. Softener resin tank(s) shall be of standard construction. Each tank shall be equipped with upper and lower distribution systems. The resins shall be manufactured to comply with the food additive regulation set forth by the US FDA.
2. Brine tank shall be molded of corrosion-proof, high-density polyethylene with an overlapping and tight fitting cover. Brine tank shall operate with pellet salt only.
3. Control valve(s) shall be MVP flow controller. Hydraulic Activated Diaphragm type. Valves and controllers shall incorporate steps for backwash, brine draw, slow rinse, fast flush and service. System shall be supplied with a fixed orifice backwash flow controller.
4. "Progressive Flow"-Duplex Parallel 50% Capacity at each Unit: Provide regeneration using flow sensor and an electronic PLV programmable controller on each unit.

5. Start-up of softening equipment and operating instructions for Owner's personnel shall be provided by factory representative.
6. A soap testing kit, B & B (Hach) shall be furnished with softening equipment.
7. Electrical Division will provide 120V circuit for the system. All power and control wiring associated with the timer and/or the meter shall be the responsibility of the Mechanical Contractor.

Part 3. - EXECUTION

3.1 GENERAL

A. Provide shut off valve on all branch piping take offs. Locate as close as possible to main in an accessible location. Provide unions threaded connections and shut-off valves on both sides of any of the following but not limited to: Mixing valves, pressure reducing/regulating valves, water softeners, water heaters, check valves, hose reels, circulation pumps, flow fittings, back flow preventers, humidifiers, laundry washers and boiler make-up.

B. Provide temperature and pressure gauges, pressure regulators, strainers, shock arrestors for residential dishwasher and laundry washers and an above counter to air gap fittings to comply with Code for dishwashers.

C. Rough-in and make final connections for all equipment in addition to equipment specified in this section. Coordinate with supplier to obtain correct location and sizes prior to rough-in.

D. Avoid installing sanitary waste piping over any food preparation equipment and food storage area or provide protection from drips with a functional water-tight safe pan.

E. Contractor shall coordinate all floor joist headering required for piping installation. Headering shall be done at contractor’s expense.

F. Coordinate locations of all venting sidewall or through the roof with the Architect and General Contractor prior to installation.

3.2 FIELD QUALITY CONTROL

A. Contractor shall engage a factory authorized representative service to supervise the field assembly of components and installation of domestic water heaters, including pumps, piping and electrical connections. Report results in writing.

1. A factory authorized service representative shall provide start-up service. Start-up to be performed only after complete water heater system is field verified and there is a full load and complete circulation.
2. Verify that the electrical wiring installation complies with manufacturer’s installations requirements.
3. Ensure pumps and operate properly. Start pumps, water heaters and adjust burners to maximum operating efficiency.
4. Measure and record temperature rise through each water heater.
5. Operate water heater, including accessories and controls to demonstrate compliance with requirements.
6. Train Owner’s maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting servicing and preventive maintenance.
7. Schedule training with Owner with at least 7 days advance notice.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Contractor shall provide all labor and materials to provide a complete plumbing and fuel system for all fixtures and equipment shown on drawings. Contractor shall rough-in and make final connections to all fixtures and appliances supplied by others.

B. Contractor shall thoroughly review the manufacturer's installation instructions prior to installing any piece of equipment or its associated services, (domestic drains, water piping, etc.). Any conflicts between the manufacturer's installation instructions and the plans or specification shall be brought to the engineer at once for clarification. Contractor will not receive additional money for installations requiring modifications due to these conflicts.

C. All plumbing systems and products shall meet State and Local codes as well as ASNI, ASME and ADA requirements regardless of information shown within the documents.

D. This contractor shall provide a complete installation manual for each piece of equipment requiring electrical power/control connections scheduled to be performed by the Electrical contractor. This shall be done prior to any rough-ins by them to insure the proper power/control wiring has been provided. Notify the Engineer of any discrepancies between the installation manuals and the electrical plans and specifications for each piece of equipment.

Part 2. - PRODUCTS

2.1 GENERAL

A. Miscellaneous Plumbing Equipment:

1. Carriers for wall hung lavatories:
   a. Provide commercial grade carrier of approved style. Verify with General Contractor for type of wall construction and space prior to ordering carriers.
2. Fittings, Trim and Accessories:
   a. Install stop and escutcheon for each supply pipe, trap and escutcheon for each waste pipe and vacuum breaker supplied with hose attachments or integral with flush valve, or where water connection is below spill line of fixture.
3. Water Closet Seats:
   a. Apartments: Church seat, #135TT, elongated seat, solid plastic open front with cover and molded-in bumpers.
   b. Public or Staff used Restrooms: Church seat, #295C elongated seat, solid plastic, open front, concealed stainless steel check hinges, molded-in bumpers and without cover.
4. Plumbing fixtures shall meet water conserving Green Communities Criteria.

B. Fixtures:

1. ACCEPTABLE MANUFACTURERS:
   a. Lavatories: American Standard, Briggs, Kohler, Toto, Gerber, Mansfield, Zurn, Peerless Pottery, Eclipse, Sloan.
   b. Water closets: American Standard, Briggs, Kohler, Toto, Gerber, Mansfield, Zurn, Peerless Pottery, Eclipse, Sloan, ProFlo.
   c. Tub and shower: Best Bath System, Aquatic Bath, American Standard, Warm Rain/Embassy, Hamilton, Maax, Aquarius, Salo, Aqua Bath, Clairon Bathware and Oasis. **Note:** Grab bars and seats provided by General Contractor for field installation.
   d. Tub/Shower, lavatory and sink faucets: Delta, Symmons, Peerless, Moen, American Standard, Chicago Faucet, Crane, Eljer, Kohler, Speakman, T & S Faucets, Zurn, Gerber, ProFlo.

e. Electric Water Coolers: Elkay, Halsey Taylor, Oasis, Sunroc, Haws, Acorn Aqua.
f. Mop sinks and laundry tub: Fiat, Mustee, Stern-Williams, Swan, Zurn, Jonespec, Gerber.
g. Stainless Steel Counter Sinks: Elkay, Just, LaCrosse, Dayton, Moen, Sterling, Advance-Tabco, Franke, Dayton.
h. Hose bibbs and Wall Hydrants: Chicago Faucet, T & S, Woodford, Josam, Wade, Zurn, Watts Drainage, MIFAB.
i. Toilet seats: Bemis, Beneke, Church, Olsonite, Sperzel, ProFlo.
j. Carriers: Josam, Jonespec, J. R. Smith, Wade, Zurn, Watts.
k. Laundry Box: Guy Gray, Water Tite.
l. ADA Insulation Kits: Truebro, Plumberex, Handy-Shield.

Water Closets

2. Water Closet (PL1P) American Standard, Cadet 3, FloWise, #2832.128, floor mounted, flush tank, 1.28 gpf, two piece, elongated bowl, 12" rough-in, vitreous china, 2 1/8" fully glazed trapway, 3" flush clapper and a lined insulated tank. Meets HET definitions and has a Map rating of 1000 grams.
   a. 3" waste, 2" vent and ½" cold water.
3. Water Closet (PL1Q) (ADA) American Standard, Cadet 3, FloWise, #2835.128, floor mounted, flush tank, 17" high with seat, 1.28 gpf, two piece, elongated bowl, 12" rough-in, vitreous china, 2 1/8" fully glazed trapway, 3" flush clapper and a lined insulated tank. Meets HET definitions and has a Map rating of 1000 grams.
   a. 3" waste, 2" vent and ½" cold water.

Lavs

4. Lavatory (P2C): Cultured marble top furnished by General Contractor and installed by this Contractor.
   a. Trim: Delta #22C341 series, single handle, 5 ¾" long spout, red/blue handle indicators, 1.5 gpm flow control aerator, adjustable rotating temperature limit stop, metal pop-up waste and P-trap.
   b. 1 1/4" waste, 1 1/4" vent, 1/2" hot water and 1/2" cold water.
5. Vanity Lavatory (P2) (ADA): American Standard "Aqualyn" #0476.028, 20" x 17" oval vitreous china, self-rimming lavatory drilled for 4" centerset faucet.
   a. Trim: Delta 22C541, sing1e handle 5 3/4" long spout, red/blue handle indicators, 1.5 gpm flow control aerator, adjustable rotating temperature limit stop, offset open grid strainer.
   b. 1 1/4" waste, 1 1/4" vent, 1/2" hot water and 1/2" cold water.

Tub and Shower

6. Shower (P3N): Best Bath System, #LSS4836B5T, overall dimension 48" x 37" x 79", smooth wall design with gelcoat finish, one piece fiberglass shower. Unit fully reinforced back for on site grab bar installation. Provide a combination of ½" tri-cell laminate core and ½" plywood backing. Unit to have a ½" water threshold, when installed above finish floor.
   a. Trim: Delta shower trim T17030 and valve body #R10000-UNWS for back to back installation, single handle, pressure balance, anti-scald with integral check stops. Volume and temperature controls. Field adjustable temperature limit stop. Provide shower drain strainer, body and trap. Provide a personal hand held shower Delta #RPW336HDF, 2.5 gpm, push button on-off control non-positive type. This unit provides backflow protection by means of a vacuum breaker, Delta #U4900-PK installed between wall supply elbow and braided hose connection. Also, the wane itself has two check valves which individually meet the requirements of ASME A11.18.3 Performance Requirements for Backflow Protection Devices and Systems in Plumbing Fixture Fittings, which is referenced in ASME A112.18.1. These check valves are listed as being in compliance with the ASME A112.18.3 standard. Provide chrome plated, wall supply elbow and a 69" long metal braided hose, push button on-off control, without a check valve, non-positive type, 2.5 gpm with vacuum breaker, wall supply elbow and a 69" long vinyl hose. Provide 3'-0" combination slide/grab bar for slip on hand held shower.
   b. 2" waste, 1 1/2" vent, ½" hot water and ½" cold water.
7. Tub and Shower (P3O): Aquatic #260330M, overall dimension 60"w x 31 1/4"d x 75 1/4"h. Dam height = 17". One piece unit, fiberglass reinforced polyester, smooth wall finish, and slip resistant floor. Above floor rough-in. Shower walls shall be fully reinforced backed for on site installed grab bars. Provide metallic over-the-rim tub filler spout, Delta #RP5834. Provide tub pop-up drain with overflow drain, drain strainer, body and trap. Coordinate color with Architect.
   a. Trim: Delta Shower valve #T13420-SHC, and body #R10000-UNWS for back to back installation, single handle, pressure balance, anti-scald with integral check stops. Temperature controls only. Field adjustable temperature limit stop. Pull-up diverter valve on tub faucet. 2.5

gpm Touch-Clean shower head with rigid shower arm. Provide metallic like over –the-rim tub filler spout with pull up diverter valve. Provide tub adjustable trip lever bath waste pop-up drain with overflow drain, drain strainer, body and trap.

b. 1 1/2" waste, 1 1/2" vent, 1/2" hot water and 1/2" cold water.

Kitchen Sinks

8. Kitchen Sink (P4): Elkay #PSR-3321 20 gauge type 302 stainless steel, self-rimming sink. Size 33" x 19 1/2" x 7 1/4" deep with double compartment, sound deadening undercoat, chrome cup strainers.
   a. Trim: Delta 400 Series, single lever, solid brass chrome faucet with 8" swing spout, 1.8 gpm aerator, and separate spray attachment. Provide all required accessories.
   b. 1 1/2" waste, 1 1/2" vent, 1/2" hot water and 1/2" cold water.
9. Kitchen Sink (P4C) (ADA): Elkay #LRAD-3321 18 gauge type 302 stainless steel, self-rimming sink. Size 33" x 19 1/2" x 5 1/2" deep with double compartment, sound deadening undercoat, off-centered drain openings, chrome cup strainers.
   a. Trim: Delta 400-LF-HDF Series, single lever, solid brass chrome faucet with 8 ¾" swing spout, 1.5 gpm vandanl resistant aerator, and separate spray attachment. Provide all required accessories.
   b. 1 1/2" waste, 1 1/2" vent, 1/2" hot water and 1/2" cold water.

Service Sinks and Basins

10. Mop Basin (P6): Fiat MSB 24" x 24" X 10" molded stone floor sink. Provide with stainless steel strainer.
    a. Trim: Delta #28C2384, faucet chrome polished with rigid vacuum breaker spout, integral check stops, wall brace and wall hook, 3/4" hose thread and four arm handles.
    b. 3" waste, 1 1/2" vent, 1/2" hot water, and 1/2" cold water.
11. Laundry Tub (P6F): Fiat #FL-TD white "molded stone", double compartment. Size 46" x 22" floor mounted. Complete with #A-2 chrome overflow pipe and "P" trap.
    a. Trim: Deck mounted faucet, 4" centers and 6 ¾" swing spout.
    b. 2" waste, 1 1/2" vent, 1/2" hot water and 1/2" cold water.

Water Coolers

12. Water Cooler - two level (P7A) (ADA): Elkay #ESZTL8-C barrier free, wall hung, with capacity of 8.0 gph from 80º F to 50º F at 90º F ambient temperature, stainless steel top with front and side push bars to activate bubbler and baked enamel cabinet of color selected by Architect. Free of lead containing brass parts. Flexiguard safety bubbler. Provide cooler apron #LKAPREZL.
    a. 1 1/2" waste, 1 1/4" vent and 1/2" cold water.

Hydrants and Bibbs

13. Wall Hydrant (P8): Woodford #67C, field testable non-freeze loose key operated, with bronze finish and vacuum breaker.
    a. ¾" cold water.
14. Interior Hose Bibb (P8A): Chicago (inside wall faucet #952) (on wall faucet #998) with 3/4" hose threaded outlet, vacuum breaker and polish chrome plate.
    a. ½" cold water.

Miscellaneous

15. Washing Machine Wall Box (P11D): Guy-Grey, Water-Tite "DU-ALL" drain plastic with single valve hose connections, vacuum breaker, water arrestors and 2" drain connection.
    a. 2" waste, 1 1/2" vent, 1/2" hot water, and 1/2" cold water.
16. Refrigerator Ice Maker Outlet Box (P11M): Oatey high impact poly styrene, recessed in wall type, with ¼ turn brass ball valve.
17. Condensate Wall Box (P11N): Shall be IPS Corporations, Guy Gray #W4012 PVC box with 2" drain opening in bottom of box and 1" opening in top for condensate drain for HVAC unit.
18. Condensate Wall Box (P11P): Fire rated, shall be IPS Corporations, Guy Gray #FRAD12 PVC box with 2" drain opening in bottom of box and 1" opening in top for condensate drain for HVAC unit. Provide matching access cover wall plate with vandal resistant screws and secure to wall box
19. Flexible vinyl insulation system kit, Truebro Hand-lav Guard #102W with accessory #105. Install sink insulation kit on all exposed P-traps and water supplies.

Part 3. - EXECUTION

3.1 GENERAL

A. All exposed piping, supplies and stop valves shall be chrome plated brass unless indicated otherwise. No stops with internal supply lines and no plastic stop valves. Traps shall include chrome plated cast brass with clean-outs however, standard PVC traps for non-food service plumbing fixtures may be installed in non-rated walls. All water supplies to each fixture shall have chrome stop valves. Floor mounted water closets shall be connected using a cast iron floor flange and ring putty or gaskets. Wax gaskets are not acceptable for wall hung fixtures. Provide adequate supports and reinforcing for all wall hung fixtures, valves and shower heads. Install all fixtures rigid, plumb and true.

B. Grout and caulk all fixtures with water and mildew resistant white epoxy shall be Hydroment or Dow Corning No. 786. Grout shall not exceed 1/4" width and shall be installed flush with finished wall or floor.

C. All fixture installation dimensions shall be determined from the Architectural documents. Plumbing fixture colors to be selected by Architect.

D. P-Traps and water supplies insulate per ADA, ANSI and Minnesota Accessibility.

E. Controls for ADA flushing water closets shall be mounted on the wide or most accessible side of the water closet.

F. All shower and bathtub waste shall be Schedule 40, one piece PVC glued or one piece cast iron trap with cast brass pipe soldered connection.

END OF SECTION

DIVISION 23

HVAC DESIGN CRITERIA – 23 00 00

1. SCOPE OF WORK: Provide and install all new, complete HVAC system as described in the contract documents
   - 1.1. Interior and Exterior of Units: Fan coils, fans, condensing units, line-sets, grilles, and ductwork.
   - 1.2. Common Area: Fan coils, fans, condensing units, line-sets, grilles, and ductwork.
   - 1.3. Common Mechanical: Unit heaters
   - 1.4. As an alternate to the base bid in the Laundry Room, provide and install a Mini-Split system and provide engineered design.
2. CODE: All mechanical work shall be designed and installed by the Contractor in accordance with all governing authorities, ordinances and codes.
3. Shop drawings shall be required for the Owner's review and approvals. Shop drawings shall include all required drawings, equipment and fixture submittals and calculations.
4. Each Contractor shall visit site to become fully informed as to existing conditions before submitting proposal. No additional compensation or allowances shall be granted to this Contractor for failure to fully understand existing conditions prior to design and construction.
5. Each Contractor shall coordinate closely with General Contractor and other Contractors to perform the work. Sufficient materials and labor shall be provided as required to maintain progress with all phases of construction.
6. All work, materials and equipment provided under this division shall be guaranteed against defect by this Contractor for one year beyond date of acceptance.
7. Provide all submittals within the final O&M manuals
8. Contractor to provide as built drawings of installed work.
9. INSTALLATION: Install in accordance with manufacturer's instructions.
10. COORDINATION: The mechanical Contractor shall coordinate with all other trades to prevent interference between beams, joists, structures, piping, wiring, etc.
11. All penetrations through fire rated assemblies shall be installed in accordance with the required rating. At the request of the building official or Contractor the Architect will supply UL design numbers to accommodate specific existing conditions.
12. TEMPERATURE CONTROL: system shall be designed to maintain an indoor temperature of 68°f at a point 3'-0" above the floor on the design heating day.
13. ENERGY CONSERVATION: Heating, ventilating and air conditioning systems of all structures shall be designed and installed for efficient utilization of energy in accordance with the Owner's provided energy report, international energy conservation code as well as the local AHJ.
14. Ducts, fans and distribution system shall be designed to minimize air noise and sensibility of air movement.
15. Exterior air conditioning units shall be located and installed on pads as per code in locations as approved by the Owner. Include hurricane tie-down clips at all units.
16. FINAL INSPECTION, TESTING, CLEANING AND ADJUSTING: At completion of work, all parts of the installation and equipment shall be inspected, tested, adjusted, cleaned, and left in a safe, proper operating condition to the satisfaction of the Owner.
17. GUARANTEE: All materials and equipment furnished for this project shall be new and free of defects. All work shall be of good quality, free of faults and defects. All work, materials and equipment shall be guaranteed for one (1) full year from the date of certificate of occupancy. All manufacturer's warranties shall be in excess of Contractor's guarantee.
18. STARTING EQUIPMENT AND SYSTEMS: Provide manufacturer's approved field representative to prepare and start equipment. Adjust for proper operation within manufacturer's published tolerances.

Demonstrate proper operation of equipment to Owner's designated representative. Video tape demonstration and turn over to Owner.

Part 1. - GENERAL

1.1 SUMMARY

A. These plans and specifications constitute a 50% set of documents.

B. General and Supplementary conditions within Division 0 and 1 are hereby incorporated and become part of these Specifications, covering all work in Mechanical Division.

C. Before submitting a proposal on the project, the Contractor shall visit the site and familiarize themselves with the conditions and limitations affecting Mechanical Division work. No additional costs to the Owner shall be allowed for items verifiable during site visits.

D. Contractor shall provide sufficient workers and materials to keep pace with the construction schedule. Contractor shall place orders for equipment such that job progress is not slowed due to late delivery and shall confirm delivery dates with suppliers.

E. The Contractor shall provide office space and storage for materials and equipment supplied. Location shall be as directed by the General Contractor or the Architect/Engineer.

F. Upon completion of the work shown and specified under Mechanical Division and prior to final close out of the Project, the Contractor shall verify in writing that all systems are 100% complete and operating properly. This notification shall include copies of all Subcontractor notifications. Any system not operating properly at final inspection shall be immediately repaired and demonstrated to the Engineer.

G. Rebates or credits provided by utility companies or equipment manufacturers shall be directly credited to the Owner.

1.2 MECHANICAL PLANS

A. The Mechanical Drawings and Specifications shall form a set of Plans for the mechanical work. Neither the Drawings nor the Specifications shall be complete without the other. Any item shown on the Drawings or specified in the Specifications shall be considered as shown and specified on both.

B. Any questions regarding the intent of the Drawings or Specifications shall be brought to the Engineer's attention as soon as possible. If direction from the Engineer cannot be obtained due to time or communication limitations, the greater quantity, higher quality or condition most favorable to the Owner shall be assumed. Contractor shall provide all labor, materials, equipment, and miscellaneous items necessary for a complete and operational mechanical installation, as shown on the Drawings and called for in these Specifications.

C. Drawings:

1. Contractor shall familiarize themselves with Architectural, Structural and Electrical Drawings and Specifications. Coordinate all shafts, chases, furred spaces, suspended ceilings, locations of equipment, etc.
2. Mechanical Contractor shall coordinate routing of all piping and ductwork within soffits provided by the General Contractor. The Mechanical Contractor shall provide all soffiting required to cover installations not coordinated or specifically approved by the Architect and Engineer.
3. Mechanical Drawings are diagrammatic and are intended to show approximate location only. Placement of mechanical equipment and devices shall not interfere with locations or clearances of other trades' materials or equipment.
4. Contractor shall verify locations with architectural elevations.
5. Dimensions given on the Drawings shall take precedence over scaled dimensions. Dimensions, whether given in figures or scaled, shall be verified in the field.

6. Contractor shall verify that the equipment to be furnished under Contract will fit within the available space.
7. Notify the Architect and Engineer of any discrepancies between Electrical, Architectural and Mechanical Drawings.
8. Verify items such as door swings, window locations, casework, etc., before installing any mechanical equipment or devices. All devices conflicting with other trade's work due to lack of coordination shall be relocated at no additional cost to the Owner.

D. The following terms used in the Drawings and Specifications shall be defined as follows:

1. Contractor: Shall mean Mechanical Contractor or any of their Subcontractors.
2. Work: Shall mean labor and/or materials of the Mechanical Contractor or any of their Subcontractors.
3. Furnish: Shall mean purchase, submit for Engineer approval, coordinate with Contract Documents and deliver to site in new, undamaged condition.
4. Connect: Shall mean to bring mechanical service and/or control wiring to equipment, make all final connections, provide all necessary miscellaneous materials required and do final check out to ensure proper equipment connections.
5. Install: Shall mean to store as directed, protect from damage, set in place, connect, test and turn over to the Owner in full operating condition.
6. Provide: Shall mean furnish and install.

E. CAD and Drawing Files:

1. Mechanical CAD drawings prepared by Steen Engineering, Inc. for this Project are instruments of Steen Engineering, Inc. for use solely with respect to this Project. During the course of the implementation of the Project, and with Steen Engineering, Inc. approval, copies may be obtained of CAD drawings for the preparation of Shop Drawings. These CAD drawings shall not be used on other projects, for additions to this Project, or for completion of this Project by others. Any revisions, additions and/or deletions to these CAD drawings, either intentional or unintentional, shall be made at the full risk of the person(s) making such revisions, additions and/or deletions. Such person(s) shall hold harmless and indemnify Steen Engineering, Inc. of any and all responsibilities and liabilities.
2. CAD drawings files of Architectural floor plans, elevations, sections, etc, shall be requested directly from the Architect.

1.3 COORDINATION OF DRAWINGS

A. For typical or repetitive HVAC unit installations, contractor shall schedule an inspection with local and/or state AHJ to review a complete mock-up example installation and receive approval prior to proceeding with additional installations. Installation shall meet all code and manufacturer's service clearance requirements. Contractor shall coordinate installation and subsequent inspection with general contractor and any related trades.

B. Contractor shall submit a ¼-inch scale drawing to the Engineer indicating placement of all mechanical and electrical systems and equipment. Indicate proposed locations of all major equipment and materials, including but not limited to service equipment, exterior wall and foundation penetrations, fire-rated wall and floor penetrations, sizes and location of required concrete pads and bases, and mechanical/electrical equipment room layouts. This effort will require each trade to closely work together to produce a ¼-inch set of coordination drawings for each area of the building.

C. Coordinate scheduling and sequencing required for movement and positioning of large equipment into the building with all other Contractors to minimize impact on their work.

D. This Contractor shall provide any and all input required to complete these drawings.

1.4 MATERIALS AND EQUIPMENT

A. Materials:

1. All materials shall be new and of the type and quality specified herein.
2. Specific materials and equipment specified is intended to establish a minimum standard of required quality. Where specified materials and equipment fail to meet minimum standards of existing federal, state and local codes and ordinances, the governing codes and ordinances shall prevail.
3. The Contractor shall provide all minor miscellaneous materials necessary for the complete mechanical installation.
4. For materials and equipment specified by description only, the Contractor shall provide materials or equipment suitable for the purpose intended. These shall be in conformance with all governing codes, these Specifications and normal trade practice.
5. Supply materials and equipment to the site in original packages, containers or crates insofar as is practical. It shall be the Contractor's responsibility to schedule deliveries in accordance with the overall Project schedule. The Contractor shall closely coordinate all deliveries with other Contractors and the Engineer.
6. Provide for proper receipt, handling, storage, and protection from the elements for all materials and equipment to be used on this Project so as to effectively prevent damage or deterioration. Materials or equipment sustaining damage or undue deterioration from any cause whatsoever shall be replaced or repaired by Contractor.
7. The Contractor shall properly protect all equipment from damage during construction. Thoroughly clean all fixtures, equipment and other supplied materials. Make all necessary repairs and apply touch up paint prior to final inspection and contract close out.
8. All materials and equipment shall be listed by Underwriters' Laboratories, Inc. (UL). Materials and Equipment shall meet the UL requirements of each standard in every case where such a standard has been established for that particular type of material. Equipment shall be UL listed as an entire assembly or system.

B. Prior Approvals:

1. All requests for prior approvals must be received by the Engineer at least seven working days prior to bid date. Applications for prior approval shall be considered only from Contractors submitting bids on the Project. Contractors shall determine whether materials receiving prior approval are actually in accordance with details of the Specifications.
2. The Contractor shall be responsible for all deficiencies that may exist from the use of substituted products or equipment, including all additional labor and materials required to complete the work. All dimensions and characteristics of substituted products shall be verified and coordinated with all affected trades and Subcontractors. Any required changes or modifications to the work of any other trade or Subcontractor incurred due to using accepted substituted products shall be coordinated and performed by this Contractor at no additional cost to the Owner.

1.5 SUBMITTALS

A. Within fifteen days after the award of the Contract, the Mechanical Contractor shall submit shop drawings on all major mechanical equipment to the Architect for approval. Shop Drawings shall be submitted by the Mechanical Contractor, not their Subcontractors. **Shop drawings shall be submitted separately per specification section. Multiple shop drawing sections received in a single submittal will be rejected.** These shop drawings shall cover such items as boilers, chillers, pumps, fittings, valves, plumbing fixtures, dampers, AHUs, fintube, exhaust fans, MUAs, diffusers, water heaters, water softeners, fire protection, etc. The Contractor shall thoroughly review each item for compliance with these Specifications making any necessary corrections prior to submittal. Each shop drawing set shall be stamped, signed and dated indicating Contractor review. If the Contractor fails to properly review shop drawings, the Contractor shall reimburse the Engineer for all additional reviews on a time and material basis. No equipment shall be released for shipment or installed prior to final approval by the Engineer.

B. The Engineer will review all Shop Drawings submitted and will retain one copy for record file.

C. Approval Stamp: This review is to verify general conformance with the design concept of the Project and substantial compliance with the information provided in the Contract Documents. This review does not in any way relieve the Contractor or their suppliers of their responsibility to provide all materials and equipment

as specified, in quantities, quality and dimensions required. Submittals will be reviewed with the following actions:

1. "No Exception Taken" indicates that the Submittal appears to conform to the design concept of the Work and that the Contractor, at his discretion, may proceed with fabrication and/or procurement and installation.
2. "Make Noted Corrections" indicates that the Submittal, after noted corrections are made, appears to conform to the design concept of the Work and that the Contractor, at his discretion, may proceed with fabrication and/or procurement and installation, if the corrections are accepted by the Contractor without an increase in Contract Sum or Time.
3. "Revised and Resubmit" indicates that the noted revisions are such that a corrected copy of the Submittal is required for review to confirm that the noted revisions have been understood and made. The Contractor, at his discretion, may proceed with fabrication and/or procurement and installation after submitting a corrected copy and verifying with the reviewer that the corrected copy is acceptable, if the corrections are accepted by the Contractor without an increase in the Contract Sum or Time.
4. "Rejected" indicates that the Submittal does not appear to conform to the specifications, a resubmission is required and fabrication or procurement is not authorized.

D. If the Engineer rejects (Revised and Resubmit or Rejected) the same section two times the engineer shall be compensated for additional reviews. Compensation will be incorporated by Change Order and will be deducted from the Contractor's application for payment. Contractor is responsible for all delays caused by the resubmittal process.

E. Provide samples of materials or equipment proposed to be furnished, if requested. Samples shall become the property of the Architect/Engineer and will be returned only when accompanied by a written request to do so.

F. Record Drawings: The Contractor shall provide and maintain an "As Built" set of bluelines on site, neatly notating routing, location or other field changes to the Contract Documents. Upon Project completion and prior to final close out, turn the "As Built" drawings over to the Owner. Provide a detailed transmittal indicating each sheet and other information turned over to the Owner and acquire their representative's signature. This information shall be included at the project close out.

1.6 WORKMANSHIP AND CONSTRUCTION PROCEDURES

A. Installation of all materials specified herein shall be performed in a neat and workmanlike manner by workers experienced and skilled in the trade. Only the best quality workmanship will be accepted.

B. The Contractor shall regularly clean their work area of debris. Removal of all Contractor generated debris and rubbish caused by their work shall be at the Contractor's expense.

C. Contractor shall coordinate with the Owner any interruptions necessary to existing systems prior to shut down.

D. Coordination:

1. Contractor shall give careful consideration to work of other Contractors on the Project and shall organize work as detailed in the Contractor's ¼" coordination drawings so as to not interfere with or delay the work of other trades.
2. This Contractor shall provide a complete installation manual to the Electrical Contractor for each piece of equipment requiring electrical power/control connections scheduled to be performed by the Electrical Contractor. This shall be done prior to any rough-ins by the Electrical Contractor to insure proper power/control wiring has been provided. Notify the Engineer of any discrepancies between the installation manuals, the electrical plans and the mechanical specifications for each piece of equipment.
3. Contractor shall consult all Architectural, Structural and Electrical Drawings and Specifications that apply for correlating information.
4. Conflicts or interference with work of other trades shall be brought to the attention of the Engineer, in writing, before installation.

5. Should the Mechanical Contractor not follow above procedures and install work that interferes with work of other Contractors, the Mechanical Contractor shall make all necessary changes as directed by Engineer to eliminate the interference or conflict at the Mechanical Contractor's expense.

E. Protection of Equipment:

1. Until final acceptance of the work by the Owner, the Contractor shall be responsible for the safety, good condition, and protection from damage of all materials and equipment installed.
2. If, during shipment or installation, the finish of equipment becomes chipped or scratched, the Contractor shall touch up or refinish surfaces to match original finish.

F. The Contractor shall complete all safety forms required by General Contractor.

1.7 LICENSES, CODES AND FEES

A. The Contractor shall be a licensed Contractor in the State where the project is being constructed. The Contractor shall employ all Licensed Professional Tradesmen required for each type of work covered under these Drawings and Specifications.

B. The Contractor shall procure all necessary certificates and permits and pay all required fees. The Contractor shall pay all fees and installation charges by the utility company for the permanent services.

C. Codes and Ordinances: All work and materials shall meet the requirements of national, state and local codes and ordinances, in every respect. This requirement shall not relieve the Contractor from meeting the requirements of Drawings and Specifications that may be in excess of all codes and ordinances and not contrary to them.

D. Inspections: Regular inspections shall be requested by the Mechanical Contractor to meet all state and local requirements. Contractor shall furnish a certificate of final inspection and approval from all enforcement agencies to the Owner.

1.8 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall deliver two sets of Operation and Maintenance (O&M) manuals to the Owner prior to final close out. O&M manuals shall consist of approved shop drawings, manufacturer's bulletins, equipment manuals, a list of manufacturers with telephone numbers for all equipment that contains replaceable parts and all other data covering the care, maintenance and operation of each piece of furnished equipment. O&M manuals shall be neatly bound in 3-ring binders, contain an index and section tabs and be labeled with the Project name.

B. Name, address, and telephone number of each Contractor installing equipment and systems, local representative for each item of equipment and each system. Table of contents shall correspond to the Specifications with the Section tab sheets placed before the respective Shop Drawings and operation and maintenance instructions.

1. Warranties for more than 1 year shall be included in appropriate section.
2. A maintenance and lubrication schedule shall include each motor, function, control location, fuse location, belt sizes type of lubricant, and rate of lubrication in accordance with manufacturer.
3. A filter maintenance schedule shall include filter size and quantity for each unit, located by room number.

1.9 OPERATING INSTRUCTIONS AND TESTING

A. The Contractor shall fully instruct the Owner in the operation of mechanical equipment prior to final close out. Contractor shall provide, without additional expense to Owner, services of competent instructors who will give full instruction in the care, adjustment, operation and maintenance of all mechanical systems provided by this Contractor to Owner's permanent employees. Instructor shall be thoroughly familiar with all parts of the installation that they are to give instructions and shall be trained in operating theory, as well as in practical operation and maintenance work. Factory trained instructors shall be employed wherever they are

available. Instruction shall be given during regular work week and at a time just prior to the time the equipment is accepted and turned over to Owner for regular operation.

B. The Contractor or his representative shall provide a minimum of five days instruction period for Owner's personnel.

C. Contractor shall test all equipment installed under this Specification and shall demonstrate its proper operation to the Engineer. No equipment shall be tested or operated for any purpose until it has been fully prepared, connected and made ready for normal operation. Damage to equipment due to improper or ill-timed operation or testing shall be repaired, at Contractor's expense, before final inspection and acceptance.

1.10 WARRANTY

A. The Contractor shall guarantee all materials and equipment to be free of defects that may develop in any part of their work, caused by faulty workmanship, material or equipment failures, for a minimum of one year from the date of final completion of the Project or for as long as normal equipment manufacturer warranties are in effect from the date of final completion of the Project, whichever is later.

B. During the guarantee period, notification by letter, personal contact or telephone conversation of a problem with any mechanical system, shall cause the Contractor to respond within one week, making repairs or corrections as necessary. After all repairs and corrections are complete, the Contractor shall notify the Engineer.

C. During the guarantee period, the Contractor shall agree to provide 24 hour service on call for emergency.

Part 2. – PRODUCTS

N/A

Part 3. - EXECUTION

N/A

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Work included under this Division shall consist of furnishing labor and materials necessary for the installation of the work called for under the Mechanical, Fire Sprinkler Protection, Temperature Control and Mechanical Test & Balance contracts as listed in the Instruction to Bidders, as specified, and as shown on Drawings to provide a complete, operable and approved system.

1.2 REFERENCES

A. The following is a partial list of related standards:

1. Air Conditioning and Refrigeration Institute (ARI).
2. American National Standard Institute (ANSI).
3. American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE).
4. American Society of Mechanical Engineers (ASME).
5. American Society for Testing and Materials (ASTM).
6. Air Moving and Conditioning Association (AMCA).
7. Manufacturer's Standardization Society (MSS of the Valve and Fittings Industry, Inc.).
8. National Electrical Manufacturers Association (NEMA).
9. Plastic Pipe Institute (PPI).
10. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
11. Steel Tank Institute (STI).

1.3 QUALITY ASSURANCE

A. Where equipment is specified by manufacturer, brand name or catalog number, this shall establish the standard of quality and style of the product to be provided under the Contract.

B. Where two or more units of the same kind of equipment are required, they shall be products of a single manufacturer. Mixing and matching of various manufacturer's like or similar components shall not be permitted.

C. The Contractor shall field verify and inspect existing buildings for connections to existing systems, equipment, and materials designated, on Drawings or in Specifications, to be used.

D. The Contractor shall have full responsibility of component parts of the mechanical system to ensure that new equipment, integrated with existing equipment and systems, will perform and operate in accordance with requirements of the Specifications without excessive or unusual service or maintenance requirements.

E. The Contractor shall be responsible for verifying locations of such things as piping, ductwork, equipment, door swings, heights of cabinets and counters, etc., prior to the installation of any mechanical equipment. Installed mechanical work that interferes with the work of other trades shall be relocated by the Mechanical Contractor at no additional cost to the Owner.

F. Contractors shall coordinate with all other trades and install their systems in the space provided/coordinated within the structure. Install systems and materials for ease of maintenance. Equipment arrangements shall provide at least the minimum clearances as recommended by equipment manufacturer to facilitate proper maintenance and servicing of system. Deviations in minimum clearance requirements shall be permitted only upon prior written authorization from the Architect/Engineer.

G. For project sites higher than 2000 feet or more above sea level, gas fired equipment shall be modified to maintain specified output.

Part 2. - PRODUCTS

2.1 FIRE BARRIER PENETRATION SEALING SYSTEMS:

A. Approved Manufacturers: Hilti, 3M, Transco Products, Nelson Flameseal Systems, Tremco, Inc..

B. Firestopping materials shall conform to local building code requirements and shall be tested according to UL 1479 and ASTM-E84 for through-penetration firestop systems.

C. Firestopping materials shall be furnished by a supplier who specializes in the selection and furnishing of firestopping materials for building systems.

D. Submit shop drawings including a penetration protection schedule which lists each fire resistive construction type for this project, its fire rating, item penetrating and insulation (if any) UL through-penetration firestop systems number, manufacturer and model numbers. Include installation diagrams and product data sheet.

E. Contractor shall submit all fire stopping methods to Local Authorities for approval. Provide copies of all approved fire stopping methods to the Engineer. Seal all penetrations and sleeves through floors and fire walls with high temperature, fire rated sealant. Fire stop material shall be 3M brand Fire Barrier Penetration System. In lieu of type system described above, modular component system shall be ProSet System Inc. may be utilized. Install the appropriate concrete or wood penetration system to comply with Code.

2.2 WALL, FLOOR, AND CEILING OPENINGS

A. General Requirements:

1. Contractor shall be responsible for exact sizes and locations of chases and openings required for mechanical work.

B. Chases and Openings:

1. General Contractor shall leave chases and openings in walls, floors, ceilings, and partitions where shown on Drawings or otherwise necessary to receive mechanical work. It is this contractor's responsibility to coordinate sizes and locations prior to framing, pouring or setting of precast.

2.3 SLEEVES

A. General Requirements:

1. Provide sleeves in conjunction with water tight piping passing through concrete or masonry walls, partitions, and slabs. Provide sleeves in mechanical equipment rooms and chases to prevent water flooding from floor to floor in addition to separating piping from building structure.
2. Sleeves shall extend 3" beyond the full thickness of walls and slabs and shall be at least 2 pipe diameters larger than or 2" larger than ducts piping passing through. Where piping with covering is installed, a minimum of 1" shall be provided between outside of pipe covering and inside surface of the sleeve.

B. Duct Sleeves:

1. Material: Except as otherwise indicated, duct sleeves shall be constructed of minimum 22 gauge galvanized iron.
2. Vertical Sleeves: Vertical duct sleeves through floors shall have space between duct and sleeve packed with an approved fire stop material flush with top of sleeve to make a fire rated and watertight joint. Insulated duct shall have foamed rubber insulation full length within sleeves.
3. Placement: Set sheet metal sleeves for ductwork passing through floors above grade. Sleeve shall extend 3-inch above finished floor elevation. Sleeve shall be supported in place before floor is poured and shall

be caulked to make a waterproof joint between floor and sleeve. Where more than one duct is passing through a floor slab above grade and one floor opening for all ducts is provided, sleeve shall be same size as the overall opening.

4. Interior Sleeves: Ductwork through walls shall have soundproof packing in non-rated wall sleeves and an approved fire stop material in fire rated wall sleeves. Ducts passing through corridor walls not containing fire dampers shall be sleeved.
5. Exterior Sleeves: Ductwork passing through exterior walls shall be sleeved and caulked watertight. Exterior ductwork shall be so installed as to pitch away from wall penetration a minimum of ¼-inch per foot.
6. Fire Rated Wall and Floor Openings: Ductwork passing through fire rated walls and floors shall be provided with an Underwriters' Laboratories listed duct and sleeve assembly. Duct and sleeve assembly shall meet or exceed fire rating of wall and floor through which the duct passes.

C. Pipe sleeves:

1. Exterior Walls: Sleeves shall be standard weight steel pipe. Install sleeves in exterior walls and floors below grade with approved caulking between sleeves and piping to make it waterproof. Plastic sleeves shall not be used.
2. Floors: Sleeves shall be standard weight steel pipe. Vertical pipe sleeves through floors shall have space between pipe and sleeve packed with an approved fire stop material flush with top of sleeve to make a watertight and fire rated joint.
3. Interior Sleeves: Sleeves shall be standard weight steel pipe. Piping through walls of adjacent rooms shall have soundproof packing in non-rated walls and an approved fire stop material in fire rated walls.
4. Fire Rated Wall and Floor Openings: Piping passing through fire rated walls and floors shall be provided with an Underwriter’s Laboratories, Inc. listed pipe and pipe sleeve assembly. Pipe and pipe sleeve assembly shall meet or exceed fire rating of wall and floor which the pipe passes through.
5. Contractor shall provide all sleeves required through footings, foundation walls and floors. Underground water services as indicated on plans shall be sleeved with schedule 40 PVC sleeving. Sleeve to be (1) size larger than the pipe it serves. Extend sleeves 0’-3” beyond penetration. Coordinate with Structural Engineer.

2.4 ACCESS PANELS

A. The Contractor shall provide means of access for all equipment, smoke/fire dampers, fire damper, valves and fittings specified to comply with Local Code. Furnish wall and ceiling access panels to the General Contractor for installation. Access doors and panels required within rated separations shall carry the appropriate rating. Conform to Division 8 access panel specifications. Contractor to provide separate per unit price per access panel for pricing purposes.

Part 3. - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. On-Site Review: Contractor shall visit site to become thoroughly acquainted with existing conditions of site and services.
2. Existing Active Services: When encountered during construction, Contractor shall protect, brace or support pneumatic tubing, existing active sewers, water, gas, ductwork, or other services for proper execution of Work.
3. Inactive Services: If encountered during construction, Contractor shall cap or plug inactive pipes, ducts, and temperature control tubing or wiring at no additional cost to Owner.
4. Responsibility: Liability for repairs or replacement of damaged or defective materials, including, but not limited to, property damage resulting from negligence or other causes, shall be the Contractor's sole responsibility until work has been accepted by Architect/ Engineer and Owner.

3.2 PREPARATION

A. Protection: After delivery, and before and after installation, equipment shall be protected against theft or damage.

1. Contractor shall protect plumbing fixtures, metal heating enclosures and other equipment and all baked enamel or glazed surfaces from damage by covering or coating as recommended in Bulletin, "Handling and Care of Enameled Cast Iron Plumbing Fixtures", issued by Plumbing Fixture Manufacturers Association or by other methods approved by Architect/Engineer.
2. Coat polished or plate metal parts with vaseline immediately after installation. Protect equipment outlets, pipe and conduit openings with temporary plugs, caps or burlap to prevent filling with construction dirt.

3.3 EXCAVATION AND BACKFILL

A. Excavation: Contractor shall perform excavation boring, drilling, back filling and compaction at required depth for installation of work indicated or specified.

1. Excavated material not required or not suitable for backfilling shall be removed from site.
2. Protect excavation by grading and pumping to keep space clear of water during construction.
3. Provide shoring and sheeting as necessary for protection of work and safety of personnel. Protect bottom of excavation from frost.
4. Excavation in rock shall be 8-inch below invert of pipe to be installed and shall be backfilled to a depth of 8-inch with clean, washed sand before pipe installation.
5. Excavation terminating in unstable or organic material at pipe invert elevation shall be continued to 30-inch below pipe invert elevation and backfilled with pit run gravel to pipe invert. Soil boring reports are available for inspection at Architect's office.
6. Pipe installation in backfilled areas shall not occur until backfill is 2 feet above pipe invert, at which time backfill shall be excavated to proper depth, pipe installed, and backfill replaced as specified.
7. All lines are to be properly capped to prevent the entrance of dirt or any other foreign matter. All debris and water shall be removed from the trench prior to final installation. Properly protect piping or ductwork until backfilling can be performed. Inspection of all installations by Local Inspection Authorities shall be completed prior to backfilling.

B. Backfilling Under Floors and Slabs: Backfill areas below concrete slabs on grade in horizontal layers not to exceed 8-inch in depth and compact with approved equipment until dry density is not less than 95 percent of Standard Proctor Density.

1. Backfill material shall be pit run gravel or coarse sand free of rubbish, compacted and leveled to receive slab. If natural earth is of similar structure with same material as specified above, no additional material will be required. Fill to raise subgrades to required elevation shall be accomplished as specified above.
2. Materials and methods of compaction shall be approved by Architect/Engineer before start of work.
3. Areas not below concrete or asphalt slabs and footings shall be backfilled with suitable excavated material, free of debris and rubbish.
4. Carefully backfill to a point 6” above piping or ductwork and thoroughly tamp. Complete backfilling in 8” lifts and compact each layer to 98% standard proctor density. Restore surface to its original condition, i.e. grass, concrete, blacktop, etc.
5. Contractor shall pay costs for testing of compacted backfill by an approved testing laboratory when tests are requested by Architect/Engineer.

C. Backfilling Outside: Backfill excavations below finished grades with materials similar to that removed in excavation, free from rubbish or other unsuitable material. Place backfill and compact to prevent settling.
1. Backfilling shall be done to finished grades indicated on Drawings. If no finished grading is done in excavated areas, Contractor shall backfill to existing grades and restore surface to original condition.
2. Compaction over ditches less than 3 feet in width and around walls and columns shall be done by the use of mechanical hand compactors.
3. Contractor shall pay costs for testing of compacted backfill by an approved testing laboratory when tests

are requested by Architect/Engineer.

D. Pavement, Curb, and Sidewalk Replacement:

1. Contractor shall be responsible for the replacement of existing street pavement, curbs and sidewalks removed or damaged by Contractor or related subcontractors.
2. Make necessary arrangements to perform such repairs and pay incurred costs in connection with said repairs, including amount in Bid.

3.4 CUTTING AND PATCHING

A. Cutting and patching shall be held to practical minimum consistent with good construction practice by properly locating and leaving sleeves and boxes, or notifying General Contractor of openings, where required, as construction progresses. All cutting and patching shall be done with the prior approval of the Architect/Engineer.

1. Necessary cutting and patching of walls, floors, partitions and ceilings for the proper installation of work under this Contract, shall be the sole responsibility of this Contractor. Perform cutting and patching in such a manner as to leave no visible trace and to return the part affected to the condition of undisturbed work. Cutting and patching shall be performed by men experienced, skilled, and licensed for the particular type of work involved. Inferior work will not be accepted.

B. Pavements and Concrete: Cutting shall be accomplished by saw cutting a minimum of 1 ½-inch deep prior to jack hammering. Contractor shall bore below the surface where indicated on Drawings or where required by Architect/Engineer.

C. Repair: Patch pavements and concrete to match existing conditions. All labor and materials required to replace and repair sections cut or damaged shall be furnished and installed by this Contractor.

3.5 INSTALLATION

A. Connection to Equipment Specified: Provide material and labor required to connect to the mechanical system of fixtures and equipment having mechanical connections and which are specified in other Sections or Divisions of the Specifications or furnished by Owner.

1. Provide piping supply connections with shut-off valves.
2. Ductwork connections to equipment, diffusers, and appurtenances shall be made with flexible ductwork unless a solid connection is indicated.
3. Drainage connections shall be properly trapped and vented.

B. The Mechanical Contractor shall provide concrete pads for all floor mounted equipment. Pads shall be 4” thick and extend a minimum of 2” beyond equipment.

C. Mechanical Contractor shall provide angle iron stands for all gas fired equipment located on the same level or below any enclosed parking garage floor where the mechanical room opens to that same level. Stands shall elevate burners above 18” or to comply with Local Code. This includes all MUA units, furnaces, water heaters, boilers, etc. Verify exact requirements with the Local Inspector prior to performing any fabrication.

D. Floor, Wall and Ceiling Plates:

1. Where uncovered exposed pipes pass through floors, walls or ceilings in finished rooms and inside casework, fit with approved type chrome plated metal plate.
2. Plastic escutcheon plates shall not be permitted.

E. Mechanical Systems Painting: Exposed supporting iron and steel work, bare pipe, fittings, hangers, and supports shall be wire brushed, washed with mineral spirits to remove dirt and grease, and painted with one coat of metal primer followed by two finish coats of battleship gray paint.

F. Concealed Equipment location: Location of motor operated equipment, furnished under this Contract, installed above ceiling shall be identified by placing a color coded thumb tack (or adhesive applied dot) in the ceiling directly below item noted. Identification colors shall be as follows:

1.	Exhaust Fans:	Green
2.	Air Handling Units:	Blue
3.	Control Valves:	Yellow
4.	Shut-off Valves:	Orange
5.	Fan Coils:	Red

G. Filtration: At time of substantial completion, and prior to turning equipment over to Owner, Contractor shall install a complete set of unused, clean filters in each type of unit supplying filtered air to the building.

3.6 IDENTIFICATION

A. Exposed Piping: Bare and insulated, exposed new piping in Boiler Room, Mechanical Rooms, and unfinished rooms shall be identified with labels, painted on using metal stencils. Stencils shall have 1-inch high letters and shall include a directional arrow 3-inch long by 1/2-inch wide, indication direction of flow. Color of stenciling shall be black lettering on a yellow background.

1. Labels shall be located at each change in direction of pipe runs and at intervals not to exceed 20 feet.
2. Setmark snap-on pipe markers by Seton Nameplate Corporation or snap-on pipe markers by W. H. Brady Company, which are similar to above stencil description shall be acceptable.

B. Concealed Piping: Bare and insulated new piping running in ceilings and soffits shall be identified with labels painted on using metal stencils. Each stencil shall have 1-inch high letters and shall include a directional arrow 3-inch long by 1/2-inch wide indicating direction of flow. Color of stenciling shall be black lettering on a yellow background.

1. Labels shall be located at each change in direction of pipe runs and at intervals not to exceed 20 feet.
2. Labels shall be located on each side of wall, partition and floor penetrations.
3. Setmark snap-on pipe markers by Seton Nameplate Corporation or snap-on pipe markers by W. H. Brady Company, which are similar to above stencil description shall be acceptable.

C. Pipe Markers: Contractor shall label the piping as follows:

1.	Condensate Drain	CD
2.	Hot Water Supply	HWS
3.	Hot Water Return	HWR
4.	Glycol Heating Water Supply	GWS
5.	Glycol Heating Water Return	GWR

D. Equipment: All scheduled equipment under this Division shall be identified with stamped labeled placards matching the scheduled identification tags and adhere directly to the equipment.

E. Controls: Controls and switches furnished under this Divisions shall be clearly labeled and identified.

F. Rated Dampers:

1. All rated fire, smoke and combination smoke/fire dampers shall be numbered and clearly labeled at ceilings and/or walls with ½" lettering. At duct penetrations in exposed areas, labels may apply directly on damper assembly or ductwork in a conspicuous location. For dampers located in floor penetrations, identification labels shall be at corresponding wall/ceiling access panel.

3.7 CLEANING

A. Housekeeping, Cleaning and Storage: Remove from the building and site, scrap material, temporary building, packaging material, miscellaneous debris, and dirt on a regular schedule and in accordance with Architect/Engineer's direction, to maintain building in a reasonably clean, workable condition during construction.

1. Cutting oil and steel shavings shall be caught in a suitable container to ensure final finish material in building will not be marred or damaged.
2. Upon completion of work and before final inspection, Contractor shall remove plaster, paint, rust, stickers, and shipping tags from installed equipment.
3. Clean foreign matter from installed equipment and remove dirt and debris, in connection with work, from building.

3.8 PRE-OPERATIONAL SYSTEM CLEANOUT

A. Pre-Cleaning Chemicals: New piping systems and appurtenances shall be cleaned with a one percent solution of Ferrosol 345, neutral pH cleaner to remove any iron deposits, oil-based coatings, mill scale and construction residues.

1. Follow manufacturers' directions regarding equipment.

B. Cooling and Heating Water Systems: The chiller, condenser and chilled water lines and related cooling equipment, boiler, heat exchangers, heating piping and related heating equipment shall be thoroughly flushed out with precleaning chemicals, as called for above, designed to remove deposits such as pipe dope, oils, loose rust, mill scale and other extraneous materials.

1. Add recommended dosages of manufactured and blended pre-cleaner chemical products and circulate throughout the water system. Drain, fill and flush water systems until no foreign mater is observed and the total alkalinity of the rinse water is equal to that of the make-up water.
2. Clean strainer screen after each flush and furnish and install new strainer screens prior to filling system for operation.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Section includes testing, adjusting, and balancing of air, plumbing and natural gas systems, testing, adjusting, and balancing of hydronic [steam] [and] [refrigerating] systems, measurement of final operating condition of HVAC systems, sound measurement of equipment operating conditions, vibration measurement of equipment of operating conditions.

1.2 REFERENCES

A. AABC (Associated Air Balance Council)-National Standards for Total System Balance.

B. ASHRAE 111 (American Society of Heating, Refrigerating and Air Conditioning Engineers). Practices for Measurement, Testing Adjusting and Balancing of Building, Heating, Ventilation, Air Conditioning and Refrigeration Systems.

C. NEBB (National Environmental Balancing Bureau). Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

D. TABB (Testing, Adjusting and Balancing Bureau). International Standards for Environmental Systems Balance.

1.3 DEFINITIONS

A. TAB: Testing, Adjusting, and Balancing. The process of checking and adjusting HVAC systems to meet design objective.

B. Basic TAB terms used in this Section: Chapter, “Testing, Adjusting and Balancing” of ASHRAE Handbook, latest Applications Volume.

1.4 SUBMITTALS

A. Test Reports: Indicate data on AABC National Standards for Total System Balance forms, forms prepared following ASHRAE 111, TABB/SMACNA or NEBB Report forms.

B. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

C. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

D. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

E. Provide reports in bound manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

F. Include detailed procedures, agenda, sample report forms and a copy of either AABC National Project Performance Guaranty or NEBB Certificate of Conformance Certification prior to commencing system balance.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

3.1 GENERAL

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Ventilation Systems:
    a. Final filters are clean and in place. If required, install temporary media in addition to final filters.
    b. Duct systems are clean of debris.
    c. Fans are rotating correctly.
    d. Fire and volume dampers are in place and open.
    e. Access doors are closed and duct end caps are in place.
    f. Air outlets are installed and connected.
    g. Air coil fins are cleaned.
5. Hydronic Systems:
    a. Pumps are rotating correctly.
    b. Proper strainers are clean and in place or in normal positions.
    c. Service and balance valves are open.
    d. Systems are flushed, filled and vented.

B. When the work has been completed, balance the air flow from each diffuser and register in accordance with the recommendations of the diffuser manufacturer, setting dampers, controls and/or other volume control devices in such a manner as to produce the air flow rate indicated on the drawings. Test to the satisfaction of the Engineer to insure for satisfactory operation of all equipment:
1. Air Handling Systems: Adjust to within plus or minus 10 percent of design.
2. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
3. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

C. Test and start-up all equipment supplied under this contract.
1. Provide all reports necessary to assure the Engineer and Owner that all functions of each piece of equipment have been thoroughly evaluated and deemed operable as designed.
2. Ensure recorded data represents actual measured or observed conditions.
3. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
4. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
5. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.2 WATER SYSTEM PROCEDURE

A. Adjust water systems after air balancing to provide design quantities:

1. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
2. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

3. Effect system balance with automatic control valves fully open or in normal position to heat transfer elements.
4. Effect adjustment of water distribution systems by means of balancing cocks, valves and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
5. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

B. Hydronic piping systems:

1. System Guarantee: Contractor shall guarantee that the installation shall operate with complete noiseless circulation of heating and/or cooling media through piping system, radiation and equipment.
2. Defects: Contractor shall be responsible for defects which develop in the systems caused be faulty workmanship, material or equipment and shall replace any such faulty workmanship, material or equipment during a period of one year from date of final acceptance. Acceptance of the work shall not waive the guarantee.
3. Tests: In the presence of the Architect/Engineer, or his duly authorized representative the heating system shall be tested at 80 psi hydrostatic pressure and proved drop tight. Tests shall be complete before piping is connected to equipment or covered.
4. Heating/cooling water piping shall hold 150 psi gauge for 1 hour without leaks or additional water.

3.3 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities at site altitude.

B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.

E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes to vary fan speed. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers to check leakage.

J. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches w.c. (12.5 Pa) positive static pressure near the building entries.

K. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.

L. Ventilation: Contractor shall guarantee complete uniform circulation of air through ventilated spaces without objectionable noise. Contractor shall assume responsibility for and shall replace any faulty workmanship, material or equipment during a period of 1 year from date of final acceptance.

3.4 START-UP AND COMMISSIONING

A. Following substantial completion, contractor shall return to the site on a quarterly basis including four (4) balancing/commissioning sessions. Commissioning shall consist of rebalancing both air and water side systems to the extent required to verify proper operation of all system components and controls. Balancing contractor shall coordinate with all trades including controls contractor to make required adjustments.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Section Includes: Include labor, materials, equipment, and accessories to furnish and install supports, anchors, and seals for equipment, materials, and related work specified elsewhere.

1.2 SUBMITTALS

A. Submit shop drawings for all equipment provided under this section. Drawing shall include registered Structural Engineers Seal where required.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Guides manufactured by: Metraflex, Hyspan, Flexweld- Keflex, Flexicraft, Flexonic, Anvil International.

B. Supports and hangers manufactured by: B-Line, Grinnell, Michigan, Anvil International, NIBCO, National, Empire Industries and L.C. Penner.

C. Expansion anchors manufactured by: Hilti, Simpson, Illinois Tool Works.

D. Power driven fasteners manufactured by: Hilti, Simpson, Norbord.

E. Firestop material for penetration or construction manufactured by: 3M MP-1 Moldable Putty Flamseal Putty, 3M Caulk CP-25WB, Dow Corning 3-6548 RTV Foam, Tremco.

2.2 DUCTWORK INSERTS AND HANGERS

A. General: Support ductwork by concrete inserts in concrete construction, "C" clamps for beams and bar joists, or toggle bolts on prefabricated reinforced hollow concrete slabs. All supports shall be installed per SMACNA Duct Construction Standards latest addition.

B. Rectangular Ductwork: From any of these structure connection supports, provide hanger straps or hanger rod with supporting angle iron below rectangular ductwork:

Longest Dimension of Duct (Inches)	Rod Hangers	Strap Hangers	Trapeze Hanger or Shelf Angles	Spacing Max.
Up Through 18	3/8-Inch Rod	1 Inch by 18 Gauge	1 by 1 by 1/8	10 Feet
19 Through 30	3/8-Inch Rod	1 Inch by 18 Gauge	1 by 1 by 1/8	10 Feet

C. Round Ductwork: Form any of these structure connection supports, provide hanger straps or hanger rod with supporting angle iron below round ductwork:

Duct Diameter	Rod Hangers	Strap Hangers	Maximum Spacing
Up Through 18	1/4-Inch Rod	1 Inch by 22 Gauge	12 Feet

D. Support:

1. Provide bridging between structural members to provide adequate support locations for hangers.

2.3 PIPING INSERTS AND HANGERS

A. Hanger Supports and Inserts: Piping suspended from construction above shall be hung from concrete inserts in concrete construction, toggle bolts and rod coupling on prefabricated, reinforced hollow concrete slabs, I-beam clamps or hanger rod, washer and two nuts on bar joist construction. On other types of building construction a field approved type clamp or bracket shall be used.

B. Hangers, Clamps, and Collars: Piping shall be suspended from inserts, clamps or brackets by means of clevis type or roller type hanger and solid steel rods spaced not more than 10 feet apart on steel pipe and pipe rings spaced not more than 8 feet apart on copper pipe. Support vertical cast iron and steel pipes at each floor by heavy wrought steel riser clamps or collars. Support vertical copper pipes at each floor by riser clamps with asphalt felt lining under couplings placed in vertical copper piping. Support piping 4-inches and larger by single pipe roller assemblies with adjustable socket.

2.4 ANCHORS AND GUIDES

A. Anchor Fabrication: Construct anchors using I-beams, channel iron, tees, or angles or a combination thereof.

1. Tee iron shall be welded to side, top or bottom of pipe. Angle iron diagonal bracing shall be welded or bolted to tee iron and wall or ceiling. Anchors shall be welded or double clamped to pipe.
2. Where a group of pipes are to be anchored, but cannot be secured as above, the pipes shall be anchored to an assembly constructed of I-beams, channels or both, which shall be anchored to the building structure.

B. Guides: Guides shall be fabricated from carbon steel. Housing shall be of two piece design, connecting upper and lower housing with two bolt or by welding, after spider and pipe have been set in lower half of housing. Lower housing shall have two legs for support running the full length of housing. Two piece spider clamp shall be fastened around pipe (or pipe with insulation) with two bolts forming six legs which guide pipe inside housing. Legs may be on bottom, side or top of unit for bolting to floor or top of beam, wall or underside of structure.

1. Insulation inside the spider clamp shall be hydrous calcium chloride with vapor barrier from entering and exiting pipe continuing through the clamp.
2. Unit shall be furnished with a factory baked enamel finish.

C. For multi-level wood floor construction allow for wood shrinkage and movement. Provide clearance for piping near wood construction.

PART 3. - EXECUTION

3.1 HANGER INSTALLATION

A. Hanger Location: Locate hangers to properly support pipes and ducts; relieve strain on pipe, duct, and fittings; and allow for ample expansion and contraction. Piping smaller than 4-inch size shall be hung with individual ring hangers where space prevents use of other type hangers.

1. Piping or ductwork shall not be hung from the roof deck.
2. Except where trapeze hangers are used to support piping, all piping and ductwork shall be individually supported. Do not support ducts or pipes from other pipes, ducts or equipment or conduit.
3. Place a hanger within one foot of each horizontal elbow.

B. Anchor Piping in Chases: Copper piping in pipe chases behind plumbing fixtures shall be anchored to waste and vent piping with angle iron and U-clamps with asphalt felt lining under clamps.

C. Trapeze Hangers: Groups of pipes at the same elevation and close together may, at the option of the Contractor, be supported by suitable trapeze hangers suspended from inserts, clamps or brackets by solid steel rods.

D. Plastic Piping Support: Support plastic piping from above inserts, clamps or brackets with Grinnell Figure 269 adjustable ring hanger on 32-inch centers.

3.2 PIPE HANGERS AND SUPPORT

A. Support horizontal steel and copper piping with maximum spacing between supports as noted.

Nominal Pipe Size (In.)	Distance Between Supports (Ft.)	Hanger Rod Diameter (In.)
½ & ¾	6	3/8
1 to 1 ½	8	3/8
2 & 2 ½	10	½
3 & 4	12	5/8
5 to 12	14	7/8
14 to 18	20	1

B. Provide additional supports for valves or other concentrated loads between supports.

C. Install hangers to provide minimum ½ inch clear space between finished pipe insulation and adjacent work.

D. Use hangers which are vertically adjustable 1-1/2 inch minimum after piping is erected.

E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

F. Provide hanger spreaders on hangers for pipes 4 inches and larger.

3.3 BRACKETS, BRACES AND SUPPORTS

A. General Requirements: Furnish and install brackets, braces or reinforcing angles in partitions not sufficient in themselves to support piping or plumbing fixtures or other wall hung equipment included in this Specification. Bolts shall extend through walls, finished on opposite side, or one wall of a pipe chase, and shall be not less than 3/8-inch brass bolts with 3-inch cut washer on opposite side of wall.

B. Fasteners: Bolt head and washer shall be concealed under wall finish on finished walls. On hollow walls not finished on opposite sides, use toggle bolts. On solid walls use 3/8-inch brass bolt extending 4 inches into wall secured with molten lead poured around bolt. Secure floor mounted wall closets with 5/16-inch brass bolt with chrome plated cap, nut, and washer.

C. Support Racks: Support tunnel piping on Unistrut, Bee-Line, pipe racks assembled as indicated by details on Drawings. Unistrut steel products shall have prime bonderized finish coating.

D. Pipe Drop Supports: Brace exposed pipe drops to pumps and other equipment with angle iron framework to relieve strain on flexible connectors or equipment and anchor piping to eliminate movement.

3.4 ANCHORS AND GUIDES INSTALLATION

A. Boiler Room: Provide adequate anchors and guides on heating [and chilled water] piping in Mechanical Rooms and Boiler Room to prevent swaying of pipe.

B. Anchors: Install anchors approximately centered in every 70-foot run, blind ends, changes in pipe direction, except when elbow is used to absorb expansion and at major branch connections.

1. An expansion joint or loop or expansion elbow, but not more than one, with appropriate guides, shall be installed between each pair of anchors.
2. If expansion loops are installed in same line with expansion joints, the section containing the loop shall be isolated from the section containing the joint by means of an anchor.

C. Guides: Install 4 guides, 2 on each side, for each expansion loop or joint. On each side, install one pipe guide a maximum of 4 pipe diameters from expansion loop or joint and one pipe guide a maximum of 14 diameters from the first guide.

D. Anchors and Guides in Radiation Covers: Provide anchors and guides in radiation covers where called for on Drawings and specified. Provide guides at each side of expansion joints.

3.5 INSULATION PROTECTION AT PIPE HANGERS

A. Shield insulation shall be galvanized steel, 16 gauge for piping smaller than 4 inches, 14 gauge for piping 4 inches and larger and shall span an arc of 180 degrees. Lengths of shields shall be as follows:

Pipe Size	Shield Length
Up to 6”	12”
8”-12”	16”
Over 12”	20”

B. On cold and chilled water piping install a wood block at hanger points. Insulation jacketing shall be sealed where cut to install the block.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Intent:

1. All mechanical equipment, piping and ductwork as noted on the equipment schedule or in the specification shall be mounted on or suspended from vibration isolators to reduce the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
2. All isolation materials shall be supplied by the same manufacturer.
3. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.

B. The work in this section includes, but is not limited to the following:

1. Vibration isolation for piping, ductwork and equipment.
2. Equipment isolation bases.
3. Flexible piping connections.
4. Resilient Pipe Anchors and Guides.

1.2 SUBMITTAL DATA REQUIREMENTS

A. The manufacturer of vibration isolation shall provide submittals for products as follows:

1. Descriptive Data:

   a. Schedules of flexibly mounted equipment, referencing drawings by number.
   b. Catalog cuts or data sheets on vibration isolators.

2. Drawings:

   a. Submit details of equipment bases including dimensions, structural member sizes and support point locations.
   b. Submit details of isolation hangers for ceiling hung equipment, piping and ductwork.
   c. Submit details of mountings for floor supported equipment, piping and ductwork.
   d. All hanger, mounting or pad drawings shall indicate deflections and model numbers as well as any other requirements in the specifications.
   e. Spring diameters, rated loads and deflections, heights at rated load and closed height shall be provided for all springs shown in the submittals in tabular form.
   f. Complete flexible connector details.

Part 2. - PRODUCTS

2.1 INTENT

A. All vibration isolators described in this section shall be the product of a single manufacturer. Mason Industries products are the basis of these specifications; products of other manufacturers will be considered provided samples strictly comply with the specification and have the approval of the specifying engineer. Submittals and certification sheets shall be in accordance with Section 1.2.

B. Refer to Equipment Schedules on Drawings for specified isolator types in Section 2.2 that correspond to the letters in that section.

2.2 PRODUCT DESCRIPTION

A. Neoprene mountings shall have a minimum static deflection of 0.35"(9mm). All metal surfaces shall be neoprene covered and have friction pads both top and bottom. Bolt holes shall be provided on the bottom and a tapped hole and cap screw on top. Steel rails shall be used above the mountings under equipment such as small vent sets to compensate for the overhang. Mountings shall be type ND or rails type DNR as manufactured by Mason Industries, Inc.

B. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4"(6mm) neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Installed and operating heights shall be equal. The ratio of the spring diameter divided by the compressed spring height shall be no less than 0.8. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be type SLF, as manufactured by Mason Industries, Inc.

C. Multiple bellow air springs shall be manufactured with powder coated upper and lower steel sections connected by a replaceable, flexible Nylon reinforced Neoprene element to achieve a maximum natural frequency of 3 Hz. (We have found 3 Hz adequate when using air springs. Should the specifying engineer require a lower frequency, change the 3 Hz to the lower number). Burst pressure must be a minimum of 3 times the published maximum operating pressure. All air spring systems shall be equipped with 3 leveling valves connected to the building control air or a supplementary air supply to maintain elevation plus or minus 1/8"(3mm). An air filter and water separator shall be installed before the air distribution system to the leveling valves.

   Submittals shall include natural frequency, as well as load and damping tests, all as performed by an independent lab or acoustician. Air springs shall by type MT and leveling valves type LV as manufactured by Mason Industries, Inc.

D. Equipment with large variations in the operating and installed weight, such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, roof mounted fans and roof mounted air handling equipment shall be mounted on spring mountings, as described in Engineering Specification B, including the neoprene acoustical pad within a rigid sided housing that includes vertical limit stops to prevent spring extension when weight is removed and temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection. When the equipment is at full operating weight, the springs shall be adjusted to assume the weight and the spacers removed, without changing the installed and operating heights. All restraining bolts shall have large rubber grommets to provide cushioning in the vertical as well as horizontal modes. The hole through the bushing shall be a minimum of 0.75"(20mm) larger in diameter than the restraining bolt. Horizontal clearance on the sides between the spring assembly and the housing shall be a minimum of 0.5"(12mm) to avoid bumping and interfering with the spring action. Vertical limit stops shall be out of contact during normal operation. Cooling tower mounts are to be located between the supporting steel and the roof or the grillage and dunnage as shown on the drawings when there is no provision for direct mounting. Housings and springs shall be powder coated and hardware electro-galvanized. Mountings shall be SLR as manufactured by Mason Industries, Inc.

E. Equipment with large variations in the operating and installed weight, such as chillers, boilers, etc., and equipment exposed to the wind such as cooling towers, roof mounted fans and roof mounted air handling equipment shall be mounted on air springs, as described in Engineering Specification C, but within a rigid sided housing that includes vertical limit stops to prevent spring extension when weight is removed and temporary steel spacers between the upper and lower housings. Housings shall serve as blocking during erection. When the equipment is at full operating weight, the air springs shall be pressurized to take the weight so the spacers can be removed without changing the installed and operating heights. All restraining bolts shall have large rubber grommets to provide cushioning in the vertical as well as the horizontal modes. The hole through the bushing shall be a minimum of 0.75"(20mm) larger in diameter than the restraining bolt. Horizontal clearance between the air spring assembly and the housing shall be a minimum of 0.5"(12mm) to avoid bumping and interference with the air spring action. Vertical limit stops shall be out of contact during normal operation. Mountings and air spring parts shall be powder coated. Hardware electro-galvanized. Air spring systems shall be connected to the building control air or a supplementary air supply and equipped with three leveling valves to maintain level within plus or minus 0.125"(3mm). Cooling tower mounts are to be located between the supporting steel and the roof or the grillage and dunnage as shown on the drawings when there is no provision for direct mounting. Mountings shall be SLR-MT

and leveling valves type LV as manufactured by Mason Industries, Inc.

F. Hangers shall consist of rigid steel frames containing minimum 1-1/4"(32mm) thick neoprene elements at the top and a steel spring with general characteristics as in specification B seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. In order to maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30° capability. Hangers shall be type 30N as manufactured by Mason Industries, Inc.

G. Hangers shall be as described in F, but they shall be precompressed and locked at the rated deflection by means of a resilient upstop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30° capability. Hangers shall be type PC30N as manufactured by Mason Industries, Inc.

H. Hangers shall be manufactured with minimum characteristics as in Specification B, but without the neoprene element. Springs are seated in a steel washer reinforced neoprene cup that has a neoprene bushing projecting through the bottom hole to prevent rod to hanger contact. Spring diameters and the lower hole sizes, shall be large enough to allow the hanger rod to swing through a 30° arc from side to side before contacting the cup bushing.

If ducts are suspended by flat strap iron, the hanger assembly shall be modified by the manufacturer with an eye on top of the box and on the bottom of the spring hanger rod to allow for bolting to the hanger straps. Submittals on either of the above hangers shall include a scale drawing of the hanger showing the 30° capability. Hangers for rods shall be Type 30 or for straps W30 as manufactured by Mason Industries, Inc.

I. When total air thrust exceeds 10% of the isolated weight, floor mounted or suspended air handling equipment shall be protected against excessive displacement by the use of horizontal thrust restraints. The restraint shall consist of a modified Specification B spring mounting. Restraint springs shall have the same deflection as the isolator springs. The assembly shall be preset at the factory and fine tuned in the field to allow for a maximum of 1/4"(6mm) movement from stop to maximum thrust. The assemblies shall be furnished with rod and angle brackets for attachment to both the equipment and duct work or the equipment and the structure. Restraints shall be attached at the center line of thrust and symmetrically on both sides of the unit. Horizontal thrust restraints shall be WB as manufactured by Mason Industries, Inc.

J. Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped. Pump bases for split case pumps shall be large enough to support suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14"(350mm) provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1"(25mm). Bases shall be type WF as manufactured by Mason Industries, Inc.

K. Vibration isolation manufacturer shall provide steel members welded to height saving brackets to cradle equipment having legs or bases that do not require a complete supplementary base. Members shall have sufficient rigidity to prevent distortion of equipment. Inverted saddles shall be type ICS, as manufactured by Mason Industries, Inc.

L. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating concrete bases. Bases for split case pumps shall be large enough to provide support for suction and discharge elbows. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6"(150mm). The base depth need not

exceed 12"(300mm) unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2"(12mm) bars welded in place on 6"(150mm) centers running both ways in a layer 1-1/2"(40mm) above the bottom. Forms shall be furnished with steel templates to hold the anchor bolt sleeves and anchor bolts while concrete is being poured. Height saving brackets shall be employed in all mounting locations to maintain a 1"(25mm) clearance below the base. Wooden formed bases leaving a concrete rather then a steel finish are not acceptable. Base shall be type BMK or K as manufactured by Mason Industries, Inc.

M. Curb mounted rooftop equipment shall be mounted on vibration isolation bases that fit over the roof curb and under the isolated equipment. The extruded aluminum top member shall overlap the bottom to provide water runoff independent of the seal. Aluminum members shall house electro-galvanized or powder coated springs selected for 0.75"(20mm) minimum deflection. Travel to solid shall be 1.5"(40mm) minimum. Spring diameters shall be no less than 0.8 of the spring height at rated load. Wind resistance shall be provided by means of resilient snubbers in the corners with a minimum clearance of 1/4"(6mm) so as not to interfere with the spring action except in high winds. Manufacturer's self adhering closed cell sponge gasketing must be used both above and below the base and a flexible EPDM duct like connection shall seal the outside perimeter. Foam or other sliding or shear seals are unacceptable in lieu of the EPDM ductlike closure. Submittals shall include spring deflections, spring diameters, compressed spring height and solid spring height as well as seal and wind resistance details. Curb mounted bases shall be Type CMAB as manufactured by Mason Industries, Inc.

N. Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind forces. All directional neoprene snubber bushings shall be a minimum of 1/4"(6mm) thick. Steel springs shall be laterally stable and rest on 1/4"(6mm) thick neoprene acoustical pads. Hardware must be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curbs waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers. Lower curbs shall have provision for 2"(50mm) of insulation. Curb shall be type RSC as manufactured by Mason Industries, Inc.

O. Rubber expansion joints shall be peroxide cured EPDM throughout with Kevlar tire cord reinforcement. The raised face rubber flanges must encase solid steel rings to prevent pull out. Flexible cable wire is not acceptable. Sizes 1-1/2" through 14"(40mm through 350mm) shall have a ductile iron external ring between the two spheres. Sizes 16" through 24" (400mm to 600mm) may be single sphere. Sizes 3/4" through 2"(20mm through 50mm) may have one sphere, bolted threaded flange assemblies and cable retention.

Minimum ratings through 14"(350mm) shall be 250psi at 170°F and 215psi at 250°F. (1.72MPa at 77°C and 1.48MPa at 121°C), 16"(400mm) through 24"(600mm) 180psi at 170°F and 150psi at 250°F. (1.24MPa at 77°C and 1.03 MPa at 121°C). Higher published rated connectors may be used where required.

Safety factors shall be a minimum of 3/1. All expansion joints must be factory tested to 150% of maximum pressure for 12 minutes before shipment.

The piping gap shall be equal to the length of the expansion joint under pressure. Control rods passing through 1/2"(12mm) thick Neoprene washer bushings large enough to take the thrust at 1000psi (0.7 kg/mm2) of surface area may be used on unanchored piping where the manufacturer determines the condition exceeds the expansion joint rating without them. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves. Expansion joints shall be SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and Control Rods CR as manufactured by Mason Industries, Inc.

P. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3"(75mm) and larger shall be flanged. Smaller sizes may have male nipples. Minimum lengths shall be as tabulated:

Flanged

3" x 14" (75 x 350mm)	6" x 20" (150 x 500mm)	12" x 28" (300 x 700mm)
4" x 15" (100 x 375mm)	8" x 22" (200 x 550mm)	14" x 30" (350 x 750mm)
5" x 19" (125 x 475mm)	10" x 26" (250 x 650mm)	16" x 32" (400 x 800mm)

Male Nipples

1/2" x 9" (12 x 225mm)	1-1/4" x 12" (32 x 300mm)	2" x 14" (50 x 350mm)
3/4" x 10" (19 x 250mm)	1-1/2"x 13" (38 x 325mm)	2-1/2" x 18" (64 x 450mm)
1" x 11" (25 x 275mm)		

At equipment, hoses shall be installed on the equipment side of the shut-off valves horizontal and parallel to the equipment shafts wherever possible. Hoses shall be type BSS as manufactured by Mason Industries, Inc.

Q. Split Seals consist of pipe halves with minimum 3/4"(20mm) thick neoprene sponge cemented to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not in place prior to the construction of the building member. Seals shall project a minimum of 1"(25mm) past either face of the wall. Where temperatures exceed 240°F (115°C), 10 lb. density fiberglass may be used in lieu of the sponge. Seals shall be Type SWS as manufactured by Mason Industries, Inc.

R. All-directional acoustical pipe anchors consist of two sizes of steel tubing separated by a minimum 1/2"(12mm) thickness of 60 duro or softer neoprene. Vertical restraint shall be provided by similar material arranged to prevent up or down vertical travel. Allowable loads on the isolation material shall not exceed 500 psi(3.45 N/mm^2) and the design shall be balanced for equal resistance in any direction. All-directional anchors shall be type ADA as manufactured by Mason Industries, Inc.

S. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2"(12mm) thickness of 60 durometer or softer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Guides shall be capable of 1-5/8"(40mm) motion, or to meet location requirements. Pipe guides shall be type VSG as manufactured by Mason Industries, Inc.

T. The first four pipe hangers in the main lines near the mechanical equipment shall be as described in specification Type G. Hangers supporting piping 2"(50mm) and larger in all other locations throughout the building shall be isolated by hangers as described in specification F. Floor supported piping shall rest on isolators as described in specification D. Heat exchangers and expansion tanks are considered part of the piping run. The first four isolators from the isolated equipment shall have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first four hangers shall have 0.75"(20mm) deflection for pipe sizes up to and including 3"(75mm), 1-1/2"(40mm) deflection for pipe sizes over 3"(75mm) and up to and including 6"(150mm), and 2-1/2" (65mm) deflection thereafter. Where piping connects to mechanical equipment install specification O expansion joints or specification P stainless hoses if O is not suitable for the service. All piping passing through the equipment walls, floors or ceilings shall be protected against sound leakage by means of an acoustical seal, as described in Specification Q.

U. All vertical risers shall be supported by spring isolators designed to support the riser filled with water, if it is a water line. Assigned loads must be within the building design limits at the support points. Neutral central resilient anchors close to the center of the run shall direct movement up and down. The anchors shall be capable of holding an upward force equal to the water weight when the system is drained. If one level cannot accommodate this force, anchors can be located on 2 or 3 adjacent floors. Resilient guides shall be spaced and sized properly depending on

the pipe diameter. Submittals must include the initial load, initial deflection, change in deflection, final load and change in load at all spring and anchor support locations, as well as guide spacing. The initial spring deflection shall be a minimum of 0.75"(20mm) or four times the thermal movement at the isolator location, whichever is greater. Calculations shall include pipe stress at end conditions and branch off locations and the manufacturer must include installation instructions. Submittal must be stamped and signed by a licensed professional engineer in the employ of the vibration vendor for at least 5 years. Proper provision shall be made for seismic protection in seismic zones. The isolator manufacturer shall be the same firm supplying the mechanical contract. Support spring mountings shall be Specification B, anchors Specification R, telescoping guides Specification S.

V. The isolation vendor shall design and provide all brackets or clamps at riser spring guide and anchor locations. The contractor must install and adjust all isolators under the supervision of the isolator vendor or his representatives.

W. All air ducts with a cross section of $2ft^2(0.19m^2)$ or larger shall be isolated from the building structure by specification H hangers or B floor supports with a minimum deflection of 0.75"(20mm). Isolators shall continue for 50'(15m) from the equipment. If air velocity exceeds 1000 fpm (5.3mps), hangers or supports shall continue for an additional 50'(15m) or as shown on the drawings.

2.3 PUMPS AND MOTOR BASES

A. 5 Horsepower and Less: Mount pumps on floors above grade, 5 horsepower and less, grouted and bolted to a 4-inch concrete pad 4-inches larger in all directions than pump base and reinforced with three No. 4 rods running long dimensions. Pour concrete pad over pre-compressed molded fiberglass pads bonded to galvanized sheet metal and design for load and rpm as pump requires. Fiberglass pads shall be as manufactured by Consolidated Kinetics Corporation or shall be neoprene waffle mounts same as Mason Industries WMW.

B. Above 5 Horsepower: Mount pumps on floors above grade over 5 horsepower and provide with mason Industries, Type K, bases constructed of 6-inch channels with ½-inch reinforcing rods welded in place 6-ionches on center both ways, 1 1/2-inche deflection anchored to floor and brackets. Pour frame solid with concrete and locate anchor bolts for pump in pour.

C. Units on Grade: Mount pumps located on grade on thickened concrete floor slab, top 4-inches above floor with ½-inch rubber expansion joint material between floor and perimeter of pump concrete pad. Pump assembly base shall have 5/8-inch thick by 3-inch wide neoprene waffle pad at all points of contract between pump base and concrete.

Part 3. - EXECUTION

3.1 GENERAL

A. The isolation vendor shall design and provide all brackets or clamps at riser spring guide and anchor locations. The contractor must install and adjust all isolators under the supervision of the isolator vendor or his representative.

B. All vibration isolators must be installed in strict accordance with the manufacturers written instructions and all certified submittal data. Remove space blocks and similar devices intended for any temporary protection against overloading during installation.

C. Installation of vibration isolators must not cause any change of position of equipment, piping or duct work resulting in stresses or misalignment.

D. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

E. The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the

building unless isolation is not specified. Building includes, but is not limited to, slabs, beams, columns, studs and walls.

F. Coordinate work with other trades to avoid rigid contact with the building.

G. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractors expense.

H. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractor's expense.

I. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractor's expense.

I. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24"(600mm) or specified movements exceed 2.2-O capabilities.

J. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide 2.2-Q seals.

K. Locate isolation hangers as near to the overhead support structure as possible.

L. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust when thrust forces exceed 10% of the equipment weight. Horizontal thrust restraints shall be 2.2-I restraints.

M. Rooftop equipment isolators must be bolted to the equipment and structure. Mountings must be designed to resist 100m/h(160 km/h) wind loads.

3.2 VIBRATION ISOLATION OF PIPING

A. Horizontal pipe shall be installed in accordance with 2.2-T Horizontal Pipe Isolation.

B. Risers shall be installed in accordance with 2.2-U Riser Isolation.

C. Spring Isolators:

1. Provide spring isolators on piping connected to isolated equipment as follows:

    a. 3- to 4-inch Diameter: First 3 points of support or 20 feet in both directions, whichever is greater.
    b. 5- to 8-inch Diameter: First 4 points of support or 50 feet in both directions, whichever is greater.
    c. 10-inch Diameter and Over: First 6 points of support or 50 feet in both directions, whichever is greater.
2. Static deflection of first point shall be twice deflection of isolated equipment.

3.3 VIBRATION ISOLATION OF DUCTWORK

A. All duct runs shall be installed in accordance with 2.2-W Duct Isolation.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Field applied insulation for thermal efficiency and condensation control for hydronic piping, ductwork and equipment.

B. Definitions:

1. ASJ: All service jacket, white finish facing or jacket.
2. Air conditioned space: Space directly supplied with heated or cooled air.
3. Cold: Equipment, ductwork or piping handling media at design temperature of 60° F or below.
4. Concealed: Ductwork and piping above ceilings and in chases and pipe spaces.
5. Exposed: Piping, ductwork, and equipment exposed to view in finished areas or exposed to outdoor weather.
6. FSK: Foil-scrim-kraft facing.
7. Hot: HVAC Ductwork handling air at design temperature above 60° F; HVAC and plumbing equipment or piping handling media above 105° F.
8. Density: Pcf - pounds per cubic foot.
9. Thermal conductance: Heat flow rate through materials.
10. Flat surface: BTU per hour per square foot.
11. Pipe or Cylinder: BTU per hour per linear foot.
12. Thermal Conductivity (k): BTU per inch thickness, per hour, per square foot, per degree F temperature difference.
13. PVDC: Polyvinylidene chloride vapor retarder jacketing, white.

Part 2. - PRODUCTS

2.1 SUMMARY

A. Materials:

1. All insulation shall have composite (insulation, jacket, and/or facing and adhesive used to adhere the facing or jacket to the insulation), fire and smoke hazard ratings as tested by Procedure ASTM E-84, NFPA 225 and U/LI 723 not exceeding Flame Spread 25 and Smoke Developed 50.
2. Jacket and Facing Descriptions:
   a. All purpose vapor barrier jackets.
   b. VB vapor barrier, white kraft bonded to 1 mil aluminum foil, reinforced with glass yarn. Water vapor permeability 0.02 perms.
   c. FSK reinforced foil and paper (Foil Scrim Kraft). Aluminum foil (minimum 0.75 mil thick) reinforced with fiberglass yard mesh and laminated to 40 lbs. chemically treated fire resistant Kraft UL rated.
3. Exterior Jacket:
   a. Venture Tape, Ventureclad 1557CW, (Alumaguard 60) 6 mil thickness, adhesive backed, aluminum finish jacket otherwise with zero permeability, shall be capable of being applied down to -20° F.

2.2 DUCTWORK

A. External rigid board insulation shall be Owens Corning 703 Series with FSK or ASJ (All Service Jacket) vapor barrier facing, 3 pound density fiberglass complete with non-combustible foil faced vapor barrier. Entire system shall be UL listed.
   1. 0.030 thick PVC preformed jackets with seams made for welding.
   2. 0.024 thick stucco embossed, smooth or corrugated pattern by Childers Products Company.

B. Internal Duct lining shall be Knauf Eclipse™ Air Duct Board is a resin-bonded fiber glass formed into rigid, rectangular boards faced on one side with a fire-resistant foil-scrim-kraft (FSK) vapor retarder and a lightweight black fiber glass mat on the airstream surface. Rigidity shall be EI-475. Thermal conductivity shall be 0.23 BTU in. per sq. ft. per °F. hour at mean temperature of 75°F. The airstream surface of duct board shall be is treated with an EPA registered, antimicrobial agent that prevents growth of mold, fungus or bacteria in accordance with ASTM C 1071, G21 and G22. Material shall be UL 181 listed and shall not exceed 25 Flame Spread, 50 Smoke Developed when tested in accordance with ASTM E 84, CAN/ULC S102-M88, NFPA 255, and UL 723.

C. Fiberglass blanket shall be 1 pound density, with factory applied type FSK jacket. Conductivity shall be 0.26 average maximum at mean temperature of 75°F.

2.3 PIPING

A. Piping shall be insulated with Manville (IMCOA, Owens-Corning, Knauf) "FLAME SAFE" fiber glass insulation. The insulation shall have an average thermal conductivity not exceeding 0.22 BTU in. per sq. ft. per °F. hour at mean temperature of 75°F.

B. Provide galvanized steel shields at all pipe hangers on insulated piping except hot water heating piping where pipes bear directly on the clevis. Shields shall be 16 gauge for pipes 4” and larger diameter and 20 gauge for smaller pipes.

C. Exposed areas inside a building shall be furnished with factory applied "FLAME SAFE" All-Purpose Vapor barrier jacket.

D. All piping in concealed areas inside a building shall be provided with factory applied "FLAME SAFE" VB (Vapor Barrier Jacket or All-Purpose Jacket).

E. All piping that is located outside and directly or indirectly exposed to the weather and is insulated, shall be totally enclosed and wrapped with a PVC pre-formed jacket.

F. Fittings, valve bodies and flanges for pipe size 4" and smaller shall be provided with PVC jackets over fiberglass inserts.

G. Armstrong (Rubatex, Halstead) Armaflex II flame retardant elastomeric thermal insulation, installed according to manufacturer’s recommendations and as allowed by Local Codes, shall be suitable for pipe temperatures between -40° and 220°.

2.4 HOT VESSELS AND EQUIPMENT

A. Insulate air separators, boiler feed water and storage tanks with 2” fiberglass board.

Part 3. - EXECUTION

3.1 GENERAL

A. All piping and ductwork shall be thoroughly cleaned and dry prior to the application of insulation.

B. Provide continuous vapor barrier over all seams.

3.2 DUCTWORK

A. Apply insulation in thickness and type as follows or per applicable state energy code, whichever is greater.

B. OUTSIDE AIR DUCTWORK: The outside air ductwork to fan coils shall be insulated with 2” external foil faced rigid board fiberglass (or wrap for round duct) insulation or thermal resistance of R-8, whichever is greater (this includes the mixing box and/or sections of mixed air duct). 2” thickness glass fiber blanket may be used in lieu of board in concealed locations. Duct lining is not acceptable for outside air ductwork.

Contractor shall coordinate the routing of all fresh air duct to maintain a minimum of 12" clearance from all domestic water and fire sprinkler piping.

C. RETURN AIR DUCTWORK: Return air ducts shall be insulated with ¾" thickness internal glass fiberboard for all return ductwork within mechanical rooms.

D. SUPPLY AIR DUCTWORK FOR DUCTED RETURNS: Supply air ducts shall be insulated with 1½" thickness glass fiberboards from air handling unit discharge up to runouts to each register/diffuser. 1½" thickness glass fiber blanket may be used in lieu of board in concealed locations.

E. RETURN AIR, DRYER AND EXHAUST AIR DUCTWORK: Ducts within 10 feet of exterior wall and roof penetrations shall be insulated with 1½" inch thickness glass fiberboards. 1½" thickness glass fiber blanket may be used in lieu of board in concealed locations.

F. All individual room exhaust run outs shall be insulated with 1" wrapped insulation. Sidewall duct penetrations within floor/ceiling assemblies shall be insulated with 2" fiberglass wrap and/or a thermal resistance of R-8, whichever is greater.

G. DUCTWORK IN ATTIC SPACES: All ductwork in attic shall be insulated with 2" foil faced rigid board or wrap fiberglass insulation or thermal resistance of R-8, whichever is greater.

H. RESIDENCE UNIT SUPPLY AIR DUCTWORK WITHIN SOFFITS: Supply air ducts shall be insulated with 1 ½" thickness glass fiberboards completely at supply discharge plenum and extended five feet from air handling unit discharge. 1 ½" thickness glass fiber blanket may be used in lieu of board in concealed locations.

I. All dryer, exhaust and outside air ducts within a floor/ceiling or ceiling/roof assembly that cannot maintain 12" clearance from sprinkler piping shall be insulated with 2" fiberglass wrap insulation.

3.3 PIPING:

A. Heating Systems above 40°F and Under 200°F:

1. Apply fiberglass insulation to provide a K-value of 0.27. If the K-value of a product is less 0.22, then the thickness must be adjusted to have an equivalent R-value. Runout branches 2" in diameter and less (not exceed 12 feet length) to individual terminal units: 0.5".

B. Refrigerant suction piping shall be insulated with 1" Armaflex. All outside insulation shall be wrapped with Venture Tape 1507 black line set tape.

C. All heating piping within 15' of any exterior opening within the mechanical room shall be insulated with a minimum of 1" Fiberglass unless indicated otherwise in this specification section.

D. For piping exposed to outdoor air, see insulation thicknesses for specific piping types below. Increase insulation thickness listed by ½".

E. Plastic sealed combustion appliance vent piping shall be insulated in attic or cold spaces with 1" Armaflex foam insulation or per manufacturers minimum recommended thickness, whichever is greater.

F. All service water heating piping in contact with high conductivity material, including concrete, must have 1" minimum insulation K-value of 0.27. Snow melting mains shall be covered with insulation below the level of the concrete slab including U-turns at the concrete slab expansion joint locations. **Note: Contractor to verify with Local Authorities if insulation is required under the concrete slab. If required, verify thickness and type.**

G. HYDRONIC HEATING WATER PIPING:

1. Apply fiberglass insulation in thickness as follows or per applicable State Energy Code, whichever is greater:
   a. (140°F-200°F):

(1)	½" thru 1 ¼"	1 ½"
(2)	1 1/2" and larger	2"

3.4 JACKETS

A. Foil and Paper Jackets: Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1 1/2" laps at longitudinal joints and 3-inch-wide butt strips at end joints.

1. Seal openings, punctures and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
2. Install PVC fitting covers over insulated flanges, fittings and valves.

B. Exterior Exposed Insulation: Install continuous PVC jackets and seal all joints and seams with waterproof sealant.

C. Install the PVC jacket with 1" overlap at longitudinal and butt joints and seal with adhesive.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. All piping materials and methods of construction and workmanship shall be provided as per the requirements of local codes and regulations.

1. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
2. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

B. Lead pipe, solders, flux, etc., are not allowed. All piping and valves associated with the potable water system shall not exceed the 0.25% maximum lead content per U.S senate Bill No. S.3874 and NSF/ANSI 372.

C. The contractor is responsible for verifying all invert elevations with respect to building finished floor elevations and site provisions.

Part 2. - PRODUCTS

2.1 PIPING

A. Heating Water Piping:
1. Type "L" hard drawn copper tubing ASTM B88-03 with wrought copper fittings, using 95/5 solder or brazing.
2. Type "L" seamless grooved copper tube with grooved copper couplings and fittings.
   a. Fittings shall be ASME B16.22 wrought copper or ASME B16.18 cast bronze, with copper-tube dimensioned grooved ends. Victaulic Copper-Connection, Grinnell Grove Copper System and Gruvlok CTS.
   b. Couplings shall be installation-ready, gasket rated to +250°F, and zinc electroplated steel bolts and nuts. Victaulic Style 607, Grinnell Style 640 and Gruvlok 6400 or 6402.
   c. System shall be manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.)
3. Schedule 40 A-53 ERW black steel pipe with cast iron screwed, welded or grooved fittings.
   a. Rigid Type: Housings shall be cast to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.
      1) 2” through 8”: Installation-Ready, stab installation without field disassembly, grade EHP gasket rated to +250°F / 120°C. Victaulic Style 107H, Grinnell Style 740 and Gruvlok 7402.
      2) Victaulic Zero-Flex Style 07, Grinnell Style 772 and Gruvlok 7400 or 7401.
   b. Flexible Type: For use in locations where vibration attenuation and stress relief are required. Three flexible couplings may be used in lieu of a flexible connector. The couplings shall be placed in close proximity to the source of the vibration. Victaulic Installation-Ready Style 177 or Style 77 and Grinnell Style 707 and Gruvlok 7000 or 7001.
   c. 14” through 24”: Victaulic AGS series and Grinnell Style 772 and Gruvlok 7001-2 or 7011.
      1) Rigid Type: Provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style W07, Grinnell Style 772 and Gruvlok 7001-2 or 7011.
      2) Flexible Type: Allow for linear and angular pipe movement. Victaulic Style W77 and Grinnell Style 707 and Gruvlok 7000 and 7001.
4. Viega Pro-Press System and Grinnell Copper G-Press system may be used on type K, L and M hard copper tubing, sizes ½” to 4” and soft copper tubing in ½” to 1 ¼”. System shall be approved for up to 200 psi operating pressure and 250ºF for joining copper tubing. Viega Pro-Press and Grinnell Copper G-Press shall only be used on piping system containing fluids and gases as indicated in the

manufacturers approved listing. All application shall include the proper factory standard or field installed specialty seals.

5. Victaulic 304 stainless steel Pressfit system ½"-2" and Grinnell 316 stainless steel G-Press ½"– 4".

B. Condensate Water Piping:

1. Type "M" seamless copper hard and soft temper ANSI-H23.1 with wrought copper fittings using 95/5 solder or brazing. Type "M" shall not be used on domestic hot water circulating systems.
2. PVC Schedule 40 unthreaded or PVC Schedule 80 threaded. Pipe and corresponding fittings installed per Code limitations.

2.2 VALVES

A. Acceptable Valve Manufacturers:

1. Apollo, Titan FCI, Milwaukee, Victaulic, Nibco, Watts, Mueller, Hammond, Griswold, Anvil, Gruvlok, Grinnell.
2. All valves for potable water shall be low level lead 0.25 percent average lead content.

B. Gate Valves – Heating Water Piping:

1. 2 inches and Smaller: Milwaukee Figure UP148 or Hammond Figure UPIB 640, 125 pound bronze bodied valve with screwed end connections. The solid style disc and bonnet shall also be bronze, and the rising-type stem shall be copper-silicon alloy.
2. 2-1/2 inches and Larger: Milwaukee Figure 2885 or Hammond Figure IR 1140, 125 pound cast iron bodied valve with bronze fittings and flanged end connections. The solid style bronze disc shall be fully guided. The stem shall be steel with OS & Y construction.

C. Butterfly Valves – Heating Water Piping:

1. 2 inches and Larger:

a. Grooved End Type: Butterfly valves shall be suitable for 300 psig psig positive bubble tight shut when fully closed. Valves shall have ductile iron bodies with coated ductile iron, stainless steel, or aluminum-bronze disc, and stainless steel shaft. (Shaft shall be offset from the disc centerline to provide full 360-degree circumferential seating.) Seat shall be pressure responsive and rated to 250°F in sizes through 12" and disc mounted and rated to 230°F for 14" and larger. Victaulic MasterSeal™ and AGS-Vic300. Grinnell Style B302 through 12" and Grinnell Style B333 for 14"-24". Gruvlok 7700 through 12" and 8000GR for 14"-24".

1). For grooved copper-tubing systems, valves shall be bronze body, with copper-tube dimensioned grooved ends. Victaulic Series 608, Grinnell Style B680 and Gruvlok 6700.

b. Lug Type: Butterfly valves shall have drilled and tapped lugs and be 150 psig positive bubble tight shut when fully closed. Valves shall have ductile iron bodies with bronze disc, Type 304 stainless steel shaft, self-lubricating bushings, EDPM seat suitable for at least 250°F. continuous operation with forced hot water. Milwaukee CL 223E/Hammond 5211-01HI.

c. Valves 6 inches and smaller used for shut off service shall have latch-lock handle and when used for throttling service shall have infinite throttling handle with indicator disc adjustable stop. Valves 8 inches and larger shall have worm screw enclosed operator with positive indicator, and when used for throttling service shall have adjustable stop. Provide extended stem to accommodate insulation on insulated piping.

D. Check Valves – Heating Water Piping:

1. 2-1/2 inches and Smaller: Milwaukee Figure UP509 Hammond Figure UPIB904, 150 pound bronze, screwed ends, bronze disc, swing check.

2. 3 inches and Larger: Milwaukee Figure 29274-M13/Hammond IR1937, 150 pound check valve with 3 percent nickel cast iron body and disc, a stainless steel seat and pin and flanged connections.
3. 2 inches and Larger: Grooved end swing check valve, Victaulic Series 712, 300 psig CWP, Grinnell Style 590 and Gruvlok 7800 with ductile iron body and cap, with stainless steel disc and shaft, for horizontal installation.
4. Non-Slam Check Valves - 3 inches and Larger: Mueller Steam Specialty 105 MAT, Titan FCI CJ50-DI-DBS, 125 pound globe style check valves with EPDM inserts.
5. Non-Slam Check Valves - 2-1/2 through 12 inches: Victaulic Series 716 or Gruvlok 7800, 300 psig spring-actuated check valve, with stainless steel spring and shaft, for horizontal or vertical installation.

    a. For sizes 14 through 24 inches, valves shall be Victaulic Series W715, rated to 230 psig, with stainless steel spring, shaft, and dual disc(s), and EPDM seat.

E. Ball Valves –Heating Water Piping:

1. 3" and smaller for heating: Apollo 70-100, Victaulic Series 722, or Milwaukee BA 100 two piece reduced port bronze body, Milwaukee BA 475/485 two piece full port forged brass body, Milwaukee BA 400 two piece full port bronze body 600 WOG chrome plated ball, blow out proof stem, reinforced PTFE seats and where necessary, extended stems for insulation.

    a. In the Vic-Press piping system, valves shall be Victaulic Series 589. In the Grinnell Stainless Steel G-Press System, valves shall be Grinnell #469 Ball Valve.

2. Grooved End Ball Valves: 1-1/2" and Larger, for heating and domestic water service with steel piping systems, Victaulic Series 726 and Grinnell BV835 two-piece ductile iron body with chrome-plated steel or stainless steel standard port ball, blow out proof stem, PTFE seats, and lever handle or gear operator.
3. 4" and larger for heating: Milwaukee Series F20CS150R-02 or Apollo Series 88-200 flanged full port 150 lb. carbon steel ball valve with stainless steel ball and stem, reinforced PTFE seats and blow out proof stem. Provide extended stems for insulation or balancing stops for modulating services.

F. Globe Valves – Heating Water Piping:

1. 2 inches and Smaller – Solder ends: Milwaukee 1502 or Hammond Figure IB 418, 125 pound bronze bodied valve with solder end connections. The disc and bonnet shall also be bronze, and the stem shall be copper-silicon alloy.
2. 2 inches and Smaller – Threaded ends: Milwaukee Figure 502 or Hammond Figure IB 418 (for angle valves) 125 pound bronze bodied valve with screwed end connections. The disc and bonnet shall also be bronze, and the stem shall be copper-silicon alloy.
3. 2-1/2 inches and Larger - Flanged: Milwaukee Figure 2882 or Hammond Figure IR 1138 (for angle valves) 125 pound cast iron bodied valve with flanged end connections. The disc, seat and stem shall also be bronze (Stockham Trim No. 6).

2.3 FLOW FITTINGS/BALANCE VALVE

A. Acceptable Manufactures:

1. Bell & Gossett, Nibco, Mueller, Victaulic/TA Hydronics, Anvil Gruvlok, Grinnell.

B. Bell & Gossett "Circuit Setter", Victaulic/TA Hydronics or Grinnell Circuit balancing valve. All bronze/brass ball or copper-alloy/ductile iron globe type construction with memory stop and integral valved read-out ports. Provide metal identification tags indicating location, size, GPM and meter reading.

2.4 MISCELLANEOUS VALVES:

A. Drain Valves - Heating Water Piping:

1. Nibco #C56-VB, ¾" male thread, tee handle and vacuum breaker.

2. Apollo Series 78-100 or Milwaukee BA100H ball valve, 600 pound, bronze body, chrome plated brass ball and blow-out proof brass stem, reinforced Teflon seals and seats and ¾" hose thread outlet with cap.

Part 3. - EXECUTION

3.1 GENERAL

A. Provide offsets and transitions to hydronic and steam piping due to existing structure and trades work.

B. Slope water piping 1" per 40' and arrange to drain at all low points.

C. Provide shut-off valves to comply with Code and good installation practice for the proper isolation of equipment. All branch take offs shall have isolation shut off valves. Provide extended stem valves where insulated for proper valve operation. Except as otherwise specified or shown on plans, valves 2-1/2 inch and smaller shall have screwed end connections and valves 3 inch and larger shall have grooved end or flange end construction. Install manual drain valves at every low point of each water piping system.

D. Mechanical formed tees connections as created by T-Drill shall be formed in a continuous operation consisting of drilling a pilot hole and drawing out the surface to form a collar having a height of not less than three times the thickness of the tube wall. Branch tube shall not obstruct the flow in the main line tube. All joints shall be brazed in accordance with the Copper Development Association. Soft soldered joints will not be permitted. Mechanical formed connections shall be listed by the National Standard Plumbing Code, B.O.C.A., I.A.M.P.O., S.B.C.C., H.U.D., U.S. Army corps of Engineers, Underwriters Laboratory, ASME Code for Pressure Piping and shall be acceptable to governing authorities.

E. Grooved joints shall be installed in accordance with the manufacturer's latest published installation instructions. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove. Gaskets shall be of an elastomer grade suitable for the intended service, and shall be molded and produced by the coupling manufacturer. The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools and installation of grooved joint products. The representative shall periodically visit the jobsite and review contractor is following best recommended practices in grooved product installation. (A distributor's representative is not considered qualified to conduct the training or jobsite visit(s).

F. Provide escutcheon plates at all wall, floor, or ceiling piping penetrations. This includes all mechanical piping systems. Escutcheon plates shall match the finish of the surrounding area.

G. Provide a dielectric coupling or waterway fitting at all connections of dissimilar metals. Provide adequate clearance for insulation and for access to valves. All piping shall be concealed and shall maintain proper clearances for ceilings, ducts, walls, lighting, etc. except that piping may be exposed in mechanical areas. At all fixture and equipment connections where nipples are necessary between copper fixtures and tubing, such nipples shall be full size brass nipples with brass or copper adapters.

H. Ream pipe ends to remove burrs. Make joints smooth and unobstructed inside. Remove any obstructions or debris inside piping, blowing it out with compressed air or otherwise cleaning it internally immediately prior to assembly.

I. Push-to-Connect Joints: Install Permalynx joints in accordance with the manufacturer's latest published installation instructions. Prepare and mark tubing ends using a tool supplied by the manufacturer and in accordance with the manufacturer's instructions.

J. Install Vic-Press 304™ in accordance with Victaulic recommendations. Pipe shall be certified for use with the Vic-Press 304™ system, square cut (+/-0.030"), properly deburred, and cleaned. Pipe ends shall be marked with a gauge supplied by Victaulic. Use a Victaulic 'PFT' series tool with the proper sized jaw for pressing.

K. Condensate Drains:

1. Provide a deep seal "P" trap at condensate drain beneath each water heater, and extend piping to nearest floor drain, service sink or as shown on drawings.
2. Effective water seal of "P" trap shall be minimum of two times negative static pressure in fan plenum for draw-through fan unit, but not less than 3 inch. Depth of trap shall be minimum of one-half the plenum maximum negative static pressure.
3. Traps for roof mounted equipment shall be constructed of rubber; drain piping shall be PVC, ABS plastic, or Type "M" copper with soldered joints.
4. When code allows and when routing condensate to local lavs, provide tailpiece for branch connection. Coordinate unit requiring tailpiece with HVAC Contractor.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Manufacturer shall have in town local representation and service of the equipment provided.

1.2 WARRANTY

A. Temperature Control: Contractor shall be responsible for defects which develop in any part of the system caused by faulty workmanship, material or equipment and shall replace any such faulty workmanship, material or equipment during a period of 1 year from date of substantial completion. Instruments shall be calibrated to sense, activate and display information specified.

Part 2. - PRODUCTS

2.1 GENERAL

A. Contractor shall provide a complete automatic temperature control system as specified. Contractor shall provide all 120/240 volt circuits to power all low voltage control devices or line voltage devices such as 120 volt damper motor etc. All wiring shall be provided by this contractor. Electrical Division shall provide all 120/240, 1 phase, line voltage, direct control devices and wiring such as line voltage thermostats, time clocks and switches unless specifically noted to be supplied by this contractor and installed by the Electrical Division or remotely controlled and monitored by a Building Automation system.

B. Acceptable Manufacturers: Honeywell, Johnson, Trane, Carrier, Alerton, Invensys, Delta.

C. Space Thermostats:

1. Thermostats shall be of one type for like systems.
2. Thermostats shall have lockout and upper/lower limit temperature setpoint capability.
3. Standalone heat/cool device thermostats shall be Emerson (White Rodgers) model 1F95EZ series capable of auto or manual heat/cool changeover. Thermostats shall have large easy to read digital display with push pad adjustment controls.
4. Common Spaces: Provide electronic programmable thermostats shall be Emerson (White Rodgers) model 1F95 series capable of auto or manual heat/cool changeover. Thermostats shall have digital readout with push pad adjustment controls.

Part 3. - EXECUTION

3.1 GENERAL

A. Coordinate exact location of control power transformers and control panels with the Architect/Engineer.

B. Thermostat located in public areas shall be provided with clear lockable covers unless noted otherwise.

C. Thermostats shall have 50°-90° F temperature scale.

D. Coordinate required mounting height of thermostats with Architect.

E. Provide sensors and support brackets constructed of stainless steel, copper, brass, cast zinc or glass. Covers shall be galvanized steel painted with manufacturer’s standard paint and color.

3.2 CONTROL SEQUENCES

A. Fan Coils: Provide a programmable thermostat with fan/off/auto switch and unoccupied/occupied settings. The space thermostat shall cycle the condensing unit to maintain setpoint. The fan shall run continuously during occupied periods.

B. Unit Heaters: Flow shall be continuous through heater coil. Furnish line voltage thermostat. Fan shall cycle to satisfy space temperature. Electrical Division shall install all 120/240, 1 phase, line voltage, direct control devices and wiring such as line voltage thermostats, time clocks and switches unless specifically noted to be remotely controlled and monitored by a Building Automation system.

C. Boilers:

1. Provide all line and low voltage control wiring for the boiler plant. This includes providing outdoor temperature sensor, wiring the outdoor reset boiler control system and all safeties, etc. Coordinate with the boiler vendor for all necessary wiring.

   Outdoor reset schedule:
   Max boiler HWS temp: When OA = 55, HWS = 100 deg F
   Min boiler HWS temp: When OA = -20 deg, HWS = 170 deg F
   The automated boiler panel automatically calculates a linear regression for all temperatures in between.

2. Boiler Circulating Pumps (BP) shall be wired to boiler panel contacts.
3. Provide pump sequencer Tekmar D132 capable of providing automatic lead/lag control and warm weather shutdown. Boiler and pump(s) OA temperature start up setpoint shall be coordinated and programmed for the same setting.
4. Emergency Boiler Shut Down: Provide an emergency shut off switch at the main boiler room door to shut off the fuel and permit any burner(s) to cycle through its post-purge sequence when the switch is activated.

D. Heating Pumps (HWP) shall be controlled by HOA switch provided by Electrical Division. Lead/lag controller (pump sequencer) shall be enabled when pumps are in ‘auto’ mode.

E. Pump, CP-1: Provide a 120 volt aquastat at the recirc water piping to control pump. Installation and 120 volt wiring by this contractor.

F. Exhaust fans: Refer to 2.1.A for control.

G. Ductless Split System (AC): Provide programmable thermostat with fan/off/auto switch and heating/cooling settings. The space thermostat shall cycle the compressor/condensing section to maintain setpoint.

3.3 START-UP AND COMMISSIONING

A. Following substantial completion, this contractor shall return to the site on a quarterly basis including four (4) balancing/commissioning sessions. Commissioning shall consist of rebalancing both air and water side systems to the extent required to verify proper operation of all system components and controls. Temperature Control contractor shall coordinate with all trades including balancing contractor to make required adjustments.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Work Included:

1. Contractor shall provide all labor, materials and equipment for the installation of complete and functioning hydronic heating system as indicated on the drawings. Install all equipment in accordance with all State and Local codes and manufacturer's recommendations.

B. Quality Assurance:

1. Contractor shall thoroughly review the manufacturer's installation instructions prior to installing any piece of equipment or its associated services (drains, piping, etc.).
2. Provide factory tests to check construction, controls and operation of unit.
3. Prior to firing, provide a boiler inspection by the proper authority and submit a copy of the inspection report to the engineer. Provide an ASME inspection certificate after field assembly of the boiler.
4. Boiler shall meet all Minnesota State Boiler code as well as any Local Code requirements.
5. Any conflicts between the manufacturer's installation instructions and the plans or specification shall be brought to the engineer at once for clarification. Review if boiler low water cut-off required by the boiler manufacturer under any conditions. Provide all the means for testing the operation of the low water cut-off without requiring the entire system to be drained. Contractor will not receive additional money for installations requiring modifications due to these conflicts.
6. Provide a supervised startup in presence of the building official for boilers with burners of 1,000,000 BTU/HR input or greater.

Part 2. - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Hydronic Specialties:
1. Tanks: B&G, Amtrol, Mepco, Thrush, Wessles, John Wood, Bremco, Jarco, Ace, Taco, Flo Fab.
2. Flow Fittings, Valves & Accessories: B&G, Amtrol, Mepco, Thrush, Wessles, John Wood, Bremco, Jarco, Ace, Gustin-Bacon, Victaulic, Taco, Flo Fab, TA Hydronics, Gerrand, FDI, Grinnell.
3. Automatic Flow Limiting/regulating Valve, Flow Fittings, and Balancing Valves: Gerrand, TA Hydronics, B&G, Taco, FDI, Hays, Victaulic, Grinnell.
4. Automatic By-Pass Valves: Danfoss.

B. Pumps: B&G, Armstrong, Aurora, Taco, Patterson, Allis-Chalmers, Peerless, Thrush, Flo Fab, Wilo.

C. Fan Coils: Trane, McQuay, Airtherm, Carrier, First Company, IEC, Envirotec, International, Williams.

D. Terminal Heat (Cabinet Unit Heaters, Unit Heaters, Coils): Modine, Vulcan, Sterling, Trane, Airtherm, Dunham-Bush, Sigma, Rittling.

E. Fintube Radiation: Sterling, Slant/Fin, Dunham-Bush, Vulcan, Argo, Rittling.

F. Sediment/Air Removal Separator (SRS) (ITT Bell & Gosset Lakos).

2.2 HYDRONIC SPECIALTIES

A. Provide backflow preventer unit approved by local authorities in make-up water line to the expansion tank with a B&G (Amtrol, Taco) pressure reducing valve.

*******PICK ONE********

B. Provide ASME conventional expansion tank as scheduled with B&G airtrol tank fitting and gauge glass. Provide saddles for horizontal or base for vertical installation.

C. Provide a pre-pressurized fixed bladder (diaphram) expansion tank Wessels Model NTA-Series tank as scheduled. Provide saddles or support for horizontal or vertical installation.

********END********

D. Provide Rolairtrol air separator (line sized).

E. Provide strainer or suction diffuser for base mounted applications.

F. Provide triple duty valve on the discharge of the pump.

G. Provide Amtrol Series 700 float type, air vent where required for proper elimination of air. Provide a shut off valve.

H. Provide flow fitting and balancing valve Gerrand KG Series, Venturis and Indicators. Provide metal identification tags indicating location, size, GPM and meter reading.

I. Provide where indicated an automatic flow limiting valve B&G Circuit Sentry complete with ball-type shutoff, measuring ports and a replaceable flow regulating cartridge to limit flow within +/-5% GPM independent of fluctuating pressure. Provide metal identification tags indicating location, size and GPM.

J. Provide where indicated an automatic by-pass valve Danfoss model AVDO. Valve shall be self-acting to maintain minimum flow rates. Valve shall open upon a rise in differential pressure with a setting range of 0.725-7.25 psi capable of 145 psi working pressure and 248° F maximum flow temperature. Valve shall be available with NPT or solder tail ends.

K. Provide where indicated flexible bronze hose with braided cover with copper tube ends for Freon or other sweat end services. Acceptable manufacturers: Mason Industries Type BBF, Flexonics Series 301.

2.3 SEDIMENT/AIR REMOVAL SEPARATOR (SRS) (ITT BELL & GOSSET LAKOS)

A. Factory-assembled, designed with tangential nozzles to create a centrifugal action. Particles shall be automatically discharged from the tank. Constructed in accordance with ASME code.

B. SRS4F 4" flanged to purge water continuously, at the same rate, capture solids and return purged liquid back into the closed loop system. Vessel Casing: Designed for indoor installation, body shall consist of carbon steel. Air collector tube: Stainless steel.

C. The unit shall have a solid separation efficiency of 98% of 200 mesh sand and water solution and un-dissolved sediment separation of at least 40-micron rating. Provide air relief 1 ½" NPT connection. Provide with optional aquapass package with ball valves, enunciator, flow switch, tubing and hose connections. Contractor shall provide factory pre-set automatic sediment removal with pump and with visual and audio alarm.

2.4 IN-LINE PUMPS

A. Bell and Gossett Series 60 or Series 80 as scheduled.

B. Unit shall be centrifugal, single stage, close coupled, in-line, back pullout design.

C. Casing shall be cast iron, bronze, rated for minimum of 175 psig working pressure, suction and discharge gauge port, air vent, flanged suction and discharge.

D. Impeller shall be bronze, fully enclosed, keyed to shaft and secured with locknut.

E. Shaft shall be stainless steel or carbon steel with bronze or stainless steel sleeve through seal chamber.

F. Provide standard mechanical seal.

G. Each pump shall be factory tested hydraulically and dynamically balanced.

H. Provide line size shutoff valve and strainer in suction piping.

I. Provide check valve and balancing valve on discharge side of each pump, or use a triple duty valve. Provide a pressure gauge with shut-off valves piped to pump casing tappings for accurate pump pressure readings.

J. Support piping on both sides of in-line pumps. Do not provide permanent support for the pump itself.

K. Provide flexible pump connectors.

L. Pump shall be selected with an impeller motor combination that would allow the pump to run out to 90% of its flow curve without overloading the motor. Notify the engineer if the motor selected is not large enough for this safety.

M. Motors 5 HP and larger shall be Premium Efficiency. Provide Aegis shaft grounding ring for variable frequency drive pump applications.

2.5 FAN COILS (2-pipe)

A. Airtherm Series as scheduled, ARI certified and U.L. listed, 120-1 for the optional high static motors and 208-1 volts for the twilight heating coils with three speed manually switched motor speed controllers. Provide with the discharge duct collar, twilights, 2" filters, forward curved double width double inlet centrifugal fans statically and dynamically balanced, drain pan. Provide VP-9A3 three-way valve package, two aquastats (pre-wired, field mounted, one discriminates whether heating or cooling water is available, second is for sensing the presence of chilled water in pipe to enable the electrical heater upon a call for heating), wall mounted thermostat (3WA115.2) with an integral fan motor speed switch. Unit shall have a separate single point input power connection for the motor (with disconnecting means and thermal overload protection) and the coil (disconnect by others).

B. Provide condensate drain piping. Provide float switch at condensate pan to shut off equipment prior to overflow of the pan. Coordinate with the plumbing contractor for drainage provisions.

C. All wiring between the fan coil and the wall mounted devices is by the Mechanical Contractor.

D. Coils shall be sized as scheduled.

2.6 CABINET UNIT HEATERS

A. Provide an Airtherm type cabinet unit heater as scheduled. Casing shall be fabricated of galvanized steel. Provide wall plate where required.

B. Coils shall be constructed of seamless copper tubes mechanically expanded into rippled aluminum fins for a permanent bond. Provide all coils with a factory installed air vent. See the schedule on the Drawings for capacities.

C. Fan Assembly shall be double width, dual inlet (DWDI) forward curved centrifugal blower. Provide fan housings with a removable front half for complete access to the fans.

D. Motors: permanent split capacitor (PSC), single speed motors. Provide motors with sleeve bearings, oilers, resilient mounts and inherent thermal overload protection with automatic reset.

E. Provide factory installed and wired speed control and integral thermostat with an "Off" position or a disconnecting plug.

F. Provide wall mounted units with inverted air flow and with a sight-tight return air grille. Mount these units 6 inches above the finished floor and provide a four sided trim strip for recessed units.

2.7 UNIT HEATER

A. Airtherm Type UH as scheduled.

B. Casing shall be constructed of 18 gauge steel with threaded connections for hanger rods.

C. Coil shall be constructed of seamless copper tubing with at least 0.025 inch wall thickness, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.

D. Fan shall be direct drive propeller, statically and dynamically balanced. Provide horizontal models with sleeve bearings and fan guards.

E. Provide adjustable pattern diffusers on horizontal models and four way louvers on vertical models.

Part 3. - EXECUTION

3.1 GENERAL

A. Provide accessible, manual vents at the high points for each zone. If a vent location is not accessible, extend the vent to an accessible surface of the cabinet.

B. Provide each zone or device with a shut off valves on the supply and return lines with balancing valve on return.

C. Support all motor driven equipment on vibration isolators.

D. Fill the system with appropriate concentrations of heating water system chemical treatment and 30% ethylene glycol. Contractor shall verify that piping systems are compatible with the glycol being used and applicable to the project's specified operating pressure, temperature and glycol concentration.

E. Provide a "Boiler Control Emergency Off" system consisting of the following for all boilers or combinations of boilers, 400,000 BTUH or more.

1. Emergency push buttons at each mechanical room door wired in series. Pushbutton(s) shall be red, mushroom, momentary with one normally closed contact. Mount in a 4 x 4 j-box with protective clear lift cover and labeled "Boiler Emergency Off" placard.
2. Two pole contactor with manual reset. Contactor shall be 20 amp, 120 volt, 2-pole with auxiliary contacts.
3. Provide wiring between the emergency pushbuttons at every door, the contactor and the boiler control power circuit.
4. Any activation of the emergency shut down system shall require a manual reset. Coordinate exact location of emergency pushbuttons and signage with the Local Boiler Inspector.

F. Auxiliary Condensate Drain Pan:

1. Provide an auxiliary drain pan beneath each cooling coil in which condensate will occur.
2. Provide condensate overflow safety switch Little Giant Model ACS-2, 3.
3. Install switch in the auxiliary condensate drain pan and wire to shut off the unit served prior to overflow of the pan.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. All above ground ductwork material and construction shall be galvanized steel, installed in accordance with the Standards described in the latest edition of the ASHRAE (American Society of Heating, Refrigeration and Air Conditioning Engineers) Guide and Data Book, SMACNA (Sheet Metal and Air Conditioning Contractor's National Association) and Local governing mechanical codes.

B. Changes in direction, elevation or shape shall be made by gradual methods such as radiused elbows of diverging or converging reducing fittings. Changes in dimension shall not exceed 20° diverging angle. Elbow radii shall be at least equal to the width of the duct in the plane of the bend.

Part 2. - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Registers, Grilles and Diffusers and Terminal Air Devices: Titus, Price, J & J, Krueger, Tuttle and Bailey, Carnes, Nailor, Metalaire, Reliable Metal.

B. Louvers: Cesco, Air Balance, Arrow United, Louvers & Dampers, Inc., Safe-Air, Pottorff, Greenheck.

C. Fire and Smoke Dampers: Prefco, Ruskin, Greenheck, Cesco, United Air, American Warming, Safe-Air, Nailor, Acme, Pottorff.

2.2 REGISTERS, GRILLES AND DIFFUSERS

A. Unless indicated, otherwise wall and ceiling R, G, D’s shall be white; floor registers shall have plain aluminum finish. Color finishes shall be approved by the Architect.

TYPE	TITUS MODEL NO.	DESCRIPTION
A	300RL	Double deflection steel supply register. Provide type 1 border. Provide sheet rock frame in sheet rock ceilings.
B	355RL	Steel return/exhaust register. Provide type 1 border. Provide sheet rock frame in sheet rock ceilings.
C	355RLF1	Steel return/exhaust register with 1” filter frame. Provide type 1 border. Provide sheet rock frame in sheet rock ceilings.

NOTE: SELECT ALL DIFFUSERS AND REGISTERS BELOW "NC" OF 30. NOT ALL DIFFUSERS ARE NECESSARILY USED. REFER TO PLANS.

2.3 DRYER/VENTS

A. Provide aluminum ductwork properly sealed and insulated. Provide gooseneck, relief hood or wall cap with backdraft damper. Insulate per discharge ducts in Section 23 07 00.

B. Provide aluminum roof vent caps and sidewall vent louvers for toilet and dryer exhausts with backdraft dampers. Provide bird screens for unit toilet exhausts only.

2.4 RELIEF/EXHAUST WALL AND ROOF VENTS

A. Wall Caps: Coordinate with Architect finishes for specific color requirements:

1. Dryer Wall Caps: Lambro 224 - Series, Primex DV4 - Series. No birdscreen. Gravity backdraft damper. Minimum free area of 12.5 square inches.
2. 4"-8" Exhaust Wall Caps: Primex WC-Series. Provide with birdscreen. Provide with backdraft damper where integral backdraft damper not supplied with exhaust fan.

B. Roof Jack (Pitched Roof): Provide Cook Gemini RJR Series corrosion resistant galvanized steel with black enamel finish, ½" birdscreen. Provide 6" (0-130 cfm) or 8" (131-220 cfm) duct adapter integral back draft damper. Coordinate with Architect finishes for specific color requirements.

1. Roof Jack for Dryers: In-O-Vate Dryer-Jack Model 486.

C. Roof Cap (Flat Roof): Provide Cook Gemini PRF Series all aluminum construction with integral back draft damper and birdscreen.

Size	CFM Range
8	150-300
12	300-800
16	800-1200
20	1200-2000

2.5 LOUVERS

A. Provide Ruskin GFL800 extruded aluminum louvers. Frame shall be 4" (0.081" wall thickness (2), with 6063T5 blades (0.063 wall thickness), J style blades, 45° angle, 5" center to center, 3/4' aluminum bird screen in removable frame.

B. Provide Ruskin ELF extruded aluminum louvers. Frame shall be 4" (0.080 wall thickness (2), with 6063T5 blades (0.081" wall thickness), J style blades, 45° angle, 5" center to center, 3/4' aluminum bird screen in removable frame.

C. Provide Ruskin model BV100 brick vent for sidewall venting of range hoods. Frame shall be extruded aluminum alloy 6063-T5, 0.100 inch nominal wall thickness.

*****SELECT ONE*****

1. Frame Construction: 4 inches (102 mm) frame depth with three 1/8 inch (3 mm) mortar ribs at perimeter.
2. Frame Construction: 1-5/16 inch (33 mm) frame depth with 1 inch (25 mm) flange face. Duct of .063 inch (1.6 mm) aluminum to 18 inches (457) in length.

*****END*****

D. Louvers for sidewall range exhausts shall be Ruskin Model ELF15J, extruded 6063T5 aluminum alloy construction.

1. Frame: 11/2" (38) deep .063" (1.6) wall thickness. Blades: .063" (1.6) nominal wall thickness. Blades are positioned at 45° angle and spaced at approximately 1-7/8" center to center. Bird screen: 3/4" x .051" expanded, flattened aluminum in removable frame. Finish: Select finish specification from Ruskin Finishes Brochure.
2. Straight blades shall be formed aluminum alloy 6063-T5, 0.100 inch nominal thickness, 48 degree angle, 39% nominal free area. Bird screen. Apply alkyd prime coat following chemical cleaning and pretreatment for field painting. Factory assembled vent components. Mechanically fastened construction.

E. Provide Ruskin ELF211 Thinline factory assembled louvers for all sidewall range exhausts with custom kynar color as selected by the architect. Extruded aluminum frame and blades (6063-T5 alloy), 0.060 inch nominal wall thickness. 2" frame depth, flanged. Thinline stationary J blades, 45 degree angle, 3-3/16 inches centers and aluminum ½" mesh bird screen.

2.6 DAMPERS

A. Where dampers separate outdoors from indoors, they shall meet the following standards: Use no damper blade that is wider than 6 inches. Construct damper frames from at least 16 gauge, hot dipped galvanized steel. Fit each blade with double sided, inflatable, field replaceable, extruded vinyl edge seals that lock into slots in the blade. Size each blade to fit tightly between flexible, compressible, metal jamb seals. Set nylon bearings in stainless steel sleeves. Use hexagonal shafts for positive blade control. Conceal damper linkage inside the frames and out of the air stream. The entire assembly shall not rattle or vibrate. A closed damper shall not leak more than 4 SCFM per square foot of face area at 1 inches of water column pressure when tested in accordance with AMCA Standard 500D.

2.7 FIRE DAMPERS

A. Provide fire dampers where shown on drawings and in all code required places even if not shown on the drawings. Fire dampers and frames shall be UL classified 555C and shall be complete with elevated 212 °F fusible links. The entire assembly and installation shall comply with the requirements of NFPA #90A and authorities having jurisdiction. For wood, combustible wood truss frame construction damper shall be UL 263 approved.

B. Mount dampers in UL263 rated assembly per manufacturer's instruction. Coordinate damper type with floor-ceiling assembly type.

C. Dampers shall be Greenheck DFD-Series type. Dampers shall allow for nominal 100% free area when in the open position. Coordinate locations of access panel so as to permit replacement of fusible links.

2.8 CEILING RADIATION DAMPER (CRD)

A. Provide fire dampers where shown on drawings and in all code required places even if not shown on the drawings. Fire dampers and frames shall be UL classified 555 and shall be complete with elevated 212 °F fusible links. The entire assembly and installation shall comply with the requirements of NFPA #90A and authorities having jurisdiction. For wood, combustible wood truss frame construction damper shall be UL 263 approved.

B. Mount dampers within factory furnished sleeves, which are to be held in place with retaining angles. Frame thickness shall be coordinated with wall thickness.

C. Dampers shall Greenheck CRD Series, butterfly type, rated for a minimum of 1 1/2 hour protection. Coordinate locations of access panel so as to permit replacement of fusible links.

2.9 COMBINATION SMOKE/FIRE DAMPERS

A. Provide 18 gauge galvanized steel damper blades. Use no damper blade that is wider than 6 inches. Construct damper frames from at least 16 gauge, hot dipped galvanized steel. Fit each blade with silicone rubber edge seals rated to withstand 450°F. for smoke control and with galvanized steel mating edges for fire control to 1900°F. after the rubber seals have failed. Size each blade to fit tightly between flexible, compressible, metal jamb seals. Set bearings in stainless steel sleeves and use hexagonal shafts for positive blade control. Use only dampers rated UL-555, UL-555S, Leakage Class I and NFPA 90A certified for a 1-1/2 hour fire rating. (The UL Class I rating is for 4 SCFM per square foot leakage at 1 inch water column.)

B. Provide each combination smoke/fire damper with an electric, 120 VAC, two-position operator able to withstand 350°F. The operator shall control the damper unless the fusible link releases it. If the fusible link releases the damper, it shall remain closed until the fusible link can be replaced. The damper shall be normally closed in the event of a power failure.

C. Provide adequately sized rated access panel for actuator and electrical. Coordinate access requirements with the General Contractor.

D. Dampers with in-airstream actuators are allowed however equivalent free area shall be maintained.
E. Dampers installed immediately behind registers shall be UL listed for use out of the wall with internally mounted actuators, Nailer 1221-OW.

2.10 FLEXIBLE DUCTWORK

A. The flexible duct shall be of semi-rigid construction capable of maintaining the shaping required by job conditions without subsequent sagging or droop. Duct connections to equipment outlet collars shall be made in accordance with the duct manufacturer's recommendations. Maximum flexible air duct length not to exceed 6'-0".

B. Flexible air duct shall be externally insulated with 1/2" thick 3/4 lb. density fiberglass wrapped around twice to 1" thick complete with non-combustible vapor barrier and UL listed.

C. Ductwork and insulation shall be UL listed as Flexible Air Ducts Connection Class I, and meet all NFPA 90A and 90B requirements.

D. Insulated flexible duct shall be Thermaflex M-KE.

E. No flexible ductwork connections shall be allowed in exposed ceiling areas

2.11 ACCESS DOORS

A. Where motorized dampers, fire dampers, control equipment are installed in ductwork, provide suitable sized, gasketed doors in ducts. Doors shall be provided with Ventlok #220 door pull and #90 sash type latches. Use sponge rubber to felt gasketing material on door openings. Access doors in insulated ductwork shall be double wall construction with 1" insulation between wall

2.12 AIR CONTROL DEVICES

A. Provide splitter dampers on all main ducts and where shown on the drawings. Provide Ventlok #690, self-locking splitter assembly on each damper.

B. Provide Clevepak, Type DESC damper extractor with spin-collar at all branch take offs.

C. Provide manual balancing damper at each main branch take-off as well as to each diffuser.

D. In all inaccessible areas, provide balancing damper within reach at each diffuser or register.

E. Provide turning vanes per SMACNA Standards in all square elbows.

Part 3. - EXECUTION

3.1 GENERAL

A. Ductwork behind registers and grilles shall be painted out flat black.

B. Duct sizes shown are free area. Increase duct as a required to accommodate internal insulation.

C. Provide a minimum of 2" wide flexible connectors to all ducted equipment less than 2000 CFM and 4" wide on 2000 CFM and greater.

D. Support all suspended motor and/or fan driven equipment on vibration isolators.

E. All duct runout shall be equal to the grille or diffuser neck size unless indicated otherwise.

3.2 COORDINATION

A. Contractor shall coordinate the routing of all sprinkler piping to maintain 8" minimum clearance from outside air ductwork and ducts or vents that communicate directly with the outdoors within a twenty foot distance from the outside wall penetration**.**

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. The boiler shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burners shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The boiler shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The boiler shall operate in a safe condition at a derated output with gas supply pressures as low as 4 inches of water column.

B. The boiler shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for boiler set-up, boiler status, and boiler diagnostics. Diagnostics shall be indicated in “real words”, not fault code numbers. It shall have a built in cascading sequencer which allows for control of up to 8 boilers by acting as a lead/lag controller which assigns one boiler as the “lead” boiler and the remaining boilers as “followers” or lag boilers. The system will rotate the firing order of each boiler to insure that each boiler will see equal run time amounts. The control system will control the boiler pump, system pump and domestic hot water pump and shall give prioritization for domestic hot water. All components shall be easily accessed and serviceable from the front and top of the jacket.

C. The boiler shall be equipped with a temperature/pressure gauge; high limit temperature control (auto reset); ASME certified pressure relief valve; boiler circulating pump (KB80-285); outlet water temperature sensor; return water temperature sensor; flue temperature sensor; outdoor air sensor; low water protection and built-in freeze protection. The boiler shall be equipped with an outdoor air reset function. The manufacturer shall verify proper operation of the burners, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

1.2 REFERENCES

A.

1.3 WARRANTY

A.

Part 2. – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. The boiler shall be a Lochinvar Knight Model KB Series as scheduled (Lars, Hydro Therm, Aerco).

B. The boiler shall bear the ASME “H” stamp for 145 PSI (285-500) or 60 PSI (80-120) working pressure and shall be National Board listed. There shall be no banding material, bolts, gaskets or “O” rings in the header configuration. The stainless steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in-trap shall allow condensation to drain from the heat exchanger assembly. The complete heat exchanger assembly shall carry a twelve (12) year limited warranty.

C. The boiler shall be certified and listed by CSA International under the latest edition of the harmonized ANSI Z21.12 test standard for the US and Canada. The boiler shall comply with the energy efficiency requirements

for the latest edition of the ASHRAE 90.1Standard and the minimum efficiency requirements of the latest edition of the ASHRAE 103 Standard. The boiler shall meet US Environmental Protection Agency and Department of Energy guidelines for "Energy Star" efficiency. The boiler shall operate at a minimum of 90% thermal efficiency (399-500) or 93% Annual Fuel Utilization Efficiency (80-285). The boiler shall be certified for indoor installation.

Part 3. – EXECUTION

3.1 EXAMINATION

A. Examine area to receive boiler for compliance with requirements for installation tolerances and other conditions affecting boiler performance. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install boilers level and plumb, according to manufacturer's written instructions and referenced standards.

B. Install gas-fired boilers according to NFPA 54.

C. Support boilers on 4-inch- (100-mm-) thick concrete base, 4 inches (100 mm) larger on each side than base of unit.

D. Furnish all control devices and wiring associated with the boiler plant and interfaced with the Boiler Control panel.

E. Install electrical devices furnished with boiler, but not specified to be factory mounted.

F. Install a 1" drain valve on the outlet piping prior to the first shut off valve.

G. Coordinate with the gas company and the owner for acceptable gas pressures.

H. Provide air vents at all points necessary for facilitating air removal. Provide shut off valves on the system side of all vents. Provide drains where necessary.

I. The contractor shall flush the heating systems. Provide a cleaning detergent and circulate for a minimum of 24 hours. Flush the system until the discharge water is clean. Fill the system with appropriate concentrations of heating water system chemical treatment.

J. Provide low water cutoff for the boilers with a rated input of 400,000 BTU/HR or greater.

K. Provide low water cutoff to protect all the boilers installed at an elevation where all radiation in the system is below the lowest safe permissible water level.

L. The boiler shall be installed and vented as follows:

a. Direct Vent system with sidewall or rooftop termination of both the vent and combustion air. The boiler's total combined air intake length shall not exceed 100 equivalent feet. The boiler's total combined exhaust venting length shall not exceed 100 equivalent feet. ***Foam core pipe is not an approved material for exhaust piping.***

M. The boiler shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of 30 ppm or less (300-500), or 55 ppm or less (80-285) corrected to 3% O2.

N. Optional Equipment:

a. Adjustable High Limit w/Manual Reset
b. Alarm Bell

c. Condensate Neutralization Kit
d. Concentric Vent Kit (KB80-210) (Recommended for non-corrosion resistant drains)
e. Flow Switch (Recommended)
f. High & Low Gas Pressure Switch
g. Low Water Cut-Off w/Manual Reset
h. PC Software 2/connector Cable (Required for BMS Systems)
i. Wall Mount Shell Kit (KB80-105)
j. Multi Stack Frame
k. FM
l. IRI
m. California Code

3.3 CONNECTIONS

A. Connect gas piping full size to boiler gas-train inlet with union.

B. Gas piping shall be installed as shown on drawings.

C. Connect hot-water piping to supply-and return-boiler tappings with shutoff valve and union or flange at each connection.

D. Install piping from safety-relief valves to nearest floor drain.

E. Connect breechings to boiler outlet, full size of outlet. The boiler shall operate under positive (Category IV) or negative (Category II) stack pressure. Vent material must be a listed Stainless Steel Double Wall type for condensing appliances. Approved venting material shall be in strict accordance with Manufacturer's instructions. AL29-4C or Polypropylene pipe may be acceptable but are subject to Manufacturer's instructions. PVC pipe is NOT an acceptable venting material for condensing boilers.

F. Electrical: Comply with applicable requirements in Electrical Division Sections.

G. Ground equipment:

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to supervise the field assembly of components and installation of boilers, including piping and electrical connections. Report results in writing.

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Manufacturer's representative shall supply a factory authorized service technician to start up the boilers.

3.5 CLEANING

A. Flush and clean boilers on completion of installation, according to manufacturer's written instructions.

B. After competing boiler installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes including chips, scratches, and abrasions with manufacturer's touchup paint.

3.6 COMMISSIONING

A. Engage a factory-authorized service representative to provide startup service. Start up to be performed only after complete boiler room operation is field verified to offer a substantial load, and complete system circulation. One-year warranty shall be handled by factory authorized technician. Engage a factory-authorized service representative to train Owner's maintenance as specified below:

1. Operate boiler, including accessories and controls, to demonstrate compliance with requirements.
2. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Review data in the maintenance manuals. Refer to Division 1 Section "Contract Closeout."
4. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
5. Schedule training with Owner with at least 7 days' advance notice.

B. Verify that installation is as indicated and specified.

1. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 16 Sections. Do not proceed with boiler startup until wiring installation is acceptable to equipment Installer.

C. Complete manufacturer's installation and startup checklist and verify the following:

1. Boiler is level on concrete base.
2. Flue and chimney are installed without visible damage.
3. No damage is visible to boiler jacket, refractory, or combustion chamber.
4. Pressure-reducing valves are checked for correct operation and specified relief pressure. Adjust as required.
5. Clearances have been provided and piping is flanged for easy removal and servicing.
6. Heating circuit pipes have been connected to correct ports.
7. Labels are clearly visible.
8. Boiler, burner, and flue are clean and free of construction debris.
9. Pressure and temperature gauges are installed.
10. Control installations are completed.

D. Ensure pumps operate properly.

E. Check operation of pressure-reducing valve on gas train, including venting.

F. Check that fluid-level, flow-switch, and high-temperature interlocks are in place.

G. Start pumps and boilers, and adjust burners to maximum operating efficiency.

1. Fill out startup checklist and attach copy with Contractor Startup Report.
2. Check and record performance of factory-provided boiler protection devices and firing sequences.
3. Check and record performances of boiler fluid-level, flow-switch, and high-temperature interlocks.
4. Run-in boilers as recommended or required by manufacturer.

H. Perform the following tests for each firing rate for high/low burners and for 100, 75, 50 and 25 percent load for modulating burners. Adjust boiler combustion efficiency at each firing rate. Measure and record the following:

1. Gas pressure on manifold.
2. Combustion-air temperature at inlet to burner.
3. Flue-gas temperature at boiler discharge.
4. Flue-gas carbon-dioxide and oxygen concentration.
5. Natural flue draft.

I. Measure and record temperature rise through each boiler.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Contractor shall thoroughly review the manufacturer's installation instructions prior to installing any piece of equipment or its associated service, (gas, hot or chilled water piping, flues, etc.). Any conflicts between the manufacturer's installation instructions and the plans or specification shall be brought to the engineer at once for clarification. Contractor will not receive additional money for installations requiring modifications due to these conflicts.

Part 2. – PRODUCTS

2.1 GENERAL

A. Approved Manufacturers: Listed acceptable manufacturers shall be subject to compliance with specified requirements.

1. Supply and Exhaust Fans: Cook, Barry Blower, Penn, Greenheck, Carnes, ACME, Nutone, Broan, S&P (Soler & Palau), Twin City Fan.
2. Condensing units: Carrier, Lennox, Bryant, Trane, Reznor, York, Tempmaster, Comfortmaker, Frigidaire, Luxaire, Gibson.
3. Fan Coils: Carrier, McQuay, First Company, Trane, Airtherm, IEC, Envirotec, International, Williams.
4. Ductless Mini-Split Air Conditioners: Daikin, Mitsubishi, Carrier.

B. Condensate:

1. Provide condensate piping from each cooling coil condensate pan to nearest floor drain or common drain riser.
2. Provide an auxiliary drain pan beneath each cooling coil in which condensate will occur.
3. Provide condensate overflow safety switch Little Giant Model ACS-2, 3 or as option Diversitech SOS-1.
4. Wire to shut off the unit served prior to overflow of the pan or sensing water build-up in the condensate piping. Piping shall be sized per Code and manufacturers recommendations with a minimum of ¾".
5. Provide condensate neutralizing kit for all high efficiency gas fired condensing burner equipment.

C. Condensing Unit (CU):

1. Provide a condensing unit as scheduled.
2. The unit shall be UL listed, high efficiency compressors, pre charged line sets, crankcase heaters, copper or aluminum tubed coil with aluminum fins, internal pressure relief valve, soft start, 5 year compressor warranty. Provide low-temp lockout control to prevent operation below 40° F (adj.) unless units are scheduled to be equipped with low-ambient controls.
3. Casing to be louvered and constructed of heavy gauge, galvanized steel and painted with a weather-resistant powder paint.
4. Provide matching insulated DX cooling coil assembly for each CU unit.
5. Provide concrete or fiberglass pad or rails for roof installation for each condensing unit.
6. Provide refrigerant piping for condensing units and size in accordance with manufacturer's recommendations. All refrigerant suction and liquid lines shall be strapped together whenever possible.
7. Provide hail guard panel(s) to protect condenser coils.

D. Fan Coils (FC):

1. Provide a fan coil hideaway or cabinet units as scheduled. Provide with the discharge duct collar, return air plenum, 2" filters, variable pitch motor sheaves, forward curved double width double inlet centrifugal fans statically and dynamically balanced.
2. Provide DX evaporator coil with matching condensing unit. Coils sized for 80ºF DB/ 67ºF WB EAT.
3. Provide 2 row hot water coil with 24-volt two way control valve. Heating coils based on 20º, 180º EWT 20º drop, 70ºF EAT.
4. Provide 3/4" condensate drain from each evaporator drain pan. Route to nearest floor drain or to the exterior 12” above finished grade.

E. Ductless Split System (AC):

1. Provide a ductless split system heat pump as scheduled, consisting of an indoor high wall mounted or ceiling recessed or ceiling suspended evaporator/blower section and matching outdoor condensing section. Unit will include high efficiency rotary-type compressor, short cycle fire delay and automatic low ambient fan operation. Heat pump shall include an in-line muffler, microprocessor defrost control, self diagnostic service mode, crankcase heater indoor coil high temperature protection and automatic changeover. Provide programmable space thermostat. **[Provide with optional outside air connection and fresh air intake. Provide duct and wall cap with bird screen and balancing damper. Balance to cfm’s shown on plans or as scheduled. Provide optional wireless remote control.]**
2. Provide 3/4" condensate drain from each evaporator drain pan. Route to nearest floor drain or to the exterior 12” above finished grade.

F. Supply Fans (SF):

1. Provide a supply fan Cook SW series as scheduled. Sidewall steel propeller fan complete with square venturi, stamped steel propeller, shutter assembly, motorized damper (factory wired interlocked with the fan), belt drive, AMCA rated. High efficiency motors, 100,000 hour sealed bearings.

G. Exhaust Fans (EF):

1. Provide Panasonic WhisperValue exhaust fan as scheduled and as shown on the drawings. The fan shall be of the ceiling/wall mount and have a totally enclosed permanently lubricated condenser motor. The fan noise rating shall be 1.4 sones maximum @ 80 cfm. The fan housing shall be heavy-gauge zinc galvanized steel and painted to protect it from rust. Provide with detachable adaptors, firmly secured duct ends, adjustable mounting brackets (up to 26"), and plug-in fan/motor units that detach easily from the housing. Provide integral motor overload protection, disconnecting means and UL rating, Energy Star qualified and labeled accordingly. Provide ceiling radiation dampers where shown and scheduled.
2. Provide a ceiling in-line blower Cook Gemini Series as scheduled. In-line duct blower units shall be of the direct drive, forward curved centrifugal blower type. Motor and blower assembly shall be permanently lubricated. Motor shall be provided with means of disconnect. Unit shall come with a white ceiling grille. Unit shall be UL listed and AMCA rated.

Part 3. - EXECUTION

3.1 GENERAL

A. Installation:

1. Equipment mounted on the roof shall be rigidly fastened with vibration isolators on curbs or rails that are flashed to the roof. Coordinate flashing with roofing contractor. Air cooled condensers and heat pumps of 5 ton capacity or less shall be rigidly fastened to a pre-cast mounting pad. Roof shall be protected from concrete pad with 1” rigid foam insulation or etha foam. Roofing contractor shall approve method and product used.

2. Support all suspended and floor mounted, motor and/or compressor driven equipment on spring isolators.
3. All floor mounted equipment shall be set at 4” high concrete curbs extending 2” beyond the equipment footprint.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide electric space heating equipment wherever required by the Drawings and Specifications.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 22 00 10.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All electric space heating equipment shall be as follows:

1. Chromalux
2. Berko
3. Fasco
4. Indeeco
5. Markel
6. Qmark
7. Raywall

2.2 PRODUCT

B. Fan Forced Wall Heaters (Berko numbers are provided for cross referencing):

1. FF-X: Berko #FRC- Series, with integral tamper proof thermostat and disconnect. Voltage and heating capacity as scheduled.

C. Cove Heaters (Berko numbers are provided for cross referencing):

1. ECH-X: Berko #CHC-Series. Length, voltage and wattage as scheduled.

D. Zero Clearance Plenum Heaters (Qmark numbers are provided for cross-referencing):

1. PH-1: 3,000 watt, 208 volt, single phase, 400 CFM, integral disconnect with 12.5”H x 19.5”W x 24”L cabinet. Provide 24V Thermostat. Qmark #MSPH138124.
2. PH-2: 5,000 watt, 208 volt, single phase, 400 CFM, integral disconnect with 12.5”H x 19.5”W x 24”L cabinet. Provide 24V Thermostat. Qmark #MSPH158124.

Part 3. – EXECUTION

3.1 INSTALLATION

A. General Requirements: When shown on plan or specified, the Contractor shall provide a line voltage, remote thermostat for control of electric space heating equipment. Exact location shall be coordinated with Architect.

END OF SECTION

DIVISION 24 – 25

1. Not included on this specification.

DIVISION 26

ELECTRICAL DESIGN CRITERIA – 26 00 00

1. SCOPE OF WORK: Provide and install complete interior, exterior and site lighting, power, low voltage emergency lighting, and alarm systems as illustrated in the contract documents.
    1.1. Including control panels, feeder, service connection, main and sub panels, connections to all mechanical equipment, pumps and fans, building grounding/bonding, switching devices, ground fault devices, duplex devices, quadplex devices, horns, strobes, smoke detectors, carbon monoxide detectors, occupancy sensors, specialty power for equipment and coordination with owner's security and tele/data consultant.
2. CODE: All electrical work shall be designed and installed by the Contractor in accordance with all governing authorities, ordinances and codes.
3. Shop drawings shall be required for the Owner's review and approvals. Shop drawings shall include all required drawings, equipment and fixture submittals and calculations.
    3.1. Shop drawings should also include a foot candle plot of the specified lighting fixtures in all areas with new lighting; both interior and exterior.
4. Each Contractor shall visit site to become fully informed as to existing conditions before submitting proposal. No additional compensation or allowances shall be granted to this Contractor for failure to fully understand existing conditions prior to design and construction.
    4.1. Each Contractor shall coordinate closely with General Contractor and other Contractors to perform the work. Sufficient materials and labor shall be provided as required to maintain progress with all phases of construction.
5. Verify the location of all electrical devices with the Owner prior to roughing in any work. Actual and final locations of devices are subject to Owner's approval.
6. NEW DEVICES: All new power devices shall be temper resistant. As required by code all new devices shall be arc fault. Contractor to verify exact scope and include as part of base bid.
7. BRANCH CIRCUIT WIRING: Complete with all final connections to equipment, devices, light fixtures, receptacles, motors, and all other equipment as required. Minimum wire size for lighting and power circuits shall be as per the local governing electrical code. Larger wire sizes shall be provided as required to carry the connected loads without excessive voltage drop.
8. JUNCTION AND OUTLET BOXES: Provide device boxes suitable for intended service and in compliance with the local governing electrical code. The electrical Contractor shall furnish and install all junction and pull boxes as required.
9. GROUNDING: All electrical equipment shall be connected to the ground network. Ground cable size, type, and connection shall be as required by the local governing electrical code.
10. All battery backed-up devices, including smoke detectors and carbon monoxide detectors shall be tested and replaced if found to not be in working order.
11. All recessed fixtures that are mounted in insulated cavities shall be IC rated. All other recessed fixtures shall be provided with a physical barrier keeping min. 3" clear of all insulation around all sides with no insulation resting on top of the fixture.
12. SMOKE AND CARBON MONOXIDE DETECTORS: All detectors shall be provided and installed by the Contractor as required by the local official and hard wired in accordance with state and local fire codes. Reference General Notes for required minimum locations as well as Electrical Sheets.
13. GUARANTEE: All materials and equipment furnished for this project shall be new and free of defects. All work shall be of good quality, free of faults and defects. All work, materials and equipment shall be guaranteed for one (1) full year from the date of certificate of occupancy. All manufacturer's warranties shall be in excess of Contractor's guarantee.
14. Provide all submittals within the final O&M manuals.
15. Contractor to provide as built drawings of installed work.

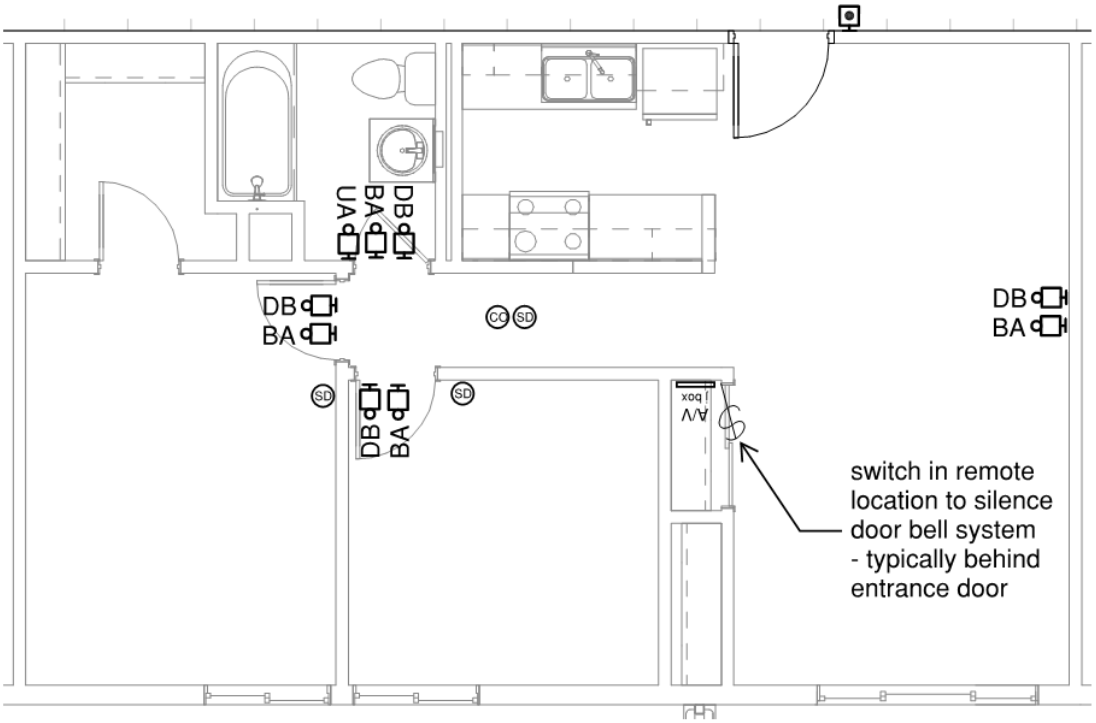
16. INSTALLATION: Install in accordance with manufacturer's instructions.
17. COORDINATION: The electrical Contractor shall coordinate with all other trades to prevent interference between beams, joists, structures, piping, ductwork, etc.
18. STARTING EQUIPMENT AND SYSTEMS: Provide manufacturer's approved field representative to prepare and start equipment. Adjust for proper operation within manufacturer's published tolerances. Demonstrate proper operation of equipment to Owner's designated representative.
19. Unless specifically noted on the drawings, no new raceways or conduits shall be exposed on the finished side of and interior or exterior surface. All concealed wiring, conduit, junction boxes, etc. shall be installed as per the requirements of the local electrical code. If any are concealed within a fire-rated assembly, proper encasement/penetrations shall be included as part of a complete installation.

HEARING AND VISUAL IMPAIRMENT DEVICES – 26 00 01

1. SCOPE OF WORK: Units as noted to be for the Hearing and Visually Impaired shall comply fully with ANSI A117.1 Chapter 7 and other relevant sections of this specification. Contractor to coordinate exact devices as illustrated in the contract documents. If not specified elsewhere, at a minimum the contractor shall provide and install the following:
2. UNIT SMOKE DETECTION – All smoke detectors in the unit shall be interconnected and include an audible and strobe notification device similar to the BRK 7010BSL. If a CO detector is needed, than a separate device needs to be installed interconnected with this device.
3. BUILDING FIRE ALARM SYSTEM – Where a building fire alarm system is provided, the system wiring shall be extended to a point within the unit in the vicinity of each bedroom detector and one location in the common area similar to all other units. The combination signaling device shall be activated by the building fire alarm system in the portion of the building containing the unit. The lens on the devise shall be CLEAR similar to the Edwards Signaling Combination Devices, 869 Series.
4. UNIT FIRE ALARM SYSTEM – Where a building fire alarm system is provided, the system wiring shall be extended to a point within the unit in the vicinity of each bedroom detector and one location in the common area similar to all other units. The combination signaling device shall be activated by the building fire alarm system in the portion of the building containing the unit. The lens on the devise shall be CLEAR similar to the Edwards Signaling Combination Devices, 869 Series.
5. UNIT PRIMARY ENTRANCE – A hard-wired electric doorbell shall be provided. A button shall be provided on the public side of the unit primary entrance. Activation of the button shall initiate an audible tone along with a strobe within the unit. The combination signaling device shall have a BLUE lens similar to the Edwards Signaling Combination Devices, 869 Series. Doorbell button basis of design: Viking Electronics, DB40-WH.
6. BUILDING ENTRY SYSTEM – System shall support voice and TTY communication with the unit interface. The unit interface shall include a telephone jack capable of supporting voice and TTY communication with the public or common-use system interface.
7. CLOSED-CIRCUIT COMMUNICATION SYSTEMS – System shall be integrated into the building entry system and comply with the same requirements.
8. VISUAL IDENTIFICATION SYSTEM - A means for visually identifying a visitor without opening the residential dwelling unit entry door shall be provided and shall allow for a minimum 180 degree range of view. In doors, peepholes that include prisms clarify the image and should offer a wide-angle view of the hallway or exterior for both standing persons and wheelchair users. Such peepholes can be placed at a “standard height” of 60” AFF and permit a view from several feet from the door. A second viewer at 42” AFF shall be installed. Basis of design: Doorscope DS238 Metallic Ultra-Wide Angle.

9. BASIS OF DESIGN LAYOUT FOR DEVICES:

9.1. All devices shall be located in areas as illustrated in the contract documents as well as per the illustration below.



Unit Door Bell	DB	amber lens	Edwards Signaling Combination Devices, 869 Series Xenon strobe light source with horn • Flash rate 60 fpm • 100dB at 1 meter/90dB at 10ft. (measured in anechoic chamber) Provide permanent label.
Building Alarm	BA	clear lens	
Unit Alarm - strobe only	UA	clear lens	
Unit Smoke Detector	SD		BRK 7010BSL - 177 candela strobe Xenon light
Unit CO2	CO		standard detector interconnected with smoke detectors
System On/Off switch			Provide ON/OFF switch in remote location for Audio/Visual system. Provide permanent label.
Signaling device			Provide Audio/Visual Signaling device with Horn/Strobe, lighted pushbutton with engraved plate & transformer. Edwards Signaling - 7005G5
J Box	A/V j box		Provide 6"x6" Hoffman box for 100VA transformer & hearing impaired wiring

Part 1. - GENERAL

1.1 SUMMARY

A. These plans and specifications constitute a 50% set of documents.

B. General and Supplementary conditions within Division 0 and 1 are hereby incorporated and become part of these Specifications, covering all work in Electrical Division.

C. Before submitting a proposal on the project, the Contractor shall visit the site and familiarize themselves with the conditions and limitations affecting Electrical Division work. No additional costs to the Owner shall be allowed for items verifiable during site visits.

D. Contractor shall provide sufficient workers and materials to keep pace with the construction schedule. Contractor shall place orders for equipment such that job progress is not slowed due to late delivery and shall confirm delivery dates with suppliers.

E. The Contractor shall provide office space and storage for materials and equipment supplied. Location shall be as directed by the General Contractor or the Architect/Engineer.

F. Upon completion of the work shown and specified under Electrical Division and prior to final close out of the Project, the Contractor shall verify in writing that all systems are 100% complete and operating properly. This notification shall include copies of all Subcontractor notifications. Any system not operating properly at final inspection shall be immediately repaired and demonstrated to the Engineer.

G. Rebates or credits provided by utility companies or equipment manufacturers shall be directly credited to the Owner.

1.2 ELECTRICAL PLANS

A. The Electrical Drawings and Specifications shall form a set of Plans for the electrical work. Neither the Drawings nor the Specifications shall be complete without the other. Any item shown on the Drawings or specified in the Specifications shall be considered as shown and specified on both.

B. Any questions regarding the intent of the Drawings or Specifications shall be brought to the Engineer's attention as soon as possible. If direction from the Engineer cannot be obtained due to time or communication limitations, the greater quantity, higher quality or condition most favorable to the Owner shall be assumed. Contractor shall provide all labor, materials, equipment, and miscellaneous items necessary for a complete and operational electrical installation, as shown on the Drawings and called for in these Specifications.

C. Drawings:

1. Contractor shall familiarize themselves with Architectural, Structural and Mechanical Drawings and Specifications. Coordinate all shafts, chases, furred spaces, suspended ceilings, locations of equipment, etc.
2. Electrical Contractor shall coordinate routing of all conduit and wire within soffits provided by the General Contractor. The Electrical Contractor shall provide all soffiting required to cover installations not coordinated or specifically approved by the Architect and Engineer.
3. Electrical Drawings are diagrammatic and are intended to show approximate location only. Placement of electrical equipment and devices shall not interfere with locations or clearances of other trades' materials or equipment.
4. Contractor shall verify locations with architectural elevations.
5. Dimensions given on the Drawings shall take precedence over scaled dimensions. Dimensions, whether given in figures or scaled, shall be verified in the field.

6. Contractor shall verify that the equipment to be furnished under Contract will fit within the available space.
7. Notify the Architect or Engineer of any discrepancies between Electrical, Architectural and Mechanical Drawings.
8. Verify items such as door swings, window locations, casework, etc., before installing any electrical equipment or devices. All devices conflicting with other trades work due to lack of coordination shall be relocated at no additional cost to the Owner.

D. The following terms used in the Drawings and Specifications shall be defined as follows:

1. Contractor: Shall mean Electrical Contractor or any of their Subcontractors.
2. Work: Shall mean labor and/or materials of the Electrical Contractor or any of their Subcontractors.
3. Furnish: Shall mean purchase, submit for Engineer approval, coordinate with Contract Documents and deliver to site in a new, undamaged condition.
4. Connect: Shall mean to bring electrical service and/or control wiring to equipment, make all final connections, provide all necessary miscellaneous materials required and do final check out to ensure proper equipment connections.
5. Install: Shall mean to store as directed, protect from damage, set in place, connect, test and turn over to the Owner in full operating condition.
6. Provide: Shall mean furnish and install.

E. CAD and Drawing Files:

1. Electrical CAD drawings prepared by Steen Engineering, Inc. for this Project are instruments of Steen Engineering, Inc. for use solely with respect to this Project. During the course of the implementation of the Project, and with Steen Engineering, Inc. approval, copies may be obtained of CAD drawings for the preparation of Shop Drawings. These CAD drawings shall not be used on other projects, for additions to this Project, or for completion of this Project by others. Any revisions, additions and/or deletions to these CAD drawings, either intentional or unintentional, shall be made at the full risk of the person(s) making such revisions, additions and/or deletions. Such person(s) shall hold harmless and indemnify Steen Engineering, Inc. of any and all responsibilities and liabilities.
2. CAD drawings files of Architectural floor plans, elevations, sections, etc, shall be requested directly from the Architect.

1.3 COORDINATION OF DRAWINGS

A. For typical or repetetive HVAC unit installations, Electrical Contractor shall coordinate with Mechanical Contractor to schedule an inspection with local and/or state AHJ to review a complete mock-up example installation and receive approval prior to proceeding with additional installations. Installation shall meet all code and manufacturer's service clearance requirements. Contractor shall coordinate installation and subsequent inspection with general contractor and any related trades.

B. Contractor shall submit ¼-inch scale drawing to the Engineer indicating placement of all mechanical and electrical systems and equipment. Indicate proposed locations of all major equipment and materials, including but not limited to service equipment, exterior wall and foundation penetrations, fire-rated wall and floor penetrations, sizes and location of required concrete pads and bases, and mechanical/electrical equipment room layouts. This effort will require each trade to closely work together to produce a ¼-inch set of coordination drawings for each area of the building.

C. Coordinate scheduling and sequencing required for movement and positioning of large equipment into the building with all other Contractors to minimize impact on their work.

D. This Contractor shall provide any and all input required to complete these drawings.

1.4 ALTERNATES:

A. All alternates described by Architect.

1.5 MATERIALS AND EQUIPMENT

A. Materials:

1. All materials shall be new and of the type and quality specified herein.
2. Specific materials and equipment specified is intended to establish a minimum standard of required quality. Where specified materials and equipment fail to meet minimum standards of existing federal, state and local codes and ordinances, the governing codes and ordinances shall prevail.
3. The Contractor shall provide all minor miscellaneous materials necessary for the complete electrical installation.
4. For materials and equipment specified by description only, Contractor shall provide materials or equipment suitable for the purpose intended. These shall be in conformance with all governing codes, these Specifications and normal trade practice.
5. Supply materials and equipment to the site in original packages, containers or crates insofar as is practical. It shall be the Contractor's responsibility to schedule deliveries with other Contractors and the Engineer.
6. Provide for proper receipt, handling, storage and protection from the elements for all materials and equipment to be used on this Project so as to effectively prevent damage or deterioration. Materials or equipment sustaining damage or undue deterioration from any cause whatsoever shall be replaced or repaired by Contractor.
7. The Contractor shall properly protect all equipment from damage during construction. Thoroughly clean all fixtures, equipment and other supplied materials. Make all necessary repairs and apply touch up paint prior to final inspection and contract close out.
8. All materials and equipment shall be listed by Underwriter's Laboratories, Inc. (UL). Materials and Equipment shall meet the UL requirements of each standard in every case where such a standard has been established for that particular type of material. Equipment shall be UL listed and labeled as an entire assembly or system.

B. Prior Approvals:

1. All requests for prior approvals must be received by the Engineer at least seven working days prior to bid date. Applications for prior approval shall be considered only from Contractors submitting bids on the Project. Contractors shall determine whether materials receiving prior approval are actually in accordance with details of the Specifications.
2. The Contractor shall be responsible for all deficiencies that may exist from the use of substituted products and equipment, including additional labor and materials required to complete the work. All dimensions and characteristics of substituted products shall be verified and coordinated with all affected trades and Subcontractors. Any required changes or modifications to the work of any other trade or Subcontractor incurred due to using accepted substituted products shall be coordinated and performed by this Contractor at no additional cost to Owner.

1.6 SUBMITTALS

A. Within fifteen days after the award of the Contract, the Electrical Contractor shall submit shop drawings on all major electrical equipment to the Architect for approval. Shop Drawings shall be submitted by the Electrical Contractor, not their Subcontractors. **Shop drawings shall be submitted separately per specification section. Multiple shop drawing sections received in a single submittal will be rejected.** These shop drawings shall cover such items as lighting fixtures, lamps, disconnects, fuses, starters, MCC sections, switchgear, devices, plates, panels, contactors, etc. The Contractor shall thoroughly review each item for compliance with these Specifications making any necessary corrections prior to submittal. Each shop drawing set shall be stamped, signed and dated indicating Contractor review. If the Contractor fails to properly review shop drawings, the Contractor shall reimburse the Engineer for all additional reviews on a time and material basis. No equipment shall be released for shipment or installed prior to final approval by the Engineer.

B. The Engineer will review all Shop Drawings submitted and will retain one copy for record file.

C. Approval Stamp: This review is to verify general conformance with the design concept of the Project and substantial compliance with the information provided in the Contract Documents. This review does not in any way relieve the Contractor or their suppliers of their responsibility to provide all materials and equipment as specified, in quantities, quality and dimensions required. Submittals will be reviewed with the following actions:

1. "No Exception Taken" indicates that the Submittal appears to conform to the design concept of the Work and that the Contractor, at his discretion, may proceed with fabrication and/or procurement and installation.
2. "Make Noted Corrections" indicates that the Submittal, after noted corrections are made, appears to conform to the design concept of the Work and that the Contractor, at his discretion, may proceed with fabrication and/or procurement and installation, if the corrections are accepted by the Contractor without and increase in Contract Sum or Time.
3. "Revised and Resubmit" indicates that the noted revisions are such that a corrected copy of the Submittal is required for review to confirm that the noted revisions have been understood and made. The Contractor, at his discretion, may proceed with fabrication and/or procurement and installation after submitting a corrected copy and verifying with the reviewer that the corrected copy is acceptable, if the corrections are accepted by the Contractor without an increase in the Contract Sum or Time.
4. "Rejected" indicates that the Submittal does not appear to conform to the specifications, a resubmission is required and fabrication or procurement is not authorized.

D. If the Engineer rejects (Revised and Resubmit or Rejected) the same section two times the engineer shall be compensated for additional reviews. Compensation will be incorporated by Change Order and will be deducted from the Contractor's application for payment. Contractor is responsible for all delays caused by the resubmittal process.

E. Provide samples of materials or equipment proposed to be furnished, if requested. Samples shall become the property of the Architect/Engineer and will be returned only when accompanied by a written request to do so.

F. Record Drawings: The Contractor shall provide and maintain an "As Built" set of bluelines on site, neatly notating routing, location or other field changes to the Contract Documents. Upon Project completion and prior to final close out, turn the "As Built" drawings over to the Owner. Provide a detailed transmittal indicating each sheet and other information turned over to the Owner and acquire their representative's signature. This information shall be included at the project close out.

1.7 WORKMANSHIP AND CONSTRUCTION PROCEDURES

A. Installation of all materials specified herein shall be performed in a neat and workmanlike manner by workers experienced and skilled in the trade. Only the best quality workmanship will be accepted.

B. The Contractor shall regularly clean their work area of debris. Removal of all Contractor generated debris and rubbish caused by their work shall be at the Contractor's expense.

C. Contractor shall coordinate with the Owner any interruptions necessary to existing systems prior shut down.

D. Coordination:

1. Contractor shall give careful consideration to work of other Contractors on the Project and shall organize work as detailed in the Contractor's ¼" coordination drawings so as to not interfere with or delay the work of other trades.
2. The Electrical Contractor shall thoroughly review installation manuals for each piece of equipment requiring power and control connections. Obtain instruction manuals from the Mechanical Contractor, Plumbing Contractor or Owner prior to roughing in any feeders or control wiring. Notify the Engineer of any discrepancies between the electrical plans and specifications and the equipment installation manuals prior to any installation. If for any reason this Contractor fails to do so, any and all costs necessary to correct discrepancies shall be borne by the Electrical Contractor.
3. Contractor shall consult all Architectural, Structural and Mechanical Drawings and Specifications that apply for correlating information.

4. Conflicts or interference with work of other trades shall be brought to the attention of the Engineer, in writing, before installation.
5. Should the Electrical Contractor not follow above procedures and install work that interferes with work of other Contractors, the Electrical Contractor shall make all necessary changes as directed by Engineer to eliminate the interference or conflict at the Electrical Contractor's expense.

E. Protection of Equipment:

1. Until final acceptance of the work by the Owner, the Contractor shall be responsible for the safety, good condition, and protection from damage of all materials and equipment installed.
2. If, during shipment or installation, the finish of equipment becomes chipped or scratched, the Contractor shall touch up or refinish surfaces to match original finish.
3. Switchboards, panelboards, transformers, bus ducts, motor starters and other electrical components stored or installed on-site shall be covered with plywood and polyethylene or an equivalent to protect them from any damage due to site conditions or from work by other trades.

F. The Contractor shall complete all safety forms required by General Contractor.

G. Live Work: All electrical equipment shall be de-energized prior to any work being performed. If it is necessary to work on any equipment live due to job conditions, precautions shall be taken to protect authorized personnel from accidentally coming in contact with live parts. Contractor shall have adequate personnel on site along with a back up plan to recover from an unscheduled outage.

1.8 LICENSES, CODES AND FEES

A. The Contractor shall be a licensed Contractor in the State where the project is being constructed. The Contractor shall employ all Licensed Professional Tradesmen required for each type of work covered under these drawings and specifications.

B. The Contractor shall procure all necessary certificates and permits and pay all required fees. The Contractor shall pay all fees and installation charges by the utility company for the permanent services.

C. Codes and Ordinances: All work and materials shall meet the requirements of national, state and local codes and ordinances, in every respect. This requirement shall not relieve the Contractor from meeting the requirements of Drawings and Specifications that may be in excess of all codes and ordinances and not contrary to them. Following is a partial list of governing codes and/or standards:

1. Occupational Safety & Health Act (OSHA)
2. Underwriters Laboratories (UL)
3. State and Local Building Codes
4. State Board of Health
5. State Industrial Commission
6. State and Local Fire Codes and Regulations
7. National Electric Code
8. State and Local Electrical Installation Codes
9. Local Power Company Regulations and Requirements

D. Inspections: Regular inspections shall be requested by the Electrical Contractor to meet all state and local requirements. Contractor shall furnish a certificate of final inspection and approval from all enforcement agencies to the Owner.

1.9 OPERATION AND MAINTENANCE MANUALS

A. The Contractor shall deliver two sets of Operation and Maintenance (O&M) manuals to the Owner prior to final close out. O&M manuals shall consist of approved shop drawings, manufacturer's bulletins, equipment manuals, a list of manufacturers with telephone numbers for all equipment that contains replaceable parts and all other data covering the care, maintenance and operation of each piece of furnished equipment. O&M

manuals shall be neatly bound in a 3-ring binders, contain an index and section tabs and be labeled with the Project name.

B. Name, address, and telephone number of each Contractor installing equipment and systems, local representative for each item of equipment and each system. Table of contents shall correspond to the Specifications with the Section tab sheets placed before the respective Shop Drawings and operation and maintenance instructions. Warranties for more than 1 year shall be included in appropriate section.

1.10 OPERATING INSTRUCTIONS AND TESTING

A. The Contractor shall fully instruct the Owner in the operation of electrical equipment prior to final close out. Contractor shall provide, without additional expense to Owner, services of competent instructors who will give full instruction in the care, adjustment, operation, and maintenance of all electrical systems provided by this Contractor to Owner's permanent employees. Instructor shall be thoroughly familiar with all parts of the installation that they are to give instructions and shall be trained in operating theory, as well as in practical operation and maintenance work. Factory trained instructors shall be employed wherever they are available. Instruction shall be given during regular work week and at a time just prior to the time the equipment is accepted and turned over to Owner for regular operation.

B. The Contractor or his representative shall provide a minimum of five days instruction period for Owner's personnel.

C. Contractor shall test all equipment installed under this Specification and shall demonstrate its proper operation to the Engineer. No equipment shall be tested or operated for any purpose until it has been fully prepared, connected and made ready for normal operation. Damage to equipment due to improper or ill-timed operation or testing shall be repaired, at Contractor's expense, before final inspection and acceptance.

1.11 WARRANTY

A. The Contractor shall guarantee all materials and equipment to be free of defects that may develop in any part of their work, caused by faulty workmanship, material or equipment failures, for a minimum of one year from the date of final completion of the Project or for as long as normal equipment manufacturer warranties are in effect from the date of Owner acceptance of the Project, whichever is later.

B. During the warranty period, notification by letter, personal contact or telephone conversation of a problem with any electrical system, shall cause the Contractor to respond within one week, making repairs or corrections as necessary. After all repairs and corrections are complete, the Contractor shall notify the Engineer.

C. The Contractor shall agree to provide 24 hour service on call for emergency.

1.12 TEMPORARY POWER

A. The Contractor shall provide all necessary temporary power and lighting to allow other Contractors and Subcontractors to perform their work. Prior to submitting a bid for this Project, contact the General Contractor to determine the type of equipment to be used in the performance of the work. The Electrical Bid shall include all labor and materials required to provide and maintain a complete temporary power and lighting system throughout the course of the project.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

N/A

END OF SECTION

Part 1. - GENERAL

1.1 GENERAL REQUIREMENTS

A. Unless noted otherwise in this Specification or on the Drawings, all materials shall be new and in their original packages. All materials shall comply with this Specification and at a minimum all applicable codes and standards as listed in Section 26 00 10.

B. Nameplates shall identify equipment by name. They shall be micarta plates, minimum of 1 1/4" x 3", or larger if necessary for wording with 3/8-inch high white lettering.

C. All distribution equipment, such as disconnects, starters, MCC's, panels and switchgear, shall be obtained from one manufacturer.

D. Any cutting and patching required in walls, floors, ceilings or partitions for the installation of electrical systems shall be the responsibility of the Electrical Contractor. All cutting and patching shall be done with the prior approval of the Architect/ Engineer. Patching to match existing finishes shall be performed by the proper trades such as concrete finishers, sheetrockers, tapers, painters etc. at the expense of the Electrical Contractor.

E. The Contractor shall be responsible for verifying locations of such things as piping, ductwork, equipment, door swings, heights of cabinets and counters, etc., prior to the installation of all electrical equipment. Installed electrical work that interferes with the work of other trades shall be relocated by the Electrical Contractor at no additional cost to the Owner.

F. Contractor shall paint all exposed electrical equipment, such as conduit/raceway, meter sockets and panels, to match adjacent finishes. Refer to Architectural Specifications for method to be used.

G. Switched receptacles, where shown, shall be modified and connected so that only the upper portion is switched.

H. Receptacles and outlets located on opposite sides of a common wall shall not be mounted in the same stud space. At least one stud shall separate devices. Where this requirement is not practical, such as in back to back floor plans where devices must be back to back, the use of 3M MPP-4S moldable Puddy Pad shall be used in sufficient thickness to match the hour rating of the wall.

I. All switches, receptacles and outlets installed within rated assemblies shall be firestopped to maintain rating of assemblies.

J. Circuit numbers shown are for reference only within noted panel. Contractor shall neatly identify correct circuit numbers on the as-built drawings.

K. Where required, the Contractor shall provide GFI devices or GFI breakers per the NEC.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide nameplates on all equipment such as disconnects, starters, MCC's, panels and switchgear.

B. Identify all pull and junction boxes with circuit or feeder numbers and source of power using black magic marker.

C. Each panelboard shall be provided with a typed circuit directory. Clearly describe loads and areas served. Room names or Owner's room numbers shall be used. Handwritten directories will not be accepted.

D. The Contractor shall perform saw cutting, trenching, backfilling, compaction and patching required for underground raceway systems shown or specified.

E. The Contractor shall provide concrete pads for all floor mounted equipment. Pads shall be 4" thick and extend a minimum of 2" beyond equipment.

F. Contractor shall verify the location of all fixtures and devices with the Architect prior to installation.

G. Provide access panels where j-boxes or pull boxes are installed in inaccessible locations. All access panels shall be approved by the Engineer and Architect prior to installation.

H. Contractor shall provide matching cord and plug for all dishwashers, disposals, ranges and electric dryers, unless provided with equipment. Provide matching receptacles. Coordinate with equipment supplier.

I. In handicapped living areas, controls or switches for range hoods, disposals, undercabinet fixtures, etc. shall be installed in the kitchen cabinet face.

J. All receptacles and outlets located in block walls shall be mounted so that only one block is cut.

K. Contractor shall connect all exterior and vestibule lighting circuits through timeclock/photo control/lighting contactor for control.

L. Contractor shall submit all fire stopping methods to the local authorities for approval. Provide copies of all approved fire stopping methods to the Engineer. All fire stopping shall be reviewed and approved by Local Authorities prior to installation.

M. Seal all penetrations and sleeves through floors and fire walls with a high temperature, fire rated sealant. Fire stop material shall be Chase Technology CTCPR-855 fire stop, 3M brand Fire Barrier Penetration System or Nelson Flameseal System.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Section Includes: Excavating, backfilling and compaction of all earth required for proper installation of buried electrical material, wherever required by the Drawings and Specifications.

1.2 EXCAVATION AND BACKFILLING

A. General Requirements: Contractor shall perform excavation, backfilling, and compaction for installation of electrical work within earth, including conduit and direct burial cables, as well as ducts or manholes shown on Drawings, as follows:

1. All conduit and direct buried cable shall be installed a minimum of twenty-four inches below finished grade. Trench shall be graded level to provide uniform support for each section of conduit. Excess excavation below required level shall be backfilled and compacted to 98% prior to conduit or direct buried cable installation. All debris and water shall be removed from the trench prior to final installation of conduit or direct buried cable. Properly protect conduit or direct buried cable until backfilling can be performed.
2. After underground lines have been inspected and prior to backfilling, forms shall be removed and excavation shall be cleaned of trash, debris and water. Material for backfilling shall consist of excavation, or borrow of sand, gravel or other materials approved by Engineer, and shall be free of trash, lumber or other debris. Place backfill in horizontal layers, not exceeding six inches in thickness, and properly moisten to approximate optimum requirements. Each layer shall be compacted down by hand or machine tampers, or by other suitable equipment, to a density that will prevent excessive settlement or shrinkage. Backfill shall be brought to a suitable elevation above grade to provide for anticipated settlement and shrinkage.
3. Underground electrical lines exterior to building are to be marked by installation of a continuous identifying tape buried in trench above line. Bury tape six inches below finished grade. Tape shall be made of inert plastic, six inches wide, yellow or orange colored with the words “Caution Buried Electric Line Below” repeatedly printed along length of tape. Type shall be Griffolyn Company, “Terratape”.

B. Inspection of all installations by local inspection authorities shall be completed prior to backfilling. Restore surface to its original condition, ie grass, concrete, blacktop, etc.

C. Areas on Owner’s property backfilled by electric utility, for electric services to building, shall be compacted and brought up to suitable grade by Contractor.

D. Areas directly under sidewalks and roadways shall be compacted to a dry density no less than 95% of ASTM D1557 moisture density relationship. Contractor shall pay costs for testing of compacted backfill by an approved testing laboratory when tests are requested by Architect/Engineer.

E. Dewatering:

1. General: Maintain excavated areas in a dry condition during excavation, compaction and backfilling operations. Under no circumstances shall concrete be poured under water. Perform excavation in a manner to prevent surface water and subsurface or groundwater from flowing into excavations. Do not allow water to accumulate in excavations.
2. Method: Remove water from excavations using dewatering methods to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations. Convey water removed from excavations and rain water to collecting or run-off areas. Provide and maintain temporary drainage

ditches or other diversions outside excavation limits. Do not use trench excavations for site utilities as temporary drainage ditches.

1.3 EQUIPMENT PADS

A. Contractor shall provide equipment pads for all exterior electrical components furnished under this contract and for the electrical utility transformer(s). Pads shall extend a minimum of six inches beyond the physical dimensions of the equipment and shall be a minimum of six inches deep. Provide all excavation, soil removal from site, compaction, forms and forming reinforcing steel, 3000 psi concrete and finishing, minor concrete touch up, removal of forms and backfilling to properly support equipment. Construct utility transformer pads per utility company requirements including all steel or PVC stubouts for primary and secondary conductors' installation. Provide grounding system.

******DELETE IF NO POLE BASES******

1.4 POLE BASES

A. Contractor shall provide all excavation, soil removal from site, forms and forming, reinforcing steel 4000 psi concrete, and finishing, anchor bolts, conduit stubouts, minor concrete touch up removal of forms and backfilling for a complete support base for all exterior fixtures as shown or specified. Bases shall be sized as called for on the details. Any question as to the size, depth or finished elevation of any bases shall be brought to the Engineer prior to setting any forms or pouring any concrete.

******END******

Part 2. – PRODUCTS

N/A

Part 3. – EXECUTION

N/A

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide circuits, including final connections unless noted otherwise, to each item of electrically powered equipment wherever required by the Drawings and Specifications.

1.2 SUBMITTALS

N/A

1.3 CONNECTIONS

A. Connect all equipment per instruction manuals provided by the Mechanical Contractor, Plumbing Contractor or Owner as specified in Section 26 00 10.

B. Connect all equipment as indicated in the Mechanical and Electrical Equipment Schedule and as specified in Section 26 24 19.

C. Do not scale Electrical Drawings for rough-in dimensions.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

N/A

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide and connect 600 volt and below wire and cable.

B. Wiring Sizing**:** Wire sizes indicated on Drawings are for copper conductors. Conductor sizes are specified by American Wire Gage (AWG) numbers, except where conductor cross sections in Kcmil is indicated. Unless noted otherwise conductors smaller than 12 AWG shall not be used for branch circuits.

C. In Conduit**:** Unless otherwise noted on Drawings, electric system conductors shall be installed in conduit. Conduit fill requirements of the National Electric Code (NEC) shall not be exceeded.

D. MC Cable: MC Cable may be used where permitted by Code.

1.2 QUALITY ASSURANCE

A. Underwriters' Laboratories (UL): Devices shall be in accordance with Section 26 00 10.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

1.4 CONDUCTORS FOR COMMUNICATION AND OTHER SYSTEMS

A. General Requirements: Refer to specific communication system Sections for conductor requirements.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All wire and cable and accessories shall be as follows:

1. Building Wire/Cable: Recognized manufactures of electrical building wire.
2. Plastic Tape: AMP, Eagle or 3M.
3. Spring Wire Connectors: Heyco, Ideal, 3M or T&B.
4. Split-Bolt Connectors: Burndy, O-Z/Gedney, Square D, or T&B.
5. Solderless Crimp Pressure Connectors: Burndy, Ideal T&B or 3M.
6. Twist-on Wire Connectors: Buchanan, Ideal or 3M.
7. Vinyl Electric Insulation Tape: Permacel, Tomic or 3M.

2.2 CONDUCTORS

A. Copper Conductors: Conductors shall be soft, annealed 98% copper, electrically continuous and free from short circuits or grounds.

B. Aluminum Conductors: Aluminum conductors shall <u>not</u> be used on this Project.

C. Aluminum conductors shall <u>not</u> be used in lieu of copper for VFD feeders.

D. Aluminum four conductor, SER cable may be used in lieu of copper for feeders to Unit Load Centers. Aluminum SER cable ampacity must be equal to ampacity of copper feeders specified.

E. Aluminum four conductor, #6 SER cable may be used in lieu of copper for electric range and dryer feeders.

2.3 SOLID AND STRANDED

A. General Requirements:

1. Wires shall be solid or stranded for sizes 10 AWG and smaller.
2. Wires shall be stranded for sizes 8 AWG and larger.

2.4 INSULATION

A. Voltage Class: Insulation, unless otherwise noted, shall be 600 volt.

B. Insulation Type: Conductor insulation shall be as follows:

1. Service, Feeder, and Branch Circuit Conductors: Type THHN/THWN with a temperature rating of 75°C. Use 60°C SER cable or 75°C M/C cable (where allowed per Code) within insulated areas.
2. Direct Burial Conductors: As noted on Drawings. Type USE or UF cross-linked polyethylene.

C. Color Code: Wire and cable color shall be in accordance with the latest edition of the NEC. On larger cables, only where factory coloring is not available, marking tape shall be used to identify each phase and neutral conductors. A minimum length of six inches shall be color coded at each end.

2.5 CONNECTORS AND TERMINATIONS

A. Conductors 8 AWG and Smaller**:** Use solderless crimp or indent type pressure connectors with insulating covers for copper wire splices and taps for 8 AWG. For 10 AWG and smaller, use insulated spring wire connectors with plastic caps. Strictly comply with the number, size and combination of conductors as listed on manufacturer's packaging.

B. Conductors 6 AWG and Larger**:** Use split bolt connectors for copper wire splices and taps, 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape.

2.6 CONTROL WIRING

A. General Requirements:

1. Control conductors shall be 14 AWG or larger.
2. Conductors shall be sized large enough so that voltage drop under in-rush conditions will not adversely affect operation of controls.

Part 3. - EXECUTION

3.1 GENERAL WIRING METHODS

A. General Requirements:

1. Provide 14 AWG or larger conductors for power and lighting circuits and no wire smaller than 14 AWG for control wiring.
2. Provide 10 AWG conductors for 20 ampere, 120 volt branch circuit runs longer than 75 feet and for 20 ampere, 277 volt branch circuit runs longer than 150 feet.
3. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
4. Conductors shall be tested to be continuous and free from shorts and grounds.
5. Neatly train and lace wiring inside boxes, equipment, and panelboards.
6. Conductor lengths for parallel circuits shall be equal.
7. Provide a minimum of twelve inches of slack conductor at each outlet.

8. Cables shall not come into direct contact with any mechanical systems, such as sprinkler piping, plumbing piping, ductwork, etc.

3.2 WIRING INSTALLATION IN RACEWAYS

A. General Requirements:

1. Pull all conductors into a raceway at the same time. Use Underwriters' Laboratories (UL) listed wire pulling lubricant for pulling No. 4 AWG and larger wires.
2. Completely and thoroughly swab raceway system before installing conductors.
3. Control and communication conductors shall be installed in separate, dedicated raceway systems.

B. SER Cable

1. SER cable shall not be installed exposed in unfinished areas. Provide fire rated enclosure.
2. In areas where SER cable is permitted by Code to be exposed in unfinished areas, provide cable tray or wire support assemblies.

    a. Provide sufficient support so that cables do not sag or droop.
    b. Route cables parallel with beams and structural numbers. Do not run diagonally.

3. Installation of exposed SER cable shall be approved by the AHJ prior to installation.

3.3 INSTALLATION OF ALUMINUM CONDUCTORS

A. When Permitted: Contractor shall substitute aluminum conductors for copper, only when permitted in Article 2.2 of this Section and only in sizes specified.

B. Installation: Aluminum conductors shall be installed in accordance with Aluminum Building Wire Installation Manual and Design Guide as published by Aluminum Association.

C. Vibration Precaution: No aluminum conductors shall be connected directly to motors, air conditioners or any equipment that vibrates. At these locations, aluminum conductors shall terminate in safety switches or junction boxes near units with copper conductors extended, in flexible conduit, directly to motors.

3.4 WIRING CONNECTIONS AND TERMINATIONS

A. General Requirements:

1. Splices shall only occur in accessible junction boxes. Splices in conductors installed below grade are not permitted.
2. Wires shall be thoroughly cleaned prior to installing lugs and connectors.
3. Splices, taps and terminations shall be made to carry full ampacity of conductors without perceptible temperature rise.
4. Spare conductors shall be terminated with electrical tape.

END OF SECTION

Part 1. - GENERAL

1.1 GENERAL REQUIREMENTS

A. NM & NMC cable may be used in lieu of conduit and wire where allowed by the National Electric Code (NEC) and/or approved by State Codes, Local Codes and Ordinances.

B. Conductors shall be a minimum of #14 AWG with a maximum of #2 AWG. All conductors shall be 98% copper, with one bare conductor for grounding purposes only. Grounding conductor shall conform to Article 250 of the National Electric Code.

C. All NM and NMC cable shall be manufactured with a distinctive marking on the exterior for its entire length. This marking shall clearly specify the cable type.

D. NM and NMC cable shall be installed through or parallel to studs, joists and rafters. Holes shall be drilled in the center of studs or joists wherever possible. Where not possible to drill in the center of studs or joists, a protective plate, such as Noer's "Safety Plate", shall be installed to protect the cable from nails or screws. These holes shall be considered as cable supports.

E. A minimum of 6" of wire shall be exposed beyond the face of each device or j-box for terminations and/or device installation.

F. Provide boxes that are approved by the NEC for use with NM & NMC cable.

G. Where required, cable or box connectors shall be two screw, strap type, specifically manufactured for connection NM or NMC cable to panels, cabinets or j-boxes.

1.2 SUBMITTALS

A. Shop Drawings: Provide shop drawings in accordance with Section 26 00 10.

Part 2. - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Approved Manufacturers: All NM & NMC cable shall be of one manufacturer as follows:

1. Bristol
2. Colonial
3. Encore
4. Excel
5. General
6. Southwire

Part 3. - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Provide MC cable in lieu of NM and NMC cable in all plenum areas. These areas include plenums above rooms containing mechanical air handling equipment, plenums between stud spaces, plenums used for return air, etc. All penetrations shall be fire stopped. Coordinate with Mechanical Division.

B. Cable shall not be installed within the air space between studs in demising walls. Install cable on stud side served.

C. Support all cables with straps, cable ties or staples specifically designed for this purpose. Installation shall not cut or damage cable in any way. All damaged cable shall be immediately removed and replaced with new. Cable shall be supported within 12" of each box, cabinet or fitting at intervals of 4 1/2 feet.

D. Splice all ground wires per NEC.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide labor, materials, equipment and accessories for the following Work:

1. Electric Service Ground: Provide grounding of secondary service neutrals at the supply side of the service disconnecting means in accordance with the National Electric Code (NEC).

    a. Provide grounding of the metallic conduit system, cabinets, non-current carrying parts of equipment and neutral service conductor at the service entrance.

2. Equipment Ground: Provide solid interconnections to form a continuous permanent and effective equipment grounding medium between the entire conduit system, switch boxes, cabinets, motor frames and other permanently installed electrical equipment:

    a. Feeder and Branch Circuits: Provide an insulated grounding conductor, sized per the NEC.

        1) All EMT conduits 1 1/2 inches and larger
        2) All PVC conduits
        3) All flexible metal conduits

    b. Switchboard Grounding: Terminate conduits entering the switchboard in grounding bushings bonded to switchboard ground bus.

3. Metal Piping: Bond interior metal piping systems to the services equipment enclosure, the grounded conductor at the service or to the grounding electrode conductor.
4. Communication System Grounding: Provide grounding for each communication system.
5. Concrete Encased Electrode: Provide 20’ grounding electrode conductor connected to bar or rod, encased in concrete, per NEC 250. Coordinate with structural.
6. Gas Meters: Provide continuous ground conductor between each metallic pipe connection to building service ground rod per NEC 250. Refer to detail.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements: Provide grounding systems to comply with the requirements of the NEC. Coordinate with the local electrical inspector.

B. Tests: Measure ground grid resistance with earth test megger. Provide additional ground rods and conductors until resistance to ground meets NEC and local code requirements.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

Part 2. - PRODUCTS

2.1 MATERIALS

A. Grounding System: Except as otherwise indicated, provide electrical grounding systems with assembly of materials including, but not limited to, cables/wires, connectors, terminals, grounding rods/electrodes, bonding jumpers, and additional accessories needed for complete installation. Where materials or components are not indicated, provide products meeting the requirements of NEC, UL, IEEE, and established industry standards for applications indicated.

1. Conductors: Copper cable, stranded of size per the NEC unless otherwise noted on Drawings.
2. Bonding Jumper Braid: Copper braided tape, constructed of 30 gauge bare copper wires and properly sized for indicated applications.
3. Connectors, Terminals, and Clamps: Burdy, Kearney, T & B, Penn-Union.
4. Ground Rods: Copper clad steel, ¾-inch diameter, a minimum 10 feet in length.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements: Grounding and bonding shall comply with the requirements of the NEC and shall be coordinated with the local electrical inspector. This, however, shall not be construed as relieving the Contractor from meeting any requirements of the Drawings and Specifications that may exceed code requirements.

3.2 GROUNDING ELECTRODE

A. General Requirements: Grounding electrode shall be the metal water piping system of the building. Water piping system electrode shall be supplemented by the following additional electrodes:

1. Metal Frame of Building: Metal frame of building in those buildings with a metal frame system.
2. Made Electrode: Provide at least 20 feet of bare copper conductor not smaller than No. 4 AWG or at least 20 feet of one or more steel reinforcing rods encased by at least 2 inches of concrete located within or near bottom of a concrete foundation or footing that is in direct contact with earth. A ground rod electrode system may be provided in lieu of foundation electrode where approved by the local electrical inspector.

3.3 GROUNDING ELECTRODE CONDUCTOR

A. Service Grounding: Grounding electrode conductor, from service entrance to grounding electrode, shall be an exposed insulated copper conductor run. Where NEC or the local electrical inspector requires grounding electrode conductor run in conduit, provide rigid non-metallic type, conduit.

1. Connection of ground electrode conductor shall be made at the point water piping system enters building. Connection to piping system may be permitted at locations other than entry to building, provided Contractor coordinates location with the local electrical inspector and provides bonding jumpers around meters, insulating joints, and other electrical components. Connections of ground electrode conductor to water main or other large members shall be made by means of approved pressure clamps.

3.4 MAIN BONDING JUMPER

A. General Requirements: Connect secondary service neutral and grounding electrode conductor to equipment grounding bus in service equipment.

3.5 FEEDER AND BRANCH CIRCUITS

A. General Requirements: Provide an insulated grounding conductor, sized in accordance with the NEC, within all PVC conduits, within all flexible metallic conduits and within all EMT conduits 1 1/2 inches in diameter or larger.

3.6 CONDUITS, BOXES, CABINETS AND PANELBOARDS

A. General Requirements:

1. Ground all metallic conduit systems. Establish ground continuity by providing standard couplings, connectors, fittings and jumpers at all grounding type wiring devices, motor and ground terminals.
2. Ground wires shall be grounded to each pull box, junction box, outlet box, cabinets and other enclosures through which the ground wires pass, except for special isolated grounding systems.

3. Provide lugs in each box and enclosure for ground wire termination where required.

3.7 MISCELLANEOUS EQUIPMENT

A. Motors and Starters: Provide lugs in motor terminal boxes and starter housings for ground wire termination and provide interconnecting ground wire.

B. Receptacles: Provide a ground wire from receptacle green ground terminals to outlet box ground screws.

C. Lighting Fixtures: Provide grounding through conduit systems. Provide a green ground wire with power wires from fixture through flexible conduit to first outlet box for all fixtures connected with flexible conduit.

D. Electrical Equipment: Provide a ground lug for termination of green ground conductor for all fixed electrical equipment.

3.8 COMMUNICATION GROUNDING

A. General Requirements:

1. Provide grounding at telephone and CATV backboards.

    a. Data Communication System(s)
    b. Fire Alarm Control Panel
    c. Intercommunication
    e. Telephone System
    f. Television Distribution System

3.9 LIGHT POLE GROUNDING

A. General Requirements: Provide an equipment grounding conductor, with green insulation, with circuit conductors to each pole. Connect grounding conductor to ground lug at pole.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide conduits wherever required by the Drawings and Specifications.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 0010.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Steel Conduit and Fittings: Galvanized steel by recognized manufacturers of conduit systems of type and sizes required.

B. Non-Metallic Conduit: High impact PVC (Polyvinyl Chloride) heavy wall, Schedule 40 rated for 90° C wire, Underwriters' Laboratories (UL) listed in accordance with Article 347 of the National Electric Code (NEC) for underground and exposed use. PVC conduit shall be Schedule 80 for under roadway or vehicle crossing area.

C. Acceptable Manufacturers: All conduit shall be of one manufacturer as follows:

1. Alfex
2. Allied
3. Carlon
4. Republic
5. Sealtight
6. Triangle
7. VAW of America
8. Youngstown

D. Acceptable Manufacturers: All conduit shall be of one manufacturer as follows:

1. Appleton
2. CH
3. Kellems
4. OZ Red Dot
5. T&B

2.2 CONDUITS

A. Minimum Size: Conduit shall be sized according to the Drawings, with no conduit smaller than ½-inch trade size. If not sized on the Drawings, the NEC shall be used to determine the size based on the number and size of conductors required. The Engineer shall approve all calculated conduit sizes and method of installation prior to installation.

B. Type: Conduit shall be rigid galvanized steel. In lieu of rigid galvanized steel the following conduits may be used only as specified herein:

1. Intermediate Steel Conduit may be used in all locations.
2. Electric Metallic Tubing (EMT): May be used in dry locations for wiring below 600 volts in all interior spaces not in direct contact with earth or where exposed to weather using steel watertight

compression fittings and backstraps. EMT shall not be installed in the following areas:

a. Concrete slabs on grade or in soil.
b. Unprotected within five feet of finished floor.
c. Conduit drops in shop areas.
d. Conduit stub-ups to equipment or machinery.
e. Hazardous areas.

3. Flexible Metal Conduit: Flexible metal conduit or liquid tight flexible metal conduit shall be permitted only in the following locations:

a. Flexible metal conduit or liquid tight flexible metal conduit shall be used for final connections to equipment such as motors, fixed equipment, electric heating equipment, ect. Trade sizes ½-inch through 1 ½-inch shall be used in lengths no longer than twenty-four inches, 2-inches through 3-inches no longer than thirty-six inches, 3 ½-inch through 4-inch no longer than forty-eight inches.
b. Fittings shall be steel set screw type for smaller sizes and steel clamp type for larger sizes.
c. For light fixture connections, where conduit is concealed above ceilings, lengths shall not exceed six feet (3/8-inch diameter size may be used above concealed ceilings to connect light fixtures).
d. Concealed within equipment cabinets if approved by Architect/Engineer.

4. Rigid Non-Metallic Conduit: May be used only where run in soil or in concrete slabs on grade unless otherwise noted on Drawings or specified herein.

a. Conduit entries into pole bases or concrete pads shall be rigid galvanized steel. Conduits emerging out of floor slab-on-grade shall be rigid galvanized steel.
b. All non-metallic conduits shall have a grounding conductor sized in accordance with Table 250-95 of the NEC. Contractor shall increase conduit size to accommodate the grounding conductor.

5. Rigid Aluminum Conduit: May be used in lieu of rigid galvanized steel with approval of Engineer.

2.3 CONDUIT FITTINGS

A. Rigid Galvanized Steel Conduit and Intermediate Metal Conduit:

1. Couplings, locknuts and bushings shall be threaded type. Threadless couplings shall not be used without prior approval of Engineer.
2. Locknuts shall be of the conduit type.
3. Bushings shall consist of an insulating insert molded or locked into metallic body fitting. Bushings made entirely of metal or non-metallic material are not permitted.
4. Where conduit is installed in concrete, Erickson-type and set-screw couplings may be used to complete a conduit run. Set-screw fittings shall be approved for concrete installation and shall be case-hardened steel with hex head and cup point to firmly set in conduit wall for positive ground.
5. Threaded cast iron type sealing fittings shall be used. Fittings used to prevent passage of water vapor shall be continuous drain type. Fittings in concealed work shall be installed in a flush steel box with blank coverplate having the same finish as that of other electrical plates in room.

B. EMT:

1. For conduit 2-inch and smaller, fittings shall be concrete tight compression gland type only, with threaded outer nut or set-screw type. Fittings shall be malleable steel type, not cast.
2. For conduit over 2-inch, connectors shall be set-screw type with two screws each and couplings shall be set-screw type with four screws each. Set-screws shall be case-hardened steel with hex head and cup point to firmly set in wall of conduit for positive ground.
3. Indent type connectors shall not be permitted.
4. Fittings made of pot metal Die cast or pressure-cast zinc alloy shall not be permitted.

C. Flexible Metal: Multiple point type threading into internal wall of conduit convolutions or set-screw type. Material shall be only steel or malleable iron.

D. Liquid-Tight Flexible Metal: Type incorporating a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats. Material shall be only steel or malleable iron.

E. Direct Burial Rigid Non-Metallic Conduit: Fittings as recommended by conduit manufacturer for bonding with solvent cement. Provide PVC-40 in all landscape areas and PVC-80 under all covered areas where vehicles travel.

F. Expansion Fittings: Use expansion fittings in conduits installed in concrete slabs or in soil under slabs at the point where conduits cross expansion joints. Verify expansion joint locations with concrete installer. Expansion fittings shall be O.Z. Type AX for rigid conduit, O.Z. Gedney Type TX for EMT conduit and Carlon Type E945 for rigid non-metallic conduit. All rigid non-metallic conduits installed at a temperature of 25° F above or below the final conduit temperature, as well as all rigid non-metallic conduits installed in temperatures below 50° F, shall require expansion fittings. Where temperature conditions require the use of rigid non-metallic expansion fittings, provide one expansion fitting for each conduit run up to one-hundred feet long. Runs over one-hundred feet in length require one expansion fitting for each one-hundred feet or portion thereof.

2.4 FIRE STOPS

A. General Requirements: Conduits and conduit sleeves that penetrate fire rated walls or partitions shall be sealed with Hevi-Duty/Nelson, Type CLK, non-sagging adhesive sealant. Basis of design is Hevi-Duty/Nelson, Type CLK. Additional approved manufactures are 3M and Specified Technologies Inc. All firestopping products shall be installed by experienced workers, familiar with the proper application and installation of appropriate U.L fire stopping design rating systems. Prior to installation, the Contractor shall submit fire stopping manufacturer's appropriate conduit and conduit sleeve penetration system design criteria and UL approved number for each type of UL fire stopping design rating system used on the project.

Part 3. - EXECUTION

3.1 CONDUIT ARRANGEMENT AND SUPPORT

A. General Requirements:

1. Conduits shall be concealed within floor, ceiling or wall building construction, unless specifically noted or otherwise specified. Conduits shall only be installed exposed in boiler rooms, mechanical rooms and electric rooms and for connections at motors and surface cabinets.
2. Conduit systems shall be complete with fittings and accessories to make system complete and electrically continuous from outlet to outlet and to cabinets and junction boxes. Conduits shall form a neat appearing, mechanically firm assembly, adhering to NECA standards of installation and good electrical practice. Conduit ends shall be reamed before installation and shall be capped during construction period. Route exposed conduits and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping with elbows, offsets, and bends uniform and symmetrical.
3. Conduits shall not obstruct head room, walkways or doorways.
4. Conduits shall be secured to cabinets, junctions boxes, pull boxes and outlet boxes by bonding type locknuts. Rigid and IMC conduit installations shall have a locknut on outside of enclosure and locknut and bushing on inside of enclosure. EMT installations may have a single locknut on inside of enclosure, wrench tight. Conduit connections shall not be made to junction box covers.
5. Provide a pull wire in empty conduits, consisting of one No. 12 steel or copper wire or heavy duty nylon cord for small conduits and nylon rope for large conduits.
6. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Conduit shall be fastened using straps or clamps, lay-in adjustable hangers, clevis hangers or bolted split galvanized hangers secured to structure with machine screws, expansion sleeves or lead anchors. Spring steel type supports or fasteners shall be permitted for concealed 1/2-inch EMT only. Chain, wire or perforated straps shall not be used to support or fasten conduit.

7. Conduit support spacing shall be provided per Code, but in no case shall the maximum spacing of supports exceed six feet for conduits smaller than 1-inch trade size and 10 feet for conduits 1-inch trade size and larger.
8. Group conduits in parallel runs where practical using conduit racks constructed of steel channel with conduit straps/clamps or trapeze hangers with U-bolts or other approved fasteners.
9. Conduits that are direct buried in the same trench shall be group in parallel runs where practical. The conduits shall be installed using racks or supports to maintain air separation between all conduits as per NEC at a minimum.
10. Fasteners shall be sized and designed for intended use. Fasteners, in solid masonry or concrete, shall be steel or malleable iron concrete inserts, 1/4-inch minimum diameter steel expansion anchors embedded not less than 1 1/8-inches or 1/4-inch minimum diameter power set fasteners with depth of penetration at least three inches. Hollow masonry anchors shall be toggle bolts, hollow wall fasteners, or concrete block anchors. Sheetmetal screws shall be used on metal studs and wood screws used on wood construction. Attachment by wood plugs or wood blocking is not permitted.
11. Support vertical conduit runs at each floor slab with approved hangers.

3.2 CONDUIT INSTALLATION

A. General Requirements: All conduits shall be installed in accordance with the NECA Standard of Installation:

1. Cut conduit square using a saw or pipecutter; de-burr cut ends.
2. Bring conduit to shoulder of fittings and couplings and fasten securely.
3. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheetmetal boxes in damp or wet locations.
4. Install no more than equivalent of four 90-degree bends between boxes for power circuits and two 90-degree bends for low voltage and communications circuits.
5. Avoid moisture traps where possible. Where unavoidable, provide junction box with drain fitting at conduit low point. Outdoor conduits shall be graded a minimum of six inches per one-hundred feet with no traps and shall be pitched to drain into manholes, pull boxes or suitable located drain tees.
6. Coordinate all conduits with other trades. Consult with Mechanical Contractor before installing conduits for electrical feeders so that conflicts between locations of conduit runs, piping, and ductwork will be adjusted prior to installation. In general, large pipe mains and air ducts shall be given priority in available space. Conduit runs shall be installed so as to maintain, wherever practical, a minimum separation of three inches from water and waste piping and six inches from steam piping.
7. Provide sealing fittings, to prevent passage of water vapor, where conduits pass from warm to cold locations.

B. Conduits in Soil or Slabs on Grade: Metallic conduit shall have a factory coating of 20 mil bonded PVC or shall be field coated on outside with asphaltum before installation. Couplings and damaged areas of coating shall be completely coated after installation. Conduits shall be at least eight inches below bottom of slabs on grade.

C. Conduits in Slabs Not On Grade: Conduits shall occupy the middle third when practical and have at least 1 1/4-inch concrete cover. Consult with the General Contractor to determine minimum allowable horizontal spacing between conduits to maintain structural integrity of floor slab. Conduits shall be tied to reinforcing rods to prevent movement or sagging during pour.

D. Conduits in Concrete Joists and Columns: No conduits shall be run in steel reinforced concrete joists, beams or columns without approval of Architect/Engineer; except for conduit runs to switches and receptacles specifically shown in columns.

E. Conduits in New Masonry Walls: Conduits shall be installed during wall construction or "fished in". No conduit shall be channeled in without special permission of Architect.

F. Horizontal Runs in Walls: No conduit shall run horizontally in concrete block or brick walls without approval of Architect/Engineer. Horizontal runs shall be made in floor or ceiling construction.

G. Conduits on Equipment: Conduits shall not be mounted on ductwork, boilers, ventilation units or other such mechanical equipment, except where necessary to make connections to electrical devices that are part of or mounted on such equipment. Where conduits must be run on equipment, care shall be taken not to cover access doors, controls, removable panels, etc., or otherwise hinder the normal maintenance and repair of the equipment.

H. Conduits Under Boilers: No conduit shall be run under boiler.

I. Demising Walls: No conduit shall be installed within the air space between studs. Conduit shall be run on the stud side served.

J. Conduit Through Roofs: Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket.

K. Expansion Fittings: Install expansion fittings where conduits in concrete slabs or in soil under slabs cross building expansion joints. Conduits installed in suspended ceiling spaces shall have offsets or bends adjacent to building expansion joints.

L. Conduits in Demountable Partitions: Conduit shall enter partitions from ceiling to facilitate future partition removal. No conduits shall enter from floors. A junction box shall be provided above ceiling at the point where conduit enters partition.

M. Conduits Through Exterior Walls: Where conduit systems pass through exterior walls or footings below grade, entrance shall be made watertight by providing pipe sleeves in wall with 1/2-inch minimum clearance around conduit and caulking with oakum or an approved non-hardening type caulking compound. Alternate acceptable method is by means of a conduit entrance seal, O.Z./Gedney Company, Type "FSK" or as approved by Engineer. Seal conduit stubs as described above. In addition, inside of conduit shall be sealed watertight with an approved non-hardening low to no VOC emitting type caulking compound packed around wires.

N. Conduits Above Furred or Suspended Ceilings: Branch circuit conduits and conduits feeding ceiling lighting shall not be supported by suspended ceiling lighting fixtures, mechanical piping or air conditioning ducts. Branch circuit conduits may be fastened to ceiling support members with fasteners designed for that purpose.

O. Conduit Sleeves: Same material as conduits required in the area. Both ends of sleeves shall have bushings.

3.3 GROUTING AND FIRE STOPS

A. General Requirements:

1. Contractor shall be responsible for grouting airtight any openings adjacent to conduits and other openings to seal against passage of air, smoke or vapors. Openings around conduits through floors shall be sealed watertight.
2. Contractor shall seal around each conduit or conduit sleeve penetrating fire rated walls or partitions with sealant specified. Interior conduit sleeves in walls or partitions shall be sealed to provide a complete fire rated installation in accordance with sealant manufacturer's instructions.
3. All firestopping products shall be installed by experienced workers, familiar with the proper application and installation of appropriate UL fire stopping design rating systems. Contractor shall submit fire stopping manufacturer's appropriate conduit and conduit sleeve penetration system design criteria and UL approved number for each type of UL fire stopping design rating system used on the project prior to installation.

3.4 CONDUIT STUB-UPS

A. Stubbed Up Through Floor Slabs: Where conduit is called to be stubbed up at an exposed location, a rigid conduit threaded coupling shall be installed flush with finish floor. Provide a recessed pipe plug, flush with floor, in each stub-up.

3.5 EMPTY CONDUITS

A. Identification: Empty conduits installed for future use or for use by others shall have markers and identification

at terminations. Empty boxes shall be marked with the system named in a visible place on the exposed coverplate.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide outlet boxes of heavy gauge galvanized steel, of knockout type, wherever required by the Drawings and Specifications.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Recognized Manufacturers of electric outlet boxes, manufactured in accordance with the latest edition of the National Electric Code (NEC) and industry standards.

2.2 MATERIALS

A. Ceiling Boxes: 4-inch octagonal ceiling boxes shall be used, except as otherwise specified. For additional wire space 4 11/16–inch square boxes may be used. Outlet boxes for fixtures shall be complete with fixture studs.

B. Wall Boxes: 4-inch square wall boxes shall be used with one or two device raised cover. Raised covers or tile rings shall be flush with finished walls.

1. Boxes in plastered walls shall be standard 4 inch square boxes with appropriate plaster rings.
2. Boxes in brick, exposed concrete block, glazed tile and wood paneled walls shall be 4-inch square having a raised cover with straight sides not less than 1-inch. 4 11/16- inch square box may be used for additional wire space. Where thickness of masonry or more than two gangs are required 3 ¾-inch high masonry boxes may be used.
3. Switch boxes in door frames shall be Raco No. 426 with Sierra narrow plates.
4. Boxes that are surface mounted shall be 4-inch square with pressed steel plates. Where mounted within six inches of a floor, box type shall be “FS” or “FD”.
5. Straight through and sectional switch boxes shall not be used.
6. Flanged airtight boxes shall be NuTek Airtight #FWSW series.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Boxes shall not be recessed back-to-back on opposite sides of wall, offset a minimum of six inches. Through wall boxes shall not be used.
2. Boxes shall be roughed-in to provide a neat appearance. Centerlines of boxes shall be aligned vertically and horizontally. Boxes shall be symmetrically located with the major architectural features when they occur between doors and windows and in wood panels.
3. Adjust horizontal position of boxes such that bottom of box is located on top of masonry coarse and vertical centerline is either on a masonry course or centered on a masonry unit. Contractor shall coordinate with other trades so boxes are installed with no unsightly joints around them.
4. Boxes shall be installed such that the front of box is flush with finished wall, boxes more than ¼ inch back from finished wall shall not be acceptable.
5. Boxes used for narrow fluorescent fixtures shall have openings of such a size that they will be completely covered by fixtures.
6. Boxes in finished ceiling construction shall be supported by structural building members or when necessary to bar hangers or steel channels supported by either structural building members or ceiling

framing channels. Exposed boxes shall be secured to structure by toggle bolts, wood screws or lead anchors.

7. Putty pads shall wrap boxes completely and shall extend to the back of structure or building material or shall encase box completely.
8. Within demising walls, offset boxes to comply with National, State and Local Codes.
9. Contractor shall coordinate height and location of boxes with Architectural elevations and other trades so as not to conflict with other work or equipment. Boxes shall not interfere with door trim. It shall be the Electrical Contractor's responsibility to move boxes that conflict with others at no additional cost to Owner.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide pull boxes to facilitate the pulling of wires or when more than four quarter bends occur in any conduit run. No attempt has been made to show all necessary boxes on Drawings.

Part2. - PRODUCTS

2.1 MATERIALS

A. Type:

1. Pull and junction boxes shall be sized and installed to meet requirements of Article 314 of the latest edition National Electric Code (NEC).
2. Provide galvanized code-gauge sheet steel junction and pull boxes.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements: Pull and junction boxes shall be located to be accessible after building is finished. Pull and junction boxes shall not be placed in any finished spaces without prior approval of Architect/Engineer. No boxes shall be installed above plaster ceilings without prior approval of Architect/Engineer.

1. Pull boxes installed above lay-in ceiling tiles shall be within twenty-four inches of ceiling for accessibility and shall not conflict with removal of ceiling tiles.
2. Pull boxes shall be within twenty-four inches where installed above access panels.

3.2 CONDUCTORS IN PULL BOXES

A. General Requirements: Conductors shall be of sufficient length within pull boxes to neatly train conductors without excess.

3.3 IDENTIFICATION

A. Pull Boxes: Pull boxes shall be identified as to type of system in box as follows:

1. Stencil coverplate with 1/2-inch black letters in non-finished areas.
2. Identify with a tag inside of box in finished areas.
3. Paint boxes red and stencil "FIRE ALARM" for all boxes used for fire alarm and detection systems.

B. Conductors: Identify in a permanent neat and legible manner all conductors or cables within box by means of tags, pressure sensitive tape or cable ties.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide wireways wherever required by the Drawings and Specifications, or at Contractor's option. Provide wireways with all fittings, connectors and accessories for a complete installation. Contractor shall provide wireways in equipment spaces where electrical equipment is grouped.

Part 2. - PRODUCTS

2.1 MATERIALS

A. Type: Provide wireways manufactured for the electrical industry by recognized manufacturers, in accordance with the latest edition of the National Electrical Code (NEC), labeled by a nationally recognized testing laboratory.

1. Wireways shall be steel troughs without knockouts and with hinged cover.
2. Unless otherwise noted wireways shall be sized for the number of conductors to be installed in accordance with the latest edition of the NEC but shall not be less than sixteen square inch area.

B. Finish: Wireways shall be galvanized steel with gangable hinge and joints secured with sheet metal screws. Provide 16 gauge sheet metal for 6-inch x 6-inch wireways and smaller. Provide 14 gauge sheet metal for larger wireways up to 12-inch x 12-inch. All wireways shall contain a rust inhibitor and shall be finished with baked enamel. Wireways installed outdoors or within other similar corrosive atmospheres shall be manufactured to suit respective uses.

Part 3. - EXECUTION

N/A

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Unless specifically noted or specified otherwise, install all electrical wiring in an enclosed raceway system. Raceway materials shall be as specified in Section 26 05 33.10.

1.2 DESIGN REQUIREMENTS

A. Raceway Size: Raceways should be sized to meet the minimum requirements of the latest edition of the National Electrical Code (NEC) and all state and local codes and ordinances. Where raceway sizes are indicated, provide raceways shown.

B. Conduit Fill: Conduit fill shall be based on THWN conductors, at 75° C, as listed in the latest edition of the NEC. Derating shall be considered when sizing conduits. Provide increased conduit size where required.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

3.1 INSTALLATION

A. Concealed: Raceways shall be installed concealed, unless specifically noted or otherwise specified. Generally, raceways shall be installed exposed only on walls and ceilings of unfinished rooms, equipment rooms or where indicated on Drawings.

B. Continuous System: Raceway systems shall be complete from outlet to outlet and from cabinets and junction boxes. Raceway systems shall enter and be secured to boxes and cabinets in such a manner that the system shall be electrically continuous from point of origin to outlets.

C. Mounting: Raceways shall not be mounted on boiler, ventilation units or other such mechanical equipment, except where necessary to make connections to electrical devices that are part of or mounted on such equipment.

D. Interference: Coordinate with the Mechanical Contractor prior to installing conduit or pull boxes for electrical feeders to avoid conflicts with locations of raceway runs and mechanical equipment. Revisions to the raceway system made to avoid conflicts shall be at no additional cost to the Owner.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. The schedule identified below is included as part of these Specifications.

B. Schedule:

1. Light Fixture Schedule.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

N/A

END OF SECTION

LIGHT FIXTURE SCHEDULE

IDENT	FIXTURE TYPE	FLUOR	INC	LED	OTHER	MOUNTING	LAMPS	LENS, LOUVER, ETC.	MANUFACTURER'S CATALOG NUMBER	NOTES
A	2X2 FLAT PANEL (SUPPORT)			X		RECESSED LAY-IN	3200 LUMENS 30W LED	WHITE FINISH, FLAT PANEL	METALUX: 22FP OR APPROVED EQUAL	
A1	2X4 FLAT PANEL (OFFICES)			X		RECESSED LAY-IN	4700 LUMENS 40W LED	WHITE FINISH, FLAT PANEL	METALUX: 24FP OR APPROVED EQUAL	
B	UNDERCABINET 24" (COMMUNITY)			X		SURFACE CABINET	820 LUMENS 14 W LED		RAB LIGHTING #KNOOK24YW OR APPROVED EQUAL	
C	NOT USED									
D	4" DOWNLIGHT			X		RECESSED CEILING	900 LUMENS 9W LED		HALO #SLD4 OR APPROVED EQUAL	
E	EXIT-LED SINGLE FACE SELF POWERED			X		UNIVERSAL	LED INCLUDED	WHITE FACE RED LETTERS	DUAL LITE #SESRWE OR APPROVED EQUAL	9
E2	EXIT + EMERGENCY EGRESS TWIN HEAD			X		UNIVERSAL	(2) 3W LED	WHITE FACE RED LETTERS ALUMINUM	DUAL LITE #EVCURWD4 OR APPROVED EQUAL	
F	EMERGENCY EGRESS			X		SURFACE WALL	(2) 3W LED INCLUDED	THERMOPLASTIC HOUSING, LEAD CALCIUM BATTERY	DUAL LITE #EV4D-02L OR APPROVED EQUAL	8, 9, 10
F1	EMERGENCY EGRESS BASE UNIT					SURFACE WALL	(0) HEADS	THERMOPLASTIC HOUSING, LEAD CALCIUM BATTERY	DUAL LITE #EV4D-02L-0 OR APPROVED EQUAL	8,9, 10,1
F2	EMERGENCY EGRESS TWIN REMOTE HEAD			X		ADJUSTABLE KNUCKLE	(2) LED, 3 WATT EACH	DIE CAST ALUMINUM HOUSING, BLACK FINISH	DUAL LITE #EVOD-W OR APPROVED EQUAL	7,10, 13
G	NOT USED									
H	STRIP 4 FOOT (UTILITY)			X		SURFACE CEILING	5411 LUMEN 42W LED	STEEL HOUSING, WHITE FINISH, WHITE LENS	COLUMBIA #LCL4-40ML-EU OR APPROVED EQUAL	
I	NOT USED									
J	NOT USED									
K	DOWNLIGHT (CORRIDOR)			X		SURFACE CEILING TO RECESSED J-BOX	885 LUMENS 12W LED		RAB LIGHTING: KLED-6-R-12-Y-H OR APPROVED EQUAL	
L	NOT USED									
M	STAIRS			X		SURFACE WALL	2836 LUMENS 28W LED		RAB LIGHTING #TSLED-2-28-YN/D10 OR APPROVED EQUAL	
N	ELEVATOR ROOM & ELEVATOR PIT			X		SURFACE WALL	6000 LUMENS, 4000K	FIBERGLASS HOUSING, HIGH IMPACT ACRYLIC LENS	COLUMBIA #LXEM4-40-HL-RFP-EU OR APPROVED EQUAL	
O	NOT USED									

LIGHT FIXTURE SCHEDULE

IDENT	FIXTURE TYPE	FLUOR	INC	LED	OTHER	MOUNTING	LAMPS	LENS, LOUVER, ETC.	MANUFACTURER'S CATALOG NUMBER	NOTES
P	PENDANT (COMMUNITY)			X		SURFACE CEILING	(1) 8W LED 3000K	STEEL CONSTRUCTION, BRUSHED NICKEL FINISH,ETCHED GLASS SHADE, STEMS INCLUDED	PROGRESS LIGHTING #P5170-09 OR APPROVED EQUAL	5
Q - T	NOT USED									
U	4' PARKING GARAGE			X		SURFACE CEILING	52W LED 6185 LUMEN	STEEL HOUSING, WHITE FINISH, WHITE LENS	COLUMBIA #LCL4-30HL-EDU OR APPROVED EQUAL	
U1	8' PARKING GARAGE			X		SURFACE CEILING	104W LED 12,369 LUMEN	STEEL HOUSING, WHITE FINISH, WHITE LENS	COLUMBIA #LCL8-30HL-EDU OR APPROVED EQUAL	
V - Z	NOT USED									15
AA	SITE POLE SINGLE HEAD TYPE III			X		20' HEIGHT W/POLE AND BASE	70W LED 7,712 LUMENS	DIECAST HOUSING, HOUSE SIDE SHIELD, SQUARE STRAIGHT POLE	SPAULDING #CL1-A-30L-U-4K-3-DB-BC	1,2, 11
AA1	SITE POLE SINGLE HEAD TYPE IV			X		20' HEIGHT W/POLE AND BASE	70W LED 7,803 LUMENS	DIECAST HOUSING, HOUSE SIDE SHIELD, SQUARE STRAIGHT POLE	SPAULDING #CL1-A-30L-U-4K-4-DB-BC	1,2, 11
BB	PAVILION DOWNLIGHT			X		SURFACE CEILING	35W LED 4,234 LUMENS	DIECAST ALUMINUM HOUSING, GLASS DIFFUSER	HUBBELL #NRG-4-30L-U-4K-BZ	18
CC	DOOR DOWNLIGHT			X		SURFACE WALL	13W LED 1,146 LUMENS	ALUMINUM HOUSING, ZERO UPLIGHT, DLC CERTIFIED, BRONZE FINISH	HUBBELL #LNC-5LU-4K-4-1	6
DD	SNOW REMOVAL BLUE LIGHT			X		SURFACE WALL/CEILING	11W LED 757 LUMENS	DIECAST ALUMINUM HOUSING BLUE GLOBE	HUBBELL #VWGL-1 & #VGL-BU	
EE	WALL FLOOD LIGHT			X		SURFACE WALL	81W LED 3,339 LUMENS	ALUMINUM HOUSING, ZERO UPLIGHT, DLC CERTIFIED, BRONZE FINISH	HUBBELL #WGH-81L-4K	
FF	GROUND SIGN			X		KNUCKLE ON BASE	50W LED, 4000K, 2653 LUMENS	CAST ALUMINUM HOUSING, BRONZE FINISH, CLEAR LENS, WITH 10X60 ACCESSORY LENS	ACCLAIM #DFB.111.PEU	12
UA	4" DOWNLIGHT			X		RECESSED CEILING	900 LUMENS		HALO: #SLD4 OR APPROVED EQUAL	
UB	UNIT: UNDER CABINET			X		SURFACE CABINET	820 LUMENS 14 W LED		RAB LIGHTING #KNOOK24YW	
UC	UNIT: VANITY OVER MIRROR			X		SURFACE WALL	1391 LUMENS 18W LED		LUMINANCE BOCA #F2533-80-LED OR APPROVED EQUAL	
UD	UNIT: ENTRY/HALL/ CLOSET/UTILITY			X		SURFACE CEILING	(2) 8W LED 3000K	BRUSHED NICKEL FINISH & SATIN WHITE GLASS	ACCEESS LIGHTING #20725-BS-ORB OR APPROVED EQUAL	
UE	UNIT: BALCONY			X		SURFACE WALL	(1) 8W LED 3000K	ANTIQUE BRONZE FINISH, FROSTED GLASS	PROGRESS #P6052-20 NUVO, ACCESS	

GENERAL NOTES:

A. ALL ENERGY STAR LIGHTING FIXTURE EQUALS SHALL BE ENERGY STAR RATED.

LIGHT FIXTURE SCHEDULE

IDENT	FIXTURE TYPE	FLUOR	INC	LED	OTHER	MOUNTING	LAMPS	LENS, LOUVER, ETC.	MANUFACTURER'S CATALOG NUMBER	NOTES

B. PROVIDE ENERGY STAR QUALIFIED FLUORESCENT LAMPS FOR ALL FLUORESCENT FIXTURES.
C. ENERGY STAR LABELS SHALL REMAIN AFFIXED TO FIXTURES.
D. FLUORESCENT LAMP COLOR TEMPERATURE SHALL MATCH EXISTING BUILDING.
E. UNLESS NOTED OTHERWISE, ALL INTERIOR FLUORESCENT AND LED LAMP COLORS SHALL BE 3000K,
F. UNLESS NOTED OTHERWISE, ALL EXTERIOR LED LAMP COLORS SHALL BE 4000K.
G. FOR FIXTURES PROVIDED WITH PRE-INSTALLED LAMPS, CONTRACTOR SHALL REPLACE LAMPS WITH NEW AS REQUIRED TO MATCH SPECIFIED BUILDING STANDARD.
H. CONTRACTOR SHALL PROVIDE ALL LAMPS FOR EACH FIXTURE.
I. FLUORESCENT BALLASTS SHALL BE PROGRAMMED START WITH LESS THAN 10% THD.

SPECIFIC NOTES:

1. **PROVIDE MINIMUM 1.5 HOUR OPERATION FOR TOTAL WATTS CONNECTED.**
2. **PROVIDE IN-LINE FUSES.**
3. **MOUNT FIXTURE ABOVE MIRROR.**
4. **MOUNT TOP OF FIXTURE 6'-6" AFF.**
5. **VERIFY CORD/CHAIN/PENDANT/STEM LENGTH WITH ARCHITECT PRIOR TO ORDERING.**
6. **DAMP LOCATION RATED FIXTURE.**
7. **PROVIDE TWIN LUMINAIRES MOUNTED ON A SINGLE COVERPLATE.**
8. **BOTTOM OF FIXTURE SHALL BE MOUNTED 80" AFF MINIMUM.**
9. **CONNECT TO NON-SWITCHED LIGHTING CIRCUIT SERVING NORMAL LIGHTING IN AREA.**
10. **EQUAL FIXTURE AND LAMP PHOTOMETRICS SHALL MATCH SPECIFIED.**
11. **POLE LENGTH AND BASE HEIGHT SHALL EQUAL MOUNTING HEIGHT. FIELD COORDINATE PRIOR TO ORDERING.**
12. **PROVIDE CUSTOM ALUMINUM VISOR, PAINTED DARK BRONZE. VISOR SHALL BE FIELD MEASURED AND FABRICATED TO ELIMINATE GLARE PAST EDGES OF SIGN.**
13. **CONNECT REMOTE HEAD TO BASE UNIT.**
14. **FIELD VERIFY LENGTHS PRIOR TO ORDERING.**
15. **PROVIDE TRANSFORMER AS REQUIRED. VERIFY SIZE PRIOR TO ROUGH-IN.**
16. **VERIFY TRIM COLOR WITH ARCHITECT AND MILLWORK PROVIDER/INSTALLER PRIOR TO ORDERING.**
17. **VERIFY TYPE OF CONSTRUCTION REQUIRED WITH CONSTRUCITON METHOD.**
18. **PROVIDE CONNECTION THROUGH BACK OF TRELLIS AND INTO INTERAL K.O. IN BACK SIDE OF FIXTURE BOX.**

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide control devices wherever required by the Drawings and Specifications.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Control devices shall be as follows:

1. Lighting Contactors:
    a. Challenger
    b. Cutler-Hammer
    c. Square D
2. Time Clocks:
    a. Tork
    b. Intermatic
3. Occupancy Sensors:
    a. Leviton
    b. Sensor Switch
    c. Hubbel
4. Photo Control
    a. Tork
5. Thermostats
    a. Honeywell

2.2 PRODUCT

A. Lighting Contactors (Square D model numbers are provided for cross referencing):

1. LC-1: Multi-pole, 30 amp, 277 volt, mechanically held, 120 volt control coil. NEMA 1 enclosure. Square D#LXG0V02.

B. Time Clocks (Tork model numbers are provided for cross referencing):

1. TC-1: 24-hour, 40 amp, 208/277 volt, DPST, skip-a-day, astro dial, 277 volt control coil, NEMA 1 enclosure. Mechanical: Tork #7202Z. Digital: Tork #EWZ103.

2. TC-2: 24-hour, 40 amp, 208/277 volt, DPST, skip-a-day, 277 volt control coil, NEMA 1 enclosure. Mechanical: Tork #7202. Digital: Tork #EW103B.
3. TC-3: 24-hour, 40 amp, 208/277 volt, DPST, skip-a-day, astro dial, photo control, 277 volt control coil, NEMA 1 enclosure. Mechanical: Tork #7202Z with #2000-2 or #EWZ103 WITH #200.
4. TC-4: 24-hour, 40 amp, 208/277 volt, 3PST, skip-a-day, astro dial, photo control, 120 volt control coil, NEMA 1 enclosure. Mechanical: Tork #7302Z with #2000-2. Digital: Tork #EWZ101 with #5401 contactor.
5. TC-5: 24 hour, 10 amp, 120 volt, SPDT, skip-a-day, 15-minute multiple interval timer, up to 48 on/off operations per day, 120 volt control coil, NEMA 1 enclosure. Mechanical: Tork #8007. Digital: Tork #DG180A.

C. LED Occupancy/Daylight Sensors (Sensor switch model numbers provided for cross referencing):
1. L-W1 (wall): Passive dual technology sensing (infrared/microphonic), 180° coverage, 20 foot detection, 30 second to 30 minute off timer adjustment, one manual on switch, raise/lower control, green LED status indicator, low voltage. Sensor Switch #nWSX PDT LV-DX-XX (color selected by Architect).
2. L-W2 (wall): Wall station, raise/lower control, manual on switches, green LED status indicator, low voltage. Sensor Switch #nPODM-XX-DX Series (color selected by Architect).
3. L-C1 (ceiling, small area, photocell with dimming): Passive dual technology sensing (infrared/microphonic), 360° coverage, 12 foot detection at 9 feet AFF, 30 second to 20 minute off timer adjustment, green LED status indicator, low voltage. Sensor Switch #nCM PDT 9 ADCX.
4. L-C2 (ceiling, large area, photocell with dimming): Passive dual technology sensing (infrared/microphonic), 360° coverage, 28 foot detection at 9 feet AFF, 30 second to 20 minute off timer adjustment, green LED status indicator, low voltage. Sensor Switch #nCM PDT 10 ADCX.
5. L-C3 (ceiling, large area, corridor): Passive dual technology sensing (infrared/microphonic), 360° coverage, 28 foot detection at 9 feet AFF, 30 second to 20 minute off timer adjustment, green LED status indicator, low voltage. Sensor Switch #nCM PDT 10.
6. Power Pack: Low voltage dimming control, 120/277 volts, 20 amp rated load, 0-10 volt dc output, plenum rated. Sensor Switch #nPP16 series.

D. Thermostats (Honeywell model numbers are provided for cross referencing).

1. Heating/cooling, 120 volt, medium duty, 44° F to 86° F range (minimum), gold face-plate with beige cover, breaks heating and makes cooling on temperature rise, heat/cool selector switch. Honeywell #T651A 3018.

Part 3. – EXECUTION

3.1 INSTALLATION

A. Photo control shall be wall mounted on a stainless steel plate supported by a recessed electrical box.

B. Contractor shall make all required connections to control devices.

C. Occupancy/Daylight Sensors:

1. Provide dedicated backbox for wall mounted occupancy sensors.
2. Contractor shall review lighting control plans prior to bid. Provide additional sensors required for a complete and fully functional system.
3. Provide power packs per manufacturer's requirements to properly control fixtures and receptacles within rooms.
4. Provide low voltage and line voltage connections between power packs, sensors, switches and controlled equipment per manufacturer's requirements for a complete and fully functional system within each room or area.
5. Mount power packs within j-boxes located above accessible ceiling, either within room or adjacent corridor. If accessible ceilings are not available, provide flush j-box behind room entry door, mounted low, with screw cover. Cover shall be painted to match wall finish.
6. Wall mounted occupancy sensors shall be set to manual on/auto off.

D. Sensor placement shown on plans is diagrammatic only and actual sensor placement and final quantity shall be as determined by the sensor manufacturer. Material and labor costs associated with the final quantities of components required shall be the responsibility of the Contractor.

E. Provide locking plastic cover for thermostats located in public areas.

F. Normal and Unfinished Areas: Wall mounted occupancy sensors and thermostats shall be mounted at the following heights, measured from top of device to floor, unless noted otherwise.

1.	Occupancy sensor	48”
2.	Thermostat	60”

G. Handicapped Areas, Living Units: Wall mounted occupancy sensors and thermostats shall be mounted at the following heights, measured from top of device to floor, unless noted otherwise.

1.	Occupancy sensor	44”
2.	Thermostat	44”

H. LED fixtures within corridors shall dimmed via the occupancy sensor to 30% output power.

I. The Contractor shall confirm the number of buttons provided for wall switches is adequate for the design requirements.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide an electric service as shown on Drawings.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

1.3 SYSTEM DESCRIPTION

A. Primary Service: Primary service conductors, pad mounted transformer and pad grounding system shall be by the local power company. Contractor shall make all arrangements with the power company required for the primary cable and transformer pad installation. Contractor shall verify service locations, charges and miscellaneous requirements and shall include all costs in their bid.

B. Secondary Service: Service shall be provided by Contractor from pad transformer to service equipment within building. Contractor shall provide service connection cabinets, wiring gutters and bussing required at transformer for secondary service conductors. Coordinate connection requirements with Power Company to provide a complete installation.

C. Concrete Pad: Provide concrete pad for local power company per their requirements. Contractor shall include all costs in their Bid.

D. Fees and Charges: Pay all required fees to the local power company for the electric service.

E. Common Area Metering: Metering shall be as described in Section 26 27 13.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Service connections shall be installed in strict accordance with the rules of the local power company. Initiate and take responsible charge for negotiations with the local power company with regard to service connections and initiate necessary requests for work which will be performed by them.
2. Perform work required by the local power company to facilitate their complete installation. No extras will be allowed because of failure to contact the local power company to determine requirements for completing the service installation.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide and connect switchboard(s) wherever required by the Drawings and Specifications.

1.2 SYSTEM DESCRIPTION

A. Design Requirements: Design tests shall have been performed on a type or style of switchboard similar to that being furnished for this Project. Perform production tests dielectric tests, mechanical operation, grounding of instrument transformer cases, electrical operation and control wiring, and ground fault sensing equipment tests on switchboard(s) provided for this Project. Tests shall be in accordance with NEMA PB2 and UL 891.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10. Shop Drawings submitted for approval shall contain the following minimum information:

1. Sufficient information to determine if design meets the requirements of the Drawings and Specifications.
2. Electrical ratings, dimensions, material, required clearances, terminations, weight, plan, front, side and rear elevations, buswork, fused switch frame and rating accessories and device nameplate data.
3. Size, ampere rating, number of bars per phase and neutral in each horizontal and vertical bus run, bus spacing, equipment ground bus and bus material.
4. Provide arc flash warning labels and calculated values.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Switchboard(s) shall be in accordance with NEMA, National Electric Code (NEC) and ANSI and as shown on Drawings.
2. Underwriters' Laboratories (UL): Switchboards shall be in accordance with Section 26 00 10.
3. Switchboard(s) used for service entrance shall be furnished with a UL service entrance label.

1.5 FUSES

A. General Requirements: Provide fuses in main switch and distribution switches as specified in Section 26 28 13. Refer to the Drawings and/or the Panel Schedule for fuse sizes and quantities.

1.6 CONCRETE PAD

A. General Requirements: Provide a 4-inch high concrete pad for mounting of switchboards.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Switchboard Manufacturers: Except for bolted pressure switches and digital metering, all switchboards shall be as follows:

1. Cutler-Hammer
2. EMI or AMP with Cutler-Hammer Distribution Switches
3. General Electric

4. Siemens-I.T.E
5. States Manufacturing Company
6. Square D

2.2 CONSTRUCTION

A. General Requirements:

1. Switchboards shall be totally enclosed, dead front, free standing type, front connected and front accessible.
2. Interior metering equipment shall be NEMA 1 general purpose and shall be surface mounted. Exterior metering equipment shall be NEMA 3R weatherproof and shall be surface mounted.
3. Switchboard(s) shall be shipped in sections and assembled on site. Contractor shall arrange with General Contractor to maintain or provide adequate openings in building until equipment has been set in place.
4. Switchboard(s) shall not exceed ninety inches high (nominal).
5. Switchboards shall consist of the required number of vertical sections bolted together to form a rigid assembly. Each sections structure to be constructed of die formed vertical posts and base members made from galvanized 12 gauge steel that form rigid self supporting structures to support the bussing and over current devices. The sides and rear shall be covered with removable bolt-on 14 gauge covers. All edges of all covers or hinged front panels shall be pan formed. Provide adequate ventilation within the enclosure.
6. All covers shall be designed with interlocking overlapping covers to inhibit water from entering the enclosure.
7. All metal parts of enclosure shall be bonderized and given a rust inhibiting prime coat. Interior of panel shall be factory finished prime coat. Exterior of panel shall be factory finished light gray or blue enamel.
8. Switchboard(s) shall be designed to allow feeder conductors to enter in accordance with Contractor requirements.
9. Provide barriers to isolate service bus bars and terminals from remainder of switchboard.
10. Assembly shall be rated to withstand a fault current of 85,000 amps symmetrical, minimum, at rated voltage.

2.3 BUSES

A. General Requirements:

1. Buses shall be arranged for phase and wire distribution as indicated on the Drawings and/or the Panel Schedule:

    a. Horizontal main phase buses and neutral bus shall be full capacity the entire length of switchboard. All phases shall be arranged in the same vertical. Provide for future extensions by means of bolt holes.
    b. Vertical branch bussing shall be sized equal to total of frame or switch rating of all individual devices served. Branch bussing shall extend full usable height of each section to receive future overcurrent devices. Where "provision for", "future", or "space" are noted on Drawings, space shall be equipped with bus connections to future overcurrent device. Provide buses for ampere rating as shown for future device.
    c. Provide an uninsulated copper equipment ground bus bar the length of switchboard and secure at each section. Ground bus bar shall be not less than 25 percent of main bus rating.

2. Buses and connections shall be hard drawn copper of 98% conductivity or high strength tin plated aluminum. Bus temperature rise shall not exceed 65°C. Current density shall not exceed 1,200 amperes per square inch for copper or 750 amperes per square inch for aluminum.
3. All contact surfaces of copper or aluminum shall be plated. Provide a minimum of two plated bolts per splice. Where physical bus size permits only one bolt, provide a means other than friction to prevent turning, twisting or bending. Make connections for aluminum bus with plated nuts and bolts with a flat plated steel washer against the bus and a bellville washer between the flat washer and nut. Torque bolts to manufacturer's recommended values.
4. Neutral bus shall be bare, mounted on insulated bus supports and shall have a bolted disconnect link to

permit isolation of neutral bus from the common ground bus and service entrance conductors. Neutral bus shall be full capacity.

5. Connect an uninsulated 1/4-inch by 2-inch copper bus between neutral and ground buses to establish system common ground point.

2.4 RATINGS

A. General Requirements:

1. Switchboard(s) shall have main bus bars sized as indicated on the Drawings and/or Panel Schedule.
2. Switchboard(s) shall be rated as indicated on the Drawings and/or Panel Schedule.
3. Switchboard(s) and main bus shall be braced for short circuits as indicated on the Drawings and/or Panel Schedule.

2.5 SIZE LIMITATION

A. General Requirements: To fit into designated location, switchboards shall not exceed the length indicated on the Drawings.

2.6 ENTRANCE, SERVICE AND DISTRIBUTION SECTIONS

A. Entrance Section: Full height auxiliary entrance section, if required, to accept incoming service.

B. Service Sections:

1. Metering: No utility metering is required in switchboard. Service shall be metered at exterior pad or wall mounted current transformer (CT) cabinet. Refer to Section 26 27 13.
2. Main Switch: Provide a Main Disconnect Switch as indicated on the Drawings and/or the Panel Schedule.

    a. Switch shall be stored energy electric trip, bolted pressure, fused.
    b. In order to provide for easy operation and ensure charge before close action, manual closing shall be accomplished by a 2-stroke sequence whereby opening spring is charged and latched before and independent of compression of closing spring. Opening of switch shall be accomplished manually. Operating handle shall be mechanically interlocked with fuse access door and have provisions for padlocking in open position.
    c. Main switches rated 1200 amps and above shall be fused bolted pressure type. Bolted pressure switches shall have fuse door interlocks.

C. Distribution Sections:

1. Fusible Switches:

    a. 1200 Amperes and Larger: Bolted pressure contact switches.
    b. Smaller than 1200 Amperes: Fusible, quick-make, quick-break switches.
    c. Provide up to 200A switches in twin configuration.

2. Provide number of switchboard sections needed to contain all of switches, as indicated on the Drawings and/or the Distribution Schedule.

2.7 SWITCHBOARD PULL BOXES

A. General Requirements: Contractor shall provide any pull boxes, below or above switchboard, deemed necessary to provide room to run conduits to switchboard. Pull boxes shall be non-bussed type with a grounding bushing on each conduit connected to ground bus of switchboard.

2.8 NAMEPLATES

A. General Requirements: Provide laminated phenolic resin nameplates on each distribution switch to indicate panel or equipment served.

2.9 ARC FLASH WARNING LABEL

A. Provide arc flash warning label per Code.

B. Label shall include calculated arc fault current.

C. Labeling and calculated values shall be included with shop drawing submittals.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Provide switchboards in accordance with NEC and as recommended by the manufacturer. Refer to the Drawings and/or the Panel Schedule.
2. Provide raised concrete bases for all floor mounted switchboards. Bases shall be four inches high where possible, but at least two inches minimum. Pad sizes shall be based on exact equipment size as determined from Shop Drawings. Provide concrete pads as described above, unless they are shown or specified to be provided by General Contractor.
3. Verify proper voltage rating for switchboard assembly and for unit switches and circuit breakers.

3.2 IDENTIFICATION

A. Panel Identification: Equipment shall be labeled per Section 26 00 50. Where equipment is located in mechanical spaces or in storage rooms, provide identification plates on front exterior.

B. Circuit Identification:

1. Circuit Breaker Panelboards: Provide typed directories identifying all circuits with clear plastic cover mounted in a card holder. Room numbers or names used for circuit identification shall correspond to nameplates installed on room doors by General Contractor or as selected by Owner and shall be verified as these may not be the same as room titles on Drawings.
2. Fused Panelboards With Doors: Provide typed directories identifying all circuits with clear plastic cover mounted in a card holder.
3. Switchboards and Fused Panelboards Without Doors: Panelboards shall have micarta plates with 3/8-inch high white cut letters identifying each circuit or component

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide panelboards wherever required by the Drawings and Specifications.

1.2 SYSTEM DESCRIPTION

A. Circuit Numbers: Circuit numbers shown on Drawings shall be used for reference only. Actual connections shall be in accordance with phasing of cabinet, load balance and common neutral requirements.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Construct panelboards to NEMA.

B. Underwriters' Laboratories (UL): Equipment shall be in accordance with Section 26 00 10.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All panelboards shall be as follows:

1. AMP (Cutler-Hammer Components)
2. Cutler-Hammer
3. EMI (Cutler-Hammer Components)
4. General Electric
5. Siemens-ITE
6. Square D
7. States Electric

2.2 COMPONENTS

A. General Requirements: Panelboards shall be dead front safety type and shall be UL listed.

B. Enclosures: Enclosures shall be constructed of code grade steel with concealed trim clamps and hinges. Panel front shall be lockable with all panels throughout the Project keyed alike. Provide two keys for each panel.

C. Lugs: Solderless lugs only shall be provided in mains, unless otherwise noted on the Drawings and/or the Panelboard Schedule. Main lugs shall be suitable for both 60° C and 75° conductors. Main and neutral lugs shall be compression type. Provide sufficient number of lugs to individually terminate each conductor.

D. Buses: Provide buses made from 98% electrolytic copper or 55% conductivity aluminum and independently supported without dependence upon circuit breakers.

E. Gutters: Provide oversized gutters for feed through, where indicated or required. Where double lugs are not permitted by local code authorities, provide suitable pull box or gutter adjacent to panels for connections. Feeder wiring shall be capable of accepting a clamp-on ammeter.

F. Molded Case Circuit Breakers: Provide circuit breakers as follows:

1. Bolt-in type.
2. Multi-pole breakers shall be common trip and reset, with one handle.
3. Rated for 10,000 amperes for 120/208 volt systems and shall be rated for 14,000 amperes for 277/480 volt systems, minimum, in lighting and appliance panelboards. Rated for 22,000 amperes, minimum, for all distribution panelboards.
4. Contain HACR label when feeding heating, air conditioning or refrigeration loads.
5. Contain HID label when feed high-intensity discharge loads.

G. Fusible Switches: Provide quick-made, quick break fusible switches.

H. Special Panelboard Requirements:

1. The following shall be provided as specified:

a. Panelboards with wireways above or below the panelboard shall have conduit enclosures of the same size and finish as the panelboards with removable, screw attached, front covers.
b. Panelboards with double tubs shall have separate individualized fronts for each tub.
c. Provide lock-offs over required breaker handles as noted.
d. Provide GFI and AFI breakers as noted.

I. For circuits within dwelling units, provide AFI breakers for all 125 volt, single phase branch circuits in all rooms, except for bathrooms, garages and unfinished basements.

2.3 ARC FLASH WARNING LABEL

A. Provide arc flash warning label per Code.

B. Label shall include calculated arc fault current.

C. Labeling and calculated values shall be included with shop drawing submittals.

2.4 SPARES/SPACES

A. At project turnover, panelboards shall contain, at a minimum, spaces for 20% additional single pole breaker.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Feeder and branch circuit conduits shall meet the cabinet squarely and shall be arranged to facilitate training of conductors to their respective terminals.
2. Top of panelboard tubs shall be mounted no more than 6 feet above finished floor.

3.2 SPARE CONDUITS

A. General Requirements: Provide three 3/4-inch empty conduits from each flush mounted panelboard to accessible ceiling space or area above panelboard for future panel connections. Empty conduits shall be capped.

3.3 IDENTIFICATION

A. Panel Identification: Equipment shall be labeled per Section 26 00 50. Where equipment is located are in mechanical spaces or in storage rooms, provide identification plates on front exterior.

B. Circuit Identification:

1. Circuit Breaker Panelboards: Provide typed directories identifying all circuits with clear plastic cover mounted in a card holder. Room numbers or names used for circuit identification shall correspond to nameplates installed on room doors by General Contractor or as selected by Owner and shall be verified as these may not be the same as room titles on Drawings.
2. Fused Panelboards With Doors: Provide typed directories identifying all circuits with clear plastic cover mounted in a card holder.
3. Switchboards and Fused Panelboards Without Doors: Panelboards shall have micarta plates with 3/8-inch high white cut letters identifying each circuit or component.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide load centers wherever required by the Drawings and Specifications.

1.2 SYSTEM DESCRIPTION

A. Circuit Numbers: Circuit numbers shown on Drawings shall be used for reference only. Actual connections shall be in accordance with phasing of cabinet, load balance and common neutral requirements.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

1.4 QUALITY ASSURANCE

A. Underwriters' Laboratories (UL): Equipment shall be in accordance with Section 26 00 10.

1. UL 67 – Standards for Panelboards.
2. UL 50 – Standards for Cabinets and boxes.
3. UL 489 – Standards for Molded Case Circuit Breakers.

B. Regulatory Requirements:

1. Federal Spec Classifications W-C 375.

C. All equipment shall conform to the latest edition of the National Electrical Code (NEC) and all local codes.

D. Load centers shall be labeled with an UL short circuit rating.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All panelboards shall be as follows:

1. AMP (Cutler-Hammer Components)
2. Challenger
3. Cutler-Hammer
4. EMI (Cutler-Hammer Components)
5. General Electric
6. Siemens-ITE
7. Square D
8. States Electric

2.2 COMPONENTS

A. Load centers shall be rated for 240 volts AC and shall have short circuit ratings as indicted in the Panel Schedule, but not less than 10,000 amprerees RMS symmetrical.

B. All breakers shall take up the same pole spacing.

C. Provide AFI breakers for all 125 volt, single phase branch circuits in all rooms, except for bathrooms, garages and unfinished basements.

D. All interiors, with the exception of the branch circuit breakers shall be factory assembled with main breakers or main lugs.

E. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

F. Physical means must be provided to prevent the installation of more over-current devices than that number for which the enclosure was designed. Full size breakers are required.

G. Bus bars for the main and cross connectors shall be of copper or aluminum construction in accordance with UL standards. Bussing shall be braced throughout to conform to industry standard practice governing short-circuit stresses in load centers.

H. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection of the same ampacity as branch bussing.

I. All wire connectors and terminals shall be of the anti-turn, solderless type and suitable for copper or aluminum wire of the sizes indicated. All connectors shall meet the "requirements for Wire Connectors and Soldering Lugs" UL 486B.

J. All load centers shall be suitable for use with 60/75°C rated wire.

K. Circuit breakers shall be molded case type, 1 inch wide per pole. Multi-pole circuit breakers shall be of a stack pole design to provide electrical phase isolation and shall have an internal common trip.

L. Each pole of the circuit breaker shall have inverse time delay overload and instantaneous short circuit protection by means of both thermal and magnetic sensors.

M. The circuit breaker calibration shall not be affected by environmental changes in relative humidity.

N. All circuit breakers shall be operated by a toggle-type handle and multi-pole circuit breakers shall have an internal common trip mechanism. The circuit breakers shall incorporate trip mechanisms that are mechanically trip-free from the handle. The handle position shall provide good visual trip indication.

O. All circuit breakers shall be molded case, thermal-magnetic, quick-make quick-break, over toggle type. Load centers shall be suitable for use in systems having a short circuit capacity of 10K, 25K, 42K, and 65K RMS amps at the load center location as indicated in the Distribution or Panel Schedule.

P. Branch breakers shall be full-size and have a range of 15 amps through 125 amps. It is also required that a plug-in surge arrestor be available for single phase applications as well as the availability of 5 MA ground fault breakers for personnel protection through 60 amp 2 pole.

Q. All terminals shall be listed for use with copper or aluminum conductors. Terminals shall be of the box lug design. The terminals shall meet UL 486B requirements and shall be suitable for use with either 60°C or 75° C wire.

R. Breakers shall be SWD/HACR rated.

S. Load centers shall have NEMA 1 general purpose or NEMA 3R rainproof enclosures as indicated on the drawings and shall be surface or recessed mounted. Provide hinged front trims with flush type lock/handle assemblies.

T. Boxes shall be made from cold rolled code gauge sheet steel having multiple knockouts except where noted. Rain tight boxes shall use galvanized steel or an approved coating system that meets or exceeds standards for outdoor type 3R enclosures. Boxes shall be of sufficient size to provide at least a minimum code gutter space on all sides.

U. The cover shall have an easy adjustment feature for flush applications.

V. Boxes shall be factory assembled into a single rigid structure.

W. Provide typed circuit breaker marking labels and typed directories.

X. Boxes and trims shall be finished with a high scratch resistant, aesthetically pleasing finish. The finish paint shall be of a type to which field applied paint will adhere.

2.3 ARC FLASH WARNING LABEL

A. Provide arc flash warning label per Code.

B. Label shall include calculated arc fault current.

C. Labeling and calculated values shall be included with shop drawing submittals.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Feeder and branch circuit conduits shall meet the cabinet squarely and shall be arranged to facilitate training of conductors to their respective terminals.
2. Provide load centers in dwelling units only.

B. Mounting Heights:

1. The top most circuit breaker shall not be mounted higher than 46” above finished floor.

3.2 IDENTIFICATION

A. Panel Identification: Load centers shall be labeled per Section 26 00 10.

B. Circuit Identification: Provide typed directories identifying all circuits with clear plastic cover mounted in a card holder.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes:

1. In general, all motors indicated in the Mechanical and Electrical Equipment Schedule or as shown on the Drawings are furnished, set in place and mounted by others. Motor locations and mounting heights are approximate and shall be verified with the motor installer.
2. Provide a feeder from a panelboard through a disconnecting switch and starter to each motor. Provide final connections to each motor and check each motor for proper rotation.
3. Provide all disconnects and starters, unless specifically noted as "Furnished By Others", in which case install disconnects and starters for a complete system.
4. Refer to the Electrical Equipment Schedule Notes for additional control requirements.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All motor control devices shall be of the same manufacturer as follows (Square D catalog numbers are used to specify required type):

1. Allen-Bradley
2. Cutler-Hammer/Eaton
3. Furnas
4. General Electric
5. Siemens
6. Square D

2.2 COMBINATION UNITS

A. General Requirements: Provide combination devices where a disconnect switch is indicated at the same location as a magnetic starter.

2.3 DISCONNECTING MEANS

A. General Requirements: Provide all disconnect switches, except where specifically noted as "Furnished By Others", in which case install switches for a complete system.

B. Type: Disconnect switches shall be as follows:

1. Heavy duty type, fusible, unless noted.
2. NEMA 1 enclosure, except NEMA 3R where installed outside or on roof.
3. Motor rated for proper horsepower.
4. Proper voltage rating.
5. Fuses shall be sized as specified in Section 26 28 13.
6. Electrical interlock to disconnect all separately derived control circuits or interlock wiring.
7. Terminals suitable for both 60°C and 75°C conductors.

2.4 MAGNETIC STARTERS

A. General Requirements: Provide all magnetic starters, except where specifically noted as "Furnished By Others", in which case install magnetic starters for a complete system.

B. Type: Magnetic starters shall be non-reversing type (Square D, Clas 8536). Each starters shall be complete with all of the following features:

1. Full voltage, across-the-line, horsepower rated. Terminals suitable for both 60°C and 75°C conductors.
2. Surface mounted NEMA 1 enclosures, except NEMA 3R where installed outside or on roof.
3. Motor running over-current protection in each ungrounded conductor. Electrical Contractor shall verify actual name plate current ratings of each motor prior to installation over-current protection.
4. Low voltage release.
5. Holding coil of proper voltage.
6. Control Transformer: Provide a transformer of the same voltage as the holding coil, within each magnetic starter. Transformer shall be complete with both primary and secondary fusing.
7. Hand-Off-Auto Selector Switch: Switch shall be mounted on starter cover and connected in circuit such that protective devices remain in circuit in both auto and hand positions ((Square D, Class 9999).
8. Pilot Light: Pilot light shall be mounted on starter cover and shall be complete with red lens and lamp (Square D, Class 9999).
9. Auxiliary Contacts: Provide a minimum of four auxiliary contacts per starter.

2.5 MANUAL STARTERS

A. General Requirements: Provide all manual starters indicated, except where specifically noted as "Furnished By Others", in which case install manual starters for a complete system.

B. Type: Manual starters shall be as follows:

1. Full voltage, across-the-line, horsepower rated.
2. One motor running over-current protector in each ungrounded conductor.
3. In finished areas, all manual starters shall be flush mounted in plates to match device plates sized to fit standard outlet boxes (Square D, Class 2510). Manufacturer’s direction plate for resetting overloads shall be installed on flush plates. Plates shall be engraved as noted in the Mechanical and Electrical Equipment Schedule.
4. Where exposed conduit is permitted, manual starters (Square D, Class 2510) shall be in surface boxes.
5. Pilot lights with manual starters shall be red neon jewel type. Pilot lights shall be connected to conductors at actual motor location in order to indicate that motor is running.

2.6 CONTROL STATIONS

A. General Requirements: Provide all control devices. In finished areas, all control stations shall be flush mounted in plates to match device plates and of a size to fit standard outlet boxes.

B. Type: Control stations shall be as follows:

1. Start-Stop Maintained Stations:, Maintained contact type for 2-wire control of magnetic starters. Actuator buttons shall be engraved start-stop (Square D, Class 9001).
2. Start-Stop Momentary Stations: For 3-wire control of magnetic starters or relays. Engrave actuator buttons “start-stop” (Square D, Class 9001).
3. Toggle Switch Stations: Provide standard toggle switches as specified under Section 26 27 23.
4. Pilot Lights: Pilot lights at start-stop stations shall be incandescent type with red lens. Pilot lights at the toggle switches shall be neon type mounted in separate gangs of device plates. Pilot lights shall be connected to conductors on load side of disconnect at motor in order to indicate that motor is running.
5. Float Switches, Pressure Switches, P.E. Switches, and E.P. Switches: Device shall be furnished and installed by others, but connected by Electrical Contractor. Verify location of such equipment with the installer.

6. Special Key Switches: Each key switch, including special wall outlet boxes and engraved plates shall be furnished by others but installed by Electrical Contractor.
7. Limit Switches: Switches shall be furnished and set in place by others, but installed by Electrical Contractor. The number of limit switches and function shall be coordinated with equipment suppliers' Shop Drawings.
8. Snap Switch: Control motor with switch on the Drawings.
9. Duct Heat or Smoke Fire Detectors: Refer to Fire Alarm and Detection Specifications.
10. Engraving: Provide engraving of remote motor control stations to properly identify station.

Part 3. - EXECUTION

3.1 INSTALLATION OF DISCONNECTS AND STARTERS

A. General Requirements: Provide disconnecting switches and starters. If not specifically noted otherwise, provide all disconnect switches and starters for a complete system.

B. Starters and Disconnect Locations: Locations shown on Drawings are approximate and shall be coordinated on site to clear other equipment, provide proper accessibility and provide ease of maintenance. Starters and disconnects shall be installed with clearances by the NEC. Starters and disconnects shall be installed in locations that do not provide required clearances only with the prior approval of both the Electrical Inspector and Architect/Engineer. In general, starters and disconnects shall be located near the motors, wall mounted not more than 6 feet above the floor or mounted on equipment where readily accessible from the floors and shall not be mounted over live or moving parts. When indicated to be installed above finished ceilings, starters and disconnects shall be located within 24 inches of ceiling for ease of maintenance and accessibility.

C. Starter Overloads: Provide running current protection in each starter based on actual motor nameplate readings and overload manufacturer's selection tables.

3.2 INSTALLATION OF CONTROLS

A. General Requirements: Provide all control wiring. Provide adequate auxiliary contacts and relays to accomplish interlocks and subsidiary control connections. Coordinate all work with Mechanical and Temperature Control Contractors, such that operation of mechanical equipment will be as described in Mechanical Specifications.

B. Hand-Off-Auto Operation: Where equipment does not have automatic control, connect the hand-off-auto selector switch for manual operation with automatic position available for future use. Connections to selector switch shall be such that only normal automatic regulatory control devices will be bypassed when switch is in manual position; safety control devices, such as low- or high-pressure cutouts, high temperature cutouts and motor overload protective devices, shall be connected in motor-control circuit in both manual and automatic positions of the selector switch.

3.3 MOTOR CONNECTIONS

A. General Requirements: Provide feeders from panelboards, through disconnecting switches and starters, to all motors. Flexible metal conduit shall be used for final connections to motors and shall not be less than 12 inches nor more than 24 inches in length. Flexible metal conduit in boiler rooms, kitchens and mechanical rooms shall be liquid tight type. Provide a separate grounding conductor within flexible conduit, bonded to conduit system, for motors.

B. Connections to Roof Mounted Motors: Provide weatherproof connections to all roof mounted motors.

C. Connections to Wall Hung Water Coolers: Install in accordance with cooler manufacturer's requirements. Conceal receptacle behind cooler enclosure at all devices where possible.

D. The Electrical Contractor shall thoroughly review installation manuals for each piece of equipment requiring power and control connections. Obtain instruction manuals from the Mechanical Contractor, Plumbing Contractor or Owner prior to roughing in any feeders or control wiring. Notify the Engineer of any

discrepancies between the electrical plans and specifications and the equipment installation manuals prior to any installation. If for any reason this Contractor fails to do so, any and all costs necessary to correct discrepancies shall be borne by the Electrical Contractor.

3.4 LABELING AND ENGRAVING

A. Labeling: Provide labels inscribed with both the motor name and number attached to each motor disconnect and to each motor starter or combination switch-starter. Each motor name shall be as indicated in the Mechanical and Electrical Equipment Schedule. On projects where no Equipment Schedule is provided, motor names shall be as directed by Engineer. Labels shall be black micarta plastic laminate plates with 1/4-inch high white cut letters.

B. Engraving: Provide identification on remote motor control pushbutton stations, momentary contact stations and hand-off-auto stations. Flush plates shall be engraved with Sierra permanent type filled letters. Surface mounted control stations shall have 1/4-inch high white cut letters on black micarta plates.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide and connect metering equipment wherever required by the Drawings and Specifications.

1.2 SYSTEM DESCRIPTION

A. Interior metering equipment shall be NEMA 1 general purpose and shall be surface mounted. Exterior metering equipment shall be NEMA 3R weatherproof and shall be surface mounted. All metering equipment shall be rated for intended voltage and shall be in accordance with the Underwriters' Laboratories, Inc. (UL) "Standard for Panelboards" UL67; File E8741 and E11713.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10. Shop Drawings submitted for approval shall contain the following minimum information:

1. Sufficient information to determine if design meets the requirements of the Drawings and Specifications.
2. Electrical ratings, dimensions, material, required clearances, terminations, weight, plan, front, side and rear elevations, buswork, fused switch frame and rating accessories and device nameplate data.
3. Size, ampere rating, number of bars per phase and neutral in each horizontal and vertical bus run, bus spacing, equipment ground bus and bus material.
4. Provide arc flash warning labels and calculated values.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Underwriters' Laboratories (UL): Equipment shall be in accordance with Section 26 00 10.
2. All metering equipment employing a main disconnect ahead of the meter units, or using a maximum of six meter positions (total) must be listed as suitable for use as service Equipment when installed in accordance with NEC-230-70 (a)-(c), and "Requirements for Service Equipment", UL 869.
3. Metering equipment shall meet UL enclosure requirements and be furnished with a UL switchboard label.
4. Metering equipment used for service entrance shall be furnished with a UL service entrance label.

1.5 FUSES

A. General Requirements:
1. Provide fuses in main switches as specified in Section 26 28 13. Refer to the Drawings and/or the Distribution Equipment Schedule for fuse sizes and quantities. Main switches rated 1200 amps and above shall be fused bolted pressure type.
2. Provide fuses in distribution switches as specified in Section 26 28 13. Refer to the Drawings and/or the Distribution Equipment Schedule for fuse sizes and quantities. Switches rated 1200 amp and above shall be fused bolted pressure type.

Part 2. – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Metering Equipment Manufacturers:

1. AMP with Cutler-Hammer Distribution Switches
2. Cutler-Hammer
3. EMI with Cutler-Hammer Distribution Switches

2.2 CONSTRUCTION

A. Boxes and trims shall be bonderized and finished with light gray ASA61 enamel. The finish paint shall be a type to which field applied paint will adhere.

B. All interior, with the exception of the branch circuit breakers, shall be factory assembled with main lugs, neutral wire connectors, bus bars, etc.

C. All wire connections and terminals shall be of the anti-turn solderless type and all shall be suitable for copper or aluminum wire of the sizes indicated and must meet the "Requirements for Wire Connectors and Soldering Lugs: UL486B.

D. Interiors shall be so designed that branch circuit breakers and metering units can be replaced without disturbing adjacent units and without removing the main bus connectors. Socket jaws must be front removable through meter opening without removing steel cover. Meter sockets shall be equipped with a fully rated, 200 amp lever by-pass that shall also provide clamping pressure and meter blades.

E. Meter sockets shall be located in the meter center such that the center of the utility provided meter when installed shall not be higher or lower than that specified by the utility.

F. Bus bars for the mains and cross connectors shall be of copper or tin plated aluminum in accordance with UL standards. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in meter centers.

G. Cross-bussing, accessible for installation purposes must be used on modular meter centers. Belleville-type spring washers are required for all bus bar connections. Tight barrier construction is required to isolate customer load compartment from incoming service connections.

H. Main horizontal bus bars shall be mounted with all phases arranged in the same vertical.

I. Main lug provision must accept top or bottom feed on all meter center units. All Branch Circuits for indoor units must be able to exit from top or bottom of unit.

J. Provide full capacity neutral bus. Neutral bussing shall have a suitable lug for each out-going feeder requiring a neutral connection of same ampacity as branch.

K. The assembly shall be rated to withstand a fault current of 85,000 amps symmetrical, minimum, at rated voltage.

L. Branch circuit breakers shall have AIC ratings based upon the tap box or main breaker rating as listed below:

Tap Box/Main Breaker Rating	AIC Rating
0-600 amps	10,000 amps
601-1200 amps	22,000 amps
1201-1600 amps	42,000 amps

M. Meter center shall consist of the required number of vertical sections bolted together to form a continuous assembly. Each sections box shall be constructed of die formed galvanized 14 gauge steel that form rigid self supporting structures to support the bussing and over current devices. The meter center front and side gutters shall be covered with removable bolt-on 14 gauge covers. All edges of all covers or hinged front panels shall be pan formed. Provide adequate ventilation within the enclosure.

N. Boxes shall be constructed with mounting provisions for grounding bars to be installed where necessary.

O. Unless otherwise noted on the drawings, hinged covers protecting all circuit breaker handles shall be included in all trims for NEMA 3R units. Hinged covers shall not uncover any live parts in making the circuit breaker handles accessible. All covers shall be designed with interlocking overlapping covers to inhibit water from entering the enclosure.

P. Individual meter covers must be supplied and available in both ring and ringless versions. Contractor shall coordinate with the Local Utility prior to Bid.

2.3 PULL BOXES

A. General Requirements: Contractor shall provide any pull boxes, below or above metering equipment, deemed necessary to provide room to run conduits to panels or equipment. Pull boxes shall be non-bussed type with a grounding bushing on each conduit connected to ground bus of metering equipment.

2.4 NAMEPLATES

A. General Requirements: Provide laminated phenolic resin nameplates on each meter to indicate room served.

2.5 ARC FLASH WARNING LABEL

A. Provide arc flash warning label per Code.

B. Label shall include calculated arc fault current and calculated arc flash rating (cal/cm).

C. Labeling and calculated values shall be included with shop drawing submittals.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Provide metering equipment in accordance with NEC and as recommended by the manufacturer. Refer to the Drawings and/or the Distribution Schedule.

******DELETE IF NO CONCRETE BASE******

2. Provide raised concrete bases for metering equipment. Bases shall be four inches high where possible, but at least two inches minimum. Pad sizes shall be based on exact equipment size as determined from Shop Drawings. Provide concrete pads as described above, unless they are shown or specified to be provided by General Contractor.

******END******

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide all labor, materials and accessories to install and connect wiring devices wherever required by Drawings and Specifications.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All wiring devices shall be of the same manufacturer as follows (Leviton and Hubbell catalog numbers are used to specify required type and quality):

1. Cooper
2. General Electric
3. Hubbell
4. Leviton
5. Pass & Seymour
6. Slater
7. Sierra

B. Acceptable Manufacturers: All wiring devices shall be of the same manufacturer as follows:

1. Cooper
2. Leviton
3. Sierra
4. Slater

2.2 DEVICE COLOR

A. General Requirements: Unless noted otherwise, all wiring devices and wall plates shall be coordinated with the Architect. Submit samples to Architect for review and approval.

2.3 SWITCHES

A. General Requirements: Switches for lighting loads shall be 15 amp or 20 amp, 120 volt, quiet toggle type and side wired.

B. Switches shall be the following:

1.	15 amp, 120 volt, single pole	Leviton #1451-X
2.	20 amp, 120 volt, single pole	Leviton #54521-2X
3.	15 amp, 120 volt, 3-way	Leviton #1453-X
4.	20 amp, 120 volt, 3-way	Leviton #54523-2X
5.	15 amp, 120 volt, 4-way	Leviton #2654-X
6.	20 amp, 120 volt, 4-way	Leviton #54529-2X
7.	20 amp, 120 volt, 2-pole	Leviton #54522-2X
8.	24 volt, momentary contact, SPDT center off	Leviton #1081

C. Door frame switches shall be Pass & Seymour No. ACD-201 or ACD-203, complete with mounting straps and stainless steel plates.

D. Timer switches shall be Leviton LTB30-1L, electronic with four presets, up to 30 minutes, rated for 1000 watts/1hp motor.

2.4 CONVENIENCE OUTLETS

A. General Requirements: Duplex receptacles shall be 15 amp or 20 amp, 125 volt, 3-wire, grounding type, quickwire push-in and side or back and side wired. Install 20 amp rated duplex receptacles in all common areas. All receptacles shall be installed with the ground slot down. Provide GFI receptacles where shown or required by the National Electrical Code (NEC) and install with ground slot down.

B. Receptacles, common areas, shall be the following:

1.	15 amp, 125 volt	Leviton #5320-X
2.	15 amp, 125 volt, GFI	Leviton #7599-X
3.	15 amp, 125 volt, controlled	Leviton #16252-1PX
4.	20 amp, 125 volt	Leviton #BR20-X
5.	20 amp, 125 volt, GFI	Leviton #7899-X
6.	20 amp, 125 volt, controlled	Leviton #16352-1PX

C. Receptacles, dwelling units and hotel guest rooms, shall be the following (tamper-resistant):

1.	15 amp, 125 volt	Leviton #T5320-X
2.	15 amp, 125 volt, GFI	Leviton #T7599-X
3.	20 amp, 125 volt	Leviton #TBR20-X
4.	20 amp, 125 volt, GFI	Leviton #T7899-X

Tamper-resistant receptacles shall be Leviton only, no substitutes.

D. Special receptacles shall be the following:

1.	20 amp, 250 volt	Leviton #5821-X
2.	30 amp, 125/250 volt, 3-pole, 4-wire, grounding	Leviton #278
3.	50 amp, 125/250 volt, 3-pole, 4-wire, grounding	Leviton #279

E. Exterior receptacles shall be low profile, recessed, weatherproof (WP) with cord openings and solid cover. Arlington IN BOX.

F. For flush, wood deck installations, provide weatherproof enclosure with cover and flexible, outdoor rated, 3-foot long cord whip. Red Dot #DKG-PRO.

2.5 DIMMERS

A. General Requirements: Provide all dimmers as shown on the Drawings.

B. Dimmers shall be as follows:

1.	600 watt, 120 volt, incandescent	Lutron #NT-600
2.	1000 watt, 120 volt, incandescent	Lutron #NT-1000
3.	1,500 watt, 120 volt, incandescent	Lutron #NT-1500
4.	16 or 8 amp, 120/277 volt, fluorescent	Lutron #NTF Series

C. Provide dimmer rated 0-10volt with on/off function for all LED dimmed lighting.

2.6 DEVICE PLATES

A. General Requirements: Device plates shall be provided for all devices shown on the Drawings or called for in the specifications. Device plates in finished and unfinished areas shall be plastic, unless noted otherwise. Multiple device plates shall be constructed of a single plate. No sectional plates will be accepted.

B. Special Screws: Where so indicated, device plates shall be complete with special tamperproof spanner oval head screw. Furnish Owner with three special screw drivers for the spanner head screws.

C. Engraved Plates: Engraved plates shall have letters sized at 1/8-inch minimum letter height and black filling. Printed tape or glued on plates are not acceptable. The following plates shall be engraved:

1. Wall plates so indicated on Drawings.
2. Switch wall plates controlling any lights which are out of sight of switches.
3. Switch wall plates controlling motors.

D. Commercial Kitchen Device Coverplates: Provide 302 stainless steel plates for all devices indicated.

Part 3. – EXECUTION

3.1 INSTALLATION OF DEVICES

A. General Requirements: Device height shall be as follows, except where noted otherwise on the Drawings:

1. Normal Areas and Rooms, Unfinished Areas: Switches, receptacles and outlets shall be mounted at the following heights, measured from device center to floor, unless noted otherwise.

a.	Receptacle	18”
b.	Telephone outlet	18”
c.	Telephone outlet, wall	46”
d.	TV outlet	18”
e.	Switch	46” top of device
f.	Devices above counter without backsplash	8” above counter
g.	Devices above counter with backsplash	4” above backsplash

2. Handicapped and Adaptable Areas and Rooms: Switches, receptacles and outlets shall be mounted at the following heights, measured from device center to floor, unless noted otherwise.

a.	Receptacle	24”
b.	Telephone outlet	24”
c.	Telephone outlet, wall	44” top of device
d.	TV outlet	24”
e.	Switch	46” top of device
f.	Devices above counter without backsplash	44” top of device
g.	Devices above counter with backsplash	44” top of device

B. The Contractor shall coordinate the mounting height of all special receptacles with the Architect, Owner, Mechanical Contractor and equipment suppliers.

C. Where locations shown or mounting heights specified for devices conflict with other trades or building finishers, the Contractor shall coordinate exact requirements prior to installation and install only after the approval of all involved.

D. Provide spacers between outlet boxes and devices so that each device is flush with the finished wall. Plate screws shall not be used to stabilize device.

E. Location:

1. Receptacles along side of switches in janitor closets, storage rooms and mechanical spaces shall be in 2-gang boxes, with switch in first gang and receptacle in second gang.
2. Switches near doors shall be located on side opposite the hinges (verify door swings with Architectural Drawings before installation) and close to door trim. Edge of switch plate shall be within four inches of door frame.
3. Devices located at counters shall be mounted eight inches from device center to top of counter, unless noted otherwise.
4. Switches controlling range hood fan and lights, garbage disposals, undercabinet lighting, etc., in handicapped units shall be installed in the cabinet front. Coordinate the exact available location with the Architect.

F. Provide dedicated neutral and ground wire to each dimmer or timer switch.

G. Controlled Receptacles:

1. Receptacles shall be half-controlled.
2. Controlled portion shall be labeled with NEMA approved marking on receptacle face.
3. Connect switched portion to room lighting control system. Refer to Plans.

H. Verify exact locations of television boxes with Television Equipment Provider and Architect prior to rough-in.

I. For flush, wood deck installations, mount weatherproof device within enclosure. Provide j-box mounted on joist below deck and make hardwire connection to enclosure cord whip.

3.2 MOVING DEVICES

A. The Owner, through the Architect/Engineer, reserves the right to move any device a distance of ten feet in any direction from the location shown on the Drawings without an increase in Contract amount. This requirement shall only apply to devices before installation.

B. In the event that an outlet shown on the Drawings will not be able to serve the specified piece of equipment, the outlet shall be relocated, with no increase in contract amount.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Provide all labor, materials, and accessories to protect feeders and branch circuits for panels, motors, and electrical appliances wherever required by the Drawings and Specifications or by applicable provisions of the National Electric Code (NEC).

Part 2. – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All fuses shall be of one manufacturer as follows:

1. Bussman
2. Littelfuse
3. Shawmut

2.2 FUSE TYPES

A. 600 Ampere and Below (Bussman model numbers used to set the minimum standard for material and equipment):

1. All fuses shall have 200,000 amperes RMS interrupting rating.
2. Fuses shall be Underwriters' Laboratories Class J current limiting, dual element time delay, rejection type.
3. Fuses shall be Bussmann LPJ_SP.

B. 601 Ampere and Above (Bussman model numbers used to set the minimum standard for material and equipment):

1. All fuses shall have 200,000 amperes RMS interrupting rating.
2. Fuses shall be Underwriter' Laboratories Class L current limiting, time delay, pure silver link type.
3. Fuses shall be Bussmann KRP-C_SP.

C. Individual Motor Circuits (Bussman model numbers used to set the minimum standard for material and equipment):

1. Fuses shall be Underwriter' Laboratories Class R, current limiting, dual element time delay.
2. For fuses rated at 250 volt, provide Bussman LPN-RK_SP.
3. For fuses rated at 600 volt, provide Bussman LPS-RK_SP.

Part 3. – EXECUTION

3.1 FUSE INSTALLATION

A. General Requirements:

1. Provide fuses in all fusible switches, except switches identified as "spare or future".
2. Provide all fuses of ampere ratings required by the NEC to protect feeders and equipment.

3.2 SPARE FUSES

A. General Requirements:

1. Fuses 100 amps and smaller: Provide one standard size package of each size, type and amperage installed.
2. Fuses over 100 amps: Provide three spare fuses of each size, type and amperage installed.

B. Turn over spare fuses to the Owner prior to final closeout of the Project.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide safety switches wherever required by the Drawings and Specifications.

1. Every effort has been expended to provide an accurate list of equipment, however, the Contractor shall verify motor nameplate on site before installing switches or selecting fuses.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All safety switches shall be of one manufacturer as follows.

1. Cutler-Hammer
2. General Electric
3. I.T.E. (Siemens)
4. Square D

2.2 MATERIALS

A. Type:

1. Safety switches shall be fused. Non-fusible switches may be used in lieu of fusible where allowed by the National Electrical Code (NEC).
2. Safety switches shall be NEMA HD (heavy duty) type, horsepower rated, and of ampere sizes shown on Drawings or to comply with NEC. Safety switches shall have NEMA 1 enclosures, except in wet locations or where indicated as weatherproof, in which case a NEMA 3R enclosure shall be used. Locations on roof or outside shall be considered wet locations.
3. Fusible safety switches shall contain Class R fuse provisions to reject fuses, except Class R type.
4. Safety switches shall contain padlocking provisions and defeater screw mechanisms. Provide interlock contacts where so specified.
5. Safety switches shall be rated 240 volts where used on 120/208 volt or 120/240 volt systems.
6. Safety switches shall be rated 600 volts where used on 277/480 volt systems.
7. Switches rated 30 amperes through 100 amperes shall have lugs listed for 60° C or 75° C conductors. Switches rated over 100 amperes shall have lugs listed for 75° C.

*****DELETE IF NO ELEVATOR*****

B. Special Requirements For Elevator Installations:

1. Safety switches installed in elevator machine rooms for elevator power shall be shunt trip breakers or fused disconnects, refer to Drawings.
2. Safety switches used for elevator power shall be provided with auxiliary contacts (one N.O. and one N.C.) controlled by the switch. The Contractor shall provide required conductors through the auxiliary contacts to the elevator controller.

*****END*****

2.3 ARC FLASH WARNING LABEL

A. Provide arc flash warning label per Code.

B. Label shall include calculated arc fault current.

C. Labeling and calculated values shall be included with shop drawing submittals.

Part 3. - EXECUTION

3.1 SUMMARY

A. This contractor shall review all Mechanical Equipment Schedule and plans and provide disconnects and fuses to comply with Code.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide fixtures shown on Drawings complete with lamps as indicated in Light Fixture Schedule.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10. Shop Drawings submitted for approval shall contain the following minimum information:

1. Manufacturer and type of ballast for fluorescent, HID fixtures and driver for LED fixtures.

1. 3 QUALITY ASSURANCE

A. Underwriters' Laboratories (UL): Assemblies shall be in accordance with Section 26 00 10.

1. Lighting fixtures shall bear the UL label for wet or damp locations for the use intended.

Part 2. - PRODUCTS

2.1 FLUORESCENT FIXTURES

A. General Requirements: Metal parts shall be steel, with end plates connected to body with fasteners or by welding, with all essential components required for a complete installation.

2.2 BALLASTS

A. Coordination With Electronic Clock System: Only ballasts and LED drivers rated to be compatible with the electronic (carrier frequency) type of clock system shall be used on this Project.

2.3 LED'S AND DRIVERS, GENERAL REQUIREMENTS

A. General

1. Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.
2. Drivers shall be compatible with the lighting control system.
3. LED shall have a lumens/watt efficacy value which will meet the current State Energy Codes.
4. Provide 0-10 volt rated dimmer with on/off function for LED dimming control.

B. Approved Driver Manufactures:

1. Albeo
2. CREE
3. GE
4. Hubbel
5. Lithonia
6. Phillips

C. Interior Lighting

1. All LEDs shall have a color temperature as scheduled, minimum 85 CRI and a minimum life expectancy of 50,000 hours.

D. Exterior Lighting

1. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction. Luminaires shall be RoHS (restriction of Hazardous Substances) compliant.
2. Must be rigid structure with weather resistant and water tight enclosures.

2.4 EMERGENCY BATTERY UNIT

A. General Requirements: Wherever noted in the Light Fixture Schedule or Drawings emergency lighting units shall be as follows:

1. A self-contained storage battery used as a second source of power.
2. Shall supply and maintain the total output for a period of 1½ hours minimum, without the voltage applied to the load failing below 87½% of normal light output.

2.5 LENSES

A. General Requirements: Provide lenses as noted in Light Fixture Schedule.

2.6 RECESSED FIXTURES

A. General Requirements:

1. Provide recessed fixtures with frames appropriate for the type of ceiling mounting.
2. Provide suitable plaster frames where installed in plaster ceilings.
3. Provide fixtures that have wiring, ballasts, drivers and relamping access from below the ceiling unless otherwise indicated.
4. Provide UL listed and labeled enclosure for all fixtures that penetrate rated fire assemblies or that penetrate into unheated areas, such as soffits and attics. Install enclosure, seal all openings with caulking and duct tape and provide plastic cover over enclosure (also caulked and taped) to restrict air infiltration prior to installation of insulation. UL listed enclosure shall be E.Z. Barrier or Tenmat Firedome. If enclosure will not maintain proper clearances around fixture per manufacturer's recommendations, provide sheetrock boxout if allowed by Local Code Authority. Otherwise provide UL listed fixture.
5. LED, Incandescent and HID fixtures shall be UL listed and labeled for thermal protection.

2.7 FIXTURE SCHEDULE

A. General Requirements:

1. Manufacturer's catalog number indicates type, quality and style, but may not cover driver, ballast, lamp or special details required. Contractor shall provide the lighting fixtures with special features noted.
2. Provide fixtures complete with lamps.
3. Coordinate light fixtures with latest Architectural Reflected Ceiling Plans prior to release of fixture order.
4. Adjust mounting to match ceiling type at no additional cost to Owner.
5. Unless noted otherwise, CRI and color temperatures of lamps shall match. Contractor shall replace pre-installed lamps to match specified building lamps. Refer to Light Fixture Schedule.

B. Acceptable Manufacturers: All lamps shall be:

1. General Electric
2. Osram/Sylvania
3. Phillips

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Remove manufacturer's labels from exterior of fixtures.
2. Install fixtures when the work of other trades in the area is substantially complete, to avoid damage or defacement after installation. Fixtures shall not be installed on ceilings until ceiling finishes are complete, except fixtures may be installed on exposed T-bar ceilings after T-bars are installed and before tile installation.
3. Coordinate fixture locations with the ceiling installation and install fixtures in a uniform pattern to tiles or exposed grids. Fixtures shall be symmetrically spaced with rows in alignment and parallel with the building features. Measurements shall be taken from the Architectural Drawings.
4. Install 2x2 fixtures and compact fluorescent downlights with lamps perpendicular to corridor.
5. Where floodlighting has been indicated, provide for adjusting during evening hours to Engineer’s satisfaction.
6. Directional fixtures shall be properly aimed and aligned as directed by the Owner's representative.
7. Provide concrete bases for anchor bolt mounting of all exterior pole mounted fixtures. Refer to the Drawings for base detail.

3.2 FIXTURE MOUNTING

A. General Requirements:

1. Surface fixtures, other than fluorescent type, shall be securely fastened to outlet box.
2. Recessed fixtures, except those installed within an exposed grid type ceiling, shall be supported from building structural members or from concealed steel framing channels 1-1/2 inches or larger. No recessed fixtures shall be supported from ceiling tiles.
3. Individually mounted fluorescent fixtures shall be supported within 12 inches of each end of fixture.
4. Continuous row fluorescent fixtures shall be supported within 12 inches of end of each row and at intervals not to exceed 48 inches along entire row.
5. Chain hung fixtures shall be permitted only where specifically noted. Chains shall be spaced the same as supports described under this Section. Chains shall be heavy duty, nickel or cadmium plated, suitable for weight of specific fixture. Jack chain shall not be used. Unless otherwise indicated, chain hung fixtures shall be provided with a grounded receptacle and grounded portable cords and plugs to feed individual units or continuous rows. Chain hung fixtures shall be located on site to clear mechanical ducts and equipment.

3.3 SUPPORTS AND FASTENING

A. For Fixtures Not In Exposed T-Bar Grid Ceilings: Fixture supports, or outlet boxes used to support fixtures, shall be securely fastened to building structural members or to concealed steel ceiling framing channels 1-1/2 inches or larger. Fixture hanging rods shall be of adequate dimensions to support fixture and shall be not less than 3/8 inch diameter. Fixture supports shall be fastened to structure as follows:

1. To concrete with steel or lead expandable concrete anchors set into a minimum of 1-1/2 inches of concrete or with 3/8 inch minimum diameter toggle bolts through concrete.
2. To wood with lag screws a minimum 1/4 inch diameter entering wood structural members a minimum of 2 inches.
3. To 16 gauge steel channels where used to span building bar joists, structural members or ceiling 1-1/2 inch minimum framing channels. Provide Steel City, No. 6029 steel channels or Thomas & Betts.

B. For Fixtures in Exposed T-Bar Grid Ceilings: Fixtures shall be supported as follows:

1. Recessed fixtures designed expressly for lay-in mounting and under 50 lbs. shall be installed in that manner. Grid system shall be supported from structure by ceiling system installer.

2. Recessed fixtures not designed for lay-in mounting or over 50 lbs. shall be installed per the manufacturer's requirements. Contractor shall provide all mounting hardware required. Contractor shall also coordinate with the ceiling system installer and the Architect.
3. Provide flexible metal conduit connections for all recessed type fixtures in lay-in ceilings permitting fixture to be lifted out. Maximum flexible conduit shall not exceed six feet. One to four fixtures may be served by a single common outlet box, securely fastened to structure or ceiling support members and within 30 inches of ceiling tile.
4. Provide fixture retainers or clips for each fixture installed in exposed grid suspended ceilings in accordance with UBC and state building codes.
5. Recessed fixtures, not designed to lay-in directly on grids, shall be centered on ceiling tiles and shall be supported with 16 gauge steel channels used to span over T-bar grids. No fixture shall be supported by ceiling tiles.
6. Surface mounted fixtures to be centered directly on a T-bar grid shall be secured to that grid with hanger clamps, clips or other approved fasteners designed for the purpose. Unless otherwise noted, ceiling T-bar grid system shall be supported from structure by ceiling system installer.
7. Surface mounted fixtures to be centered between T-bar grids shall be secured to a 16 gauge steel channel installed by this Contractor to span over top of main T-bar grids. Steel channels shall be Steel City, No. 6029 or Thomas & Betts. Non-main T-bar grids shall not be used to support steel channels. Unless otherwise noted, ceiling T-bar grid system shall be supported from structure by ceiling system installer.

3.4 SPECIAL FIXTURE COORDINATION

A. Storage and Mechanical/Electrical Rooms: Contractor shall verify actual fixture locations with Architect. Fixture locations shall be revised to clear all equipment, ducts, and piping.

END OF SECTION

Part 1. – GENERAL

1.1 SUMMARY

A. Section Includes: Provide one copy of quantity invoices required by the local power company to allow Owner to receive Energy Rebates for the use of energy saving ballasts and/or energy saving lamps.

Part 2. – PRODUCTS

N/A

Part 3. – EXECUTION

3.1 GENERAL REQUIREMENTS

A. Contractor shall complete and submit all form/applications required by the Utility Company or Energy/Environmental Firm(s).

B. All rebates shall be made directly to Owner.

C. Retain samples of existing lamps and/or ballasts for proof of energy savings when required by the local power company.

END OF SECTION

Part 1. - GENERAL

1.1 GENERAL REQUIREMENTS

A. The complete installation shall conform to local codes and the National Electrical Code (NEC). All wiring shall be installed according to the local Utility's recommendations.

B. Telephone and Voice/Data cables shall be 4-pair, 24 AWG, CAT 5e or **[CAT6]**. All cable installed within plenum spaces shall be teflon coated.

C. The Owner shall provide a telephone switching system near the main entrance backboard. Contractor shall coordinate routing of cables and placement of all termination blocks to properly connect to the telephone switch.

D. System shall be interconnected with the Access/Entry Control System to provide a "no phone bill" entry system. Refer to Section 26 75 43.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

Part 2. - PRODUCTS

N/A

Part 3. - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Contractor shall provide a complete and fully functional interior telephone backbone system, including all required wiring, punchdown blocks, patch panels, backboxes, mudrings, outlets and jacks.

B. Contractor shall provide a ¾" plywood backboard of sufficient size for Contractor and utility use. Contractor shall paint the backboard with a grey, fire retardant paint prior to all equipment installation.

C. Contractor shall provide an exterior, weatherproof, lockable enclosure of sufficient size for Contractor and utility use.

D. Contractor shall provide separate 4'x8'x3/4" plywood backboards in all remote Voice/Data rooms for Contractor and utility use. Contractor shall paint backboard with a grey, fire retardant paint prior to all equipment installation.

E. Provide **[66 (CAT-5) or 110 (CAT-6)** style punchdown blocks with style brackets. Route cables under bracket to punchdown area. All conductors shall be terminated. Insulation shall not be stripped back further than needed.

F. Contractor shall provide one RJ45 jack for all telephone outlets.

G. Contractor shall provide two RJ45 jacks for voice/data outlets, one for voice and one for data.

H. Contractor shall provide coverplates to match wiring devices for all telephone and voice/data outlets.

I. Telephone and voice/data outlets shall be supported by a single gang mudring nailed to a wall surface.

J. The local Utility shall provide system entrance telephone cable to a main entrance backboard provided by the Contractor as specified in this section.

K. Contractor shall provide cable connection between the main entrance backboard and each remote Voice/Data room.

L. Contractor shall provide one telephone cable from a telephone backboard to one telephone outlet in each unit. Provide separate cables from this telephone outlet to each telephone outlet within the unit.

M. Contractor shall provide one telephone cable from a telephone backboard to each telephone outlet located within common areas.

N. Contractor shall provide two telephone cables from the main entrance backboard to each voice/data outlet located within common areas.

O. Contractor shall provide signal boosters for voice/data cable runs that exceed 250 feet. Provide receptacle adjacent to booster, obtain power from nearby 120 volt receptacle circuit. Coordinate booster location with Architect prior to rough-in.

P. Contractor shall make final terminations at punchdown blocks, patch panels and jacks with permanent label at each end of individual conductors.

Q. Sufficient length shall be provided at both ends of each telephone cable to allow for outlet installation and termination by Contractor.

R. Contractor shall test each cable and certify. Provide 3-ring binder with certification documentation to the Owner prior to installation of Owner's equipment.

******END******

******RESIDENTIAL WITH UNIT MEDIA CABINET, EDIT AS REQUIRED******

S. Contractor shall provide a complete and fully functional interior telephone backbone system, including all required wiring, punchdown blocks, patch panels, backboxes, mudrings, outlets and jacks.

T. Contractor shall provide a ¾" plywood backboard of sufficient size for Contractor and utility use. Contractor shall paint the backboard with a grey, fire retardant paint prior to all equipment installation.

U. Contractor shall provide an exterior weatherproof, lockable enclosure of sufficient size for Contractor and utility use.

V. Contractor shall provide separate 4'x8'x3/4" plywood backboards in all remote Voice/Data rooms for Contractor and utility use. Contractor shall paint backboard with a grey, fire retardant paint prior to all equipment installation.

*****EDIT*****

W. Provide **[66 (CAT-5) or 110 (CAT-6)** style punchdown blocks with style brackets. Route cables under bracket to punchdown area. All conductors shall be terminated. Insulation shall not be stripped back further than needed.

*****EDIT*****

X. Contractor shall provide one RJ45 jack for all telephone outlets.

Y. Contractor shall provide two RJ45 jacks for voice/data outlets, one for voice and one for data.

Z. Contractor shall provide coverplates to match wiring devices for all telephone and voice/data outlets.

AA. The local Utility shall provide system entrance telephone cable to a main entrance backboard provided by the Contractor as specified in this section.

BB. Contractor shall provide cable connection between the main entrance backboard and each remote Voice/Data room.

CC. Contractor shall provide two telephone cable from a telephone backboard to the structured media center within each unit. Provide separate dedicated cables from the structured media center to each telephone outlet within unit.

DD. Contractor shall provide one telephone cable from a telephone backboard to each telephone outlet located within common areas.

EE. Contractor shall provide two telephone cables from a telephone backboard to each voice/data outlet located within common areas.

FF. Contractor shall provide signal boosters for voice/data cable runs that exceed 250 feet. Provide receptacle adjacent to booster, obtain power from nearby 120 volt receptacle circuit. Coordinate booster location with Architect prior to rough-in.

GG. Contractor shall make final terminations at punchdown blocks, patch panels and jacks with permanent label at each end of individual conductors.

HH. Sufficient length shall be provided at both ends of each telephone cable to allow for outlet installation and termination by Contractor.

II. Contractor shall test each cable and certify. Provide 3-ring binder with certification documentation to the Owner prior to installation of Owner's equipment.

*****END*****

******RESIDENTIAL, I1 OR I2, EDIT AS REQUIRED******

JJ. Contractor shall provide a complete and fully functional interior telephone backbone system, including all required wiring, punchdown blocks, patch panels, backboxes, mudrings, outlets and jacks.

KK. Contractor shall provide a ¾" plywood backboard of sufficient size for Contractor and utility use. Contractor shall paint the backboard with a grey, fire retardant paint prior to all equipment installation.

LL. Contractor shall provide separate 4'x8'x3/4" plywood backboards in all remote Voice/Data rooms for Contractor and utility use. Contractor shall paint backboard with a grey, fire retardant paint prior to all equipment installation.

*****END*****

MM. Provide **[66 (CAT-5) or 110 (CAT-6)** style punchdown blocks with style brackets. Route cables under bracket to punchdown area. All conductors shall be terminated. Insulation shall not be stripped back further than needed.

*****END*****

NN. Contractor shall provide one RJ45 jack for all telephone outlets.

OO. Contractor shall provide two RJ45 jacks for voice/data outlets, one for voice and one for data.

PP. Contractor shall provide coverplates to match wiring devices for all telephone and voice/data outlets.

QQ. Telephone outlets shall consist of a recessed j-box with a ½" conduit extended into a nearby accessible ceiling space.

RR. Voice/data outlets shall consist of a recessed double gang box and single gang plate with a ¾" conduit extended into a nearby accessible ceiling space.

SS. The local Utility shall provide system entrance telephone cable to a main entrance backboard provided by the Contractor as specified in this section.

TT. Contractor shall provide cable connection between the main entrance backboard and each remote Voice/Data room.

UU. Contractor shall provide one telephone cable from a telephone backboard to each telephone outlet.

VV. Contractor shall provide two telephone cables from a telephone backboard to each voice/data outlet.

WW. Contractor shall make final terminations at punchdown blocks, patch panels and jacks with permanent label at each end of individual conductors.

XX. Sufficient length shall be provided at both ends of each telephone cable to allow for outlet installation and termination by Contractor.

YY. Contractor shall test each cable and certify. Provide 3-ring binder with certification documentation to the Owner prior to installation of Owner's equipment.

ZZ. Provide **[66 (CAT-5) or 110 (CAT-6)** style punchdown blocks with style brackets. Route cables under bracket to punchdown area. All conductors shall be terminated. Insulation shall not be stripped back further than needed.

*****END*****

AAA. Contractor shall provide one RJ45 jack for all telephone outlets.

BBB. Contractor shall provide two RJ45 jacks for voice/data outlets, one for voice and one for data.

CCC. Contractor shall provide coverplates to match wiring devices for all telephone and voice/data outlets.

DDD. Telephone outlets shall consist of a recessed j-box with a ½" conduit extended into a nearby accessible ceiling space.

EEE. Voice/data outlets shall consist of a recessed double gang box and single gang plate with a ¾" conduit extended into a nearby accessible ceiling space.

FFF. The local Utility shall provide system entrance telephone cable to a main entrance backboard provided by the Contractor as specified in this section.

GGG. Contractor shall provide cable connection between the main entrance backboard and each remote Voice/Data room.

HHH. Contractor shall provide one telephone cable from a telephone backboard to each telephone outlet.

III. Contractor shall provide two telephone cables from a telephone backboard to each voice/data outlet.

JJJ. Contractor shall make final terminations at punchdown blocks, patch panels and jacks with permanent label at each end of individual conductors.

KKK. Sufficient length shall be provided at both ends of each telephone cable to allow for outlet installation and termination by Contractor.

LLL. Contractor shall test each cable and certify. Provide 3-ring binder with certification documentation to the Owner prior to installation of Owner's equipment.

*****END*****

END OF SECTION

Part 1. - GENERAL

1.1 GENERAL REQUIREMENTS

A. The complete installation shall conform to local codes and the National Electric Code (NEC).

B. All wiring shall be installed according to the manufacturer's recommendations.

C. Wiring shall be checked to ensure that it is free from shorts and grounds.

*****EDIT*****

D. The following devices shall be provided (Leviton model numbers are provided for cross referencing):

1. Structured Media Center. Leviton #47605-14W.
2. Basic Telephone and Video Panel. Leviton #47606-BTV.
3. Cat 5e Connectors. Leviton #5G108-R5.
4. Cable, satellite, HDTV and DVD F-Type connectors. Leviton #41084.
5. Surge protected AC power receptacle. Leviton #47605-ACS.

E. Provide Telephone and Voice/Data connections in accordance with Section 26 55 13.13.

F. Provide CATV connections in accordance with Section 26 55 43.43.

G. Provide MATV connections in accordance with Section 26 60 00.53.

H. Provide Satellite connections in accordance with Section 26 55 13.53

*****END*****

1.2 QUALITY ASSURANCE

A. Underwriters' Laboratories (UL): System shall be in accordance with Section 26 00 10.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

1. Shop drawings submitted for approval shall contain the following minimum information:

a. Complete descriptive data indicating UL listings for all system components.
b. Complete system wiring diagrams.

Part 2. - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Acceptable Manufacturers: All structured media equipment shall be of one manufacturer as follows:

1. Leviton
2. OnQ Technologies
3. ICC

Part 3. - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Contractor shall provide a complete and fully functional structured media system, consisting of equipment from one manufacturer and including all required installation components.

B. The Contractor shall fully test the completed structured media system in the presence of the Owner's representative. The Contractor shall certify the completion of a successful test in writing to the Owner and the General Contractor.

C. The Contractor shall instruct the Owner's representative in the correct operation of the structured media system.

D. The Contractor shall warrant the completed structured media system wiring and equipment to be free from mechanical and electrical defects for a period of one year from date of turnover.

END OF SECTION

Part 1. - GENERAL

1.1 GENERAL REQUIREMENTS

A. The complete installation shall conform to local codes and the National Electrical Code (NEC).

B. All wiring shall be installed according to the local Utility's recommendations. The Contractor shall provide RG6 coax cable. All coax installed within plenum spaces shall be teflon coated.

C. The Owner shall provide a CATV switching system near the main entrance backboard. The Contractor shall coordinate routing of cables and placement of all termination blocks to properly connect to the CATV switch.

1.2 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

Part 2. – PRODUCTS

N/A

Part 3. - EXECUTION

3.1 GENERAL REQUIREMENTS

******RESIDENTIAL, EDIT AS NEEDED******

A. The Electrical Contractor shall provide a complete and fully functional interior CATV system, including all required wiring, splitters, termination blocks, backboxes, mudrings, outlets and jacks.

B. The Contractor shall provide a 3/4" plywood backboard of sufficient size for Contractor and Utility use. Contractor shall paint the backboard with a grey, fire retardant paint prior to all equipment installation.

C. Contractor shall provide an exterior, weatherproof, lockable enclosure of sufficient size for Contractor and utility use.

D. The Contractor shall provide separate 4'x8'x3/4" plywood backboards in all remote Voice/Data rooms for Contractor and Utility use. Contractor shall paint backboard with a grey, fire retardant paint prior to all equipment installation.

E. CATV outlets shall be supported by a single gang mudring nailed to a wall stud surface.

F. The local Utility shall provide system entrance CATV cable to a main entrance backboard provided by the Contractor as specified in this Section.

G. Contractor shall provide cable connections between the main entrance backboard and each remote Voice/Data room.

H. Contractor shall provide jacks for all CATV outlets.

I. Contractor shall provide coverplates to match wiring device plates for all CATV outlets.

J. The Contractor shall provide one CATV cable from a CATV backboard to one CATV outlet in each unit. Provide separate cables from this CATV outlet to each CATV outlet within the unit.

K. The Contractor shall provide one CATV cable from a CATV backboard to each CATV outlet located within common areas.

L. The Electrical Contractor shall make final terminations at blocks and jacks.

M. Sufficient lengths shall be provided at both ends of each CATV cable to allow for outlet installation and termination by the Contractor.

N. Contractor shall test each cable and certify. Provide 3-ring binder with certification to the Owner prior to installation of Owner's equipment.

*****END*****

******RESIDENTIAL WITH UNIT MEDIA CABINET, EDIT AS REQUIRED******

O. The Electrical Contractor shall provide a complete and fully functional interior CATV system, including all required wiring, splitters, termination blocks, backboxes, mudrings, outlets and jacks.

P. The Contractor shall provide a 3/4" plywood backboard of sufficient size for Contractor and Utility use. Contractor shall paint the backboard with a grey, fire retardant paint prior to all equipment installation.

Q. Contractor shall provide an exterior, weatherproof, lockable enclosure of sufficient size for Contractor and utility use.

R. The Contractor shall provide separate 4'x8'x3/4" plywood backboards in all remote Voice/Data rooms for Contractor and Utility use. Contractor shall paint backboard with a grey, fire retardant paint prior to all equipment installation.

S. CATV outlets shall be supported by a single gang mudring nailed to a wall stud surface.

T. The local Utility shall provide system entrance CATV cable to a main entrance backboard provided by the Contractor as specified in this Section.

U. Contractor shall provide cable connections between the main entrance backboard and each remote Voice/Data room.

V. Contractor shall provide jacks for all CATV outlets.

W. Contractor shall provide coverplates to match wiring device plates for all CATV outlets.

X. The Contractor shall provide two CATV cables from a backboard to the structured media center within each unit. Provide separate dedicated cables from the structured media center to each CATV outlet within unit.

Y. The Contractor shall provide one CATV cable from a CATV backboard to each CATV outlet located within common areas.

Z. The Electrical Contractor shall make final terminations at blocks and jacks.

AA. Sufficient lengths shall be provided at both ends of each CATV cable to allow for outlet installation and termination by the Contractor.

BB. Contractor shall test each cable and certify. Provide 3-ring binder with certification to the Owner prior to installation of Owner's equipment.

****** RESIDENTIAL, I1 or I2 AS REQUIRED ******

CC. The Electrical Contractor shall provide a complete and fully functional interior CATV system, including all required wiring, splitters, termination blocks, backboxes, mudrings, outlets and jacks.

DD. The Contractor shall provide a 3/4" plywood backboard of sufficient size for Contractor and Utility use. Contractor shall paint the backboard with a grey, fire retardant paint prior to all equipment installation.

EE. Contractor shall provide an exterior, weatherproof, lockable enclosure of sufficient size for Contractor and utility use.

FF. The Contractor shall provide separate 4'x8'x3/4" plywood backboards in all remote Voice/Data rooms for Contractor and Utility use. Contractor shall paint backboard with a grey, fire retardant paint prior to all equipment installation.

GG. CATV outlets shall consist of a recessed single gang box with a ¾" conduit extended into a nearby accessible ceiling space.

HH. The local Utility shall provide system entrance CATV cable to a main entrance backboard provided by the Contractor as specified in this Section.

II. Contractor shall provide cable connections between the main entrance backboard and each remote Voice/Data room.

JJ. Contractor shall provide jacks for all CATV outlets.

KK. Contractor shall provide coverplates to match wiring device plates for all CATV outlets.

LL. The Contractor shall provide one CATV cable from a CATV backboard to one CATV outlet in each unit. Provide separate cables from this CATV outlet to each CATV outlet within the unit.

MM. The Contractor shall provide one CATV cable from a CATV backboard to each CATV outlet located within common areas.

NN. The Electrical Contractor shall make final terminations at blocks and jacks.

OO. Sufficient lengths shall be provided at both ends of each CATV cable to allow for outlet installation and termination by the Contractor.

PP. Contractor shall test each cable and certify. Provide 3-ring binder with certification to the Owner prior to installation of Owner's equipment.

*****END*****

END OF SECTION

Part 1. - GENERAL

1.1 GENERAL REQUIREMENTS

A. The complete installation shall conform to local codes and the National Electric Code (NEC).

*****EDIT*****

B. The following devices shall be provided (MIRCOM model numbers are provided for cross referencing):

1. Main Control Panel. TX3/TX3-100 Series.
2. Auxiliary Controller. TX3-CX. **[1 for every additional 2 doors]**
3. Keyfob, Multipass, One Button. HID 1346 Prox Key II. **[Without garage door Linear ACT-31DHC.]**
4. Mini Proximity Reader. Hid Mini Prox 5365.
5. RF Receiver. TX3-CX-REC. **[Garage door controller]**
6. Software. Linear WOR. **[Computer interface]**
7. On Board Camera Module. CAM-2. **[Requires RG6 to DVR]**
8. Master NSL Relay Cabinet. TX3-NSL-8M. **[No external phone line system (NSL Option)]**
9. Expansion NSL Relay Cabinet. TX3-XXEC. **[No external phone line system (NSL Option)]**
10. Standby batteries.
11. All required accessories and wiring.

C. Provide RG6 coax cable from DVR to CATV backboard. **[Keep for onboard camera option]**

D. All equipment and cable shall be provided to interconnect with the internal telephone lines. (**Rarely - No external telephone line shall be required for proper operation. [Keep if NSL Option]**

*****END*****

E. Contractor shall provide all cables required for a complete and functional system.

*****EDIT*****

F. Provide XXX keyfobs. Keyfobs shall be factory programmed to operate all entry doors.

*****END*****

G. Provide interconnection with garage door operator. Coordinate with garage door operator vendor.

H. All electric strike or door contact power shall be 24 volt dc. Door strikes and/or magnetic lock to be provided by door hardware supplier.

I. All wiring shall be installed according to the manufacturer's recommendations.

J. Wiring shall be checked to insure that it is free from shorts and grounds. All wiring shall be copper. Minimum wiring size shall be #22 gauge. Wire shall be UL type CL2, approved for access control system installation.

K. Provide surge protection on power, LAN and RS485 serving entry unit. Protection shall meet manufacturer recommendations.

L. The Contractor shall warrant the completed access/entry control system wiring and equipment to be free from mechanical and electrical defects for a period of one year from the date of turn over.

1.2 QUALITY ASSURANCE

A. Underwriters' Laboratories (UL): System shall be in accordance with Section 26 00 10.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 10 00.

1. Shop drawings submitted for approval shall contain the following minimum information:

a. Complete descriptive data indicating UL listings for all system components.
b. Complete sequence of operations for the system.
c. Complete system wiring diagrams.

Part 2. - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Acceptable Manufacturers: All access control equipment shall be of one manufacturer as follows:

1. Mircom
2. Keri Systems

Part 3. - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Contractor shall provide a complete and fully functional access/entry control system, consisting of equipment from one manufacturer and including all required installation components.

B. The Contractor shall fully test the completed access/entry control system in the presence of the Owner's representative. The Contractor shall certify the completion of a successful test in writing to the Owner and the General Contractor.

C. The Contractor shall instruct the Owner's personnel in the correct operation of the access/entry control system.

D. The Contractor shall warrant the completed access/entry control system wiring and equipment to be free from mechanical and electrical defects for a period of one year from date of turnover.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. The complete installation shall conform to the local codes and the National Electrical Code (NEC).

B. The following devices shall be provided where shown on the Drawings (Cornell and Alpha Communications model numbers are provided for cross referencing):

*****EDIT*****

1. Call Station. Cornell #4800V.
2. Main Control Panel, digital. Cornell #A-4800M.
3. Expansion Switch. Cornell #ES-4808.
4. Rescue Assistance Sign with “Area of Refuge” legend. Alpha Communications #RSN7043.
5. Power Supply with Battery Backup. Cornell #B-5248A.

C. The System shall provide separate visual signals at the Main Control Panel for each Call Station.

D. The System shall provide visual signals at each Call Station as follows:

1. Alarm Sent – steady LED.
2. Call in Progress - flashing LED.

E. The System shall provide 2-way voice communication between the Call Stations, Command Unit and Central Station Monitoring.

F. The Call Stations and Command Unit shall contain internal battery back-up.

****END*****

1.2 QUALITY ASSURANCE

A. Underwriters’ Laboratories (UL): Devices shall be in accordance with Section 26 00 10.

1.3 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

1. Shop drawings submitted for approval shall contain the following minimum information:

   a. Complete descriptive data indicating UL listings for all system components.
   b. Complete sequence of operations for the system.
   c. Complete system wiring diagrams.

1.4 WARRANTY

A. The Contractor shall guarantee all materials and equipment to be free of defects that may develop in any part of their work, caused by faulty workmanship, material or equipment failures, for a minimum of one year from the date of final completion of the Project or for as long as normal equipment manufacturer warranties are in effect from the date of Owner acceptance of the Project, whichever is later.

B. During the warranty period, notification by letter, personal contact or telephone conversation of a problem with any electrical system, shall cause the Contractor to respond within one week, making repairs or corrections as necessary. After all repairs and corrections are complete, the Contractor shall notify the Engineer.

C. The Contractor shall agree to provide 24 hour service on call for emergency during warranty period.

1.5 MONITORING

A. General Requirements: Provide first year of Central Station Monitoring during warranty period at no additional cost to Owner. Owner shall provide for Central Station Monitoring after warranty period. Include all costs to install Telephone Access Kit, including programming and initial test.

Part 2. - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Acceptable Manufacturers: All Rescue Assistance Call Systems shall be of one manufacturer as follows:

1. Alpha Communications.
2. Cornell.
3. Housing Devices.
4. Tek Tone.

Part 3. - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Contractor shall provide a complete and fully functional stand alone Rescue Assistance Call System, consisting of equipment from one manufacturer and including all required installation components.

B. Provide backboxes and enclosures for all Rescue Assistance Call System devices.

C. All wiring shall be installed in a separate conduit system. A color coded wiring system shall be maintained throughout the installation.

D. Wiring shall be color coded, tagged and checked to insure that it is free from shorts and grounds. All wiring shall be solid copper. Minimum wire size shall be #22 gauge. Refer to manufacturer for additional wiring requirements.

E. Devices shall be mounted at the following heights, unless noted otherwise. Distances shall be measured to center of devices from finished floor.

1. Call Station 44”
2. Control Panel 48”

Devices shall be mounted to conform with ADA.

F. All j-boxes shall be sprayed green and labeled “Rescue Assistance Call”.

G. Provide 3/4" conduit with dual telephone lines between each Call Station and telephone backboard for Central Station Interconnection. Make required connections.

H. Provide 3/4" conduit with dual telephone lines between the Command Unit and telephone backboard for Central Station Interconnection. Make required connections.

I. Provide 3/4" conduit with 4-wire connection between the Command Unit and each Call Station. Make required connections.

J. Contractor shall verify proper sign legend prior to ordering.

3.2 TESTING

A. The Contractor shall fully test the completed Rescue Assistance Call system in the presence of the Owner's representative. The Contractor shall certify the completion of a successful test in writing to the Owner and the General Contractor.

3.3 WARRANTY

A. The Contractor shall warranty the completed Rescue Assistance Call system wiring and equipment to be free from mechanical and electrical defects for a period of one year from the date of turn over.

3.4 TRAINING

A. The system supplier shall provide a minimum of a two hour training session to the Owner and Management Team. The training shall be coordinated with the Owner.

END OF SECTION

Part 1. - GENERAL

1.1 SUMMARY

A. Section Includes: Provide an electrically double supervised closed circuit, temporal code sounding fire alarm system wherever required by the Drawings and Specifications.

1. Provide a complete and fully functional addressable fire detection and alarm system, consisting of equipment from one manufacturer and including all required wiring, conduit, j-boxes and outlet boxes. Equipment shall consist of factory assembled components, with warranties and guarantees as specified.
2. Fire alarm system shall be an addressable operation/analog detection type, electrically supervised, temporal code sounding with individual devices. Devices shall include but not be limited to alarm initiating devices, alarm notification devices, control panels, auxiliary control devices (including sprinkler zones) and power supplies.

1.2 PERMITS AND FEES

A. General Requirements: All permits, fees, bonds and drawings required by local and/or state fire marshal or Code Authorities shall be the responsibility of this Contractor and included as a part of this Contract.

1.3 REFERENCES

A. General Requirements:

1. The complete installation shall conform to the applicable sections of the International Fire Code (IFC), NFPA-72, local codes and the National Electric Code (NEC). Each item of the system shall meet the UL label. All control equipment shall be listed under the UL category “UOJZ” as a single control unit; partial listings will not be accepted. Smoke detector shall be approved under UL 268 and shall be UL listed for Power Limited Applications per NEC 760-23.
2. Control equipment shall contain transient protection devices in accordance with the UL864 requirements.

1.4 QUALITY ASSURANCE

A. Underwriters’ Laboratories (UL): Devices shall be in accordance with Section 26 00 10.

1.5 VENDOR QUALIFICATIONS

A. General Requirements: The Manufacturer shall have a minimum of ten years experience in fire detection systems and shall employ factory trained, NICET II certified technicians. Installation shall be supervised by an employee with a NICET Level III certification or better. Provide evidence of certification with submittals.

1.6 COMPATIBILITY OF EQUIPMENT

A. General Requirements: Contractor shall have full responsibility for component parts of fire alarm system to ensure that equipment will perform and operate in accordance with requirements of Specifications without excessive or unusual service or maintenance requirements. All equipment shall be the product of a single manufacturer.

1. It is Contractor's responsibility to determine that changes in physical dimensions, access for maintenance, and connections for substitute equipment are acceptable in space provided for equipment and that performance characteristics are at least equal to base specification for equipment utilized from substitutes listed.
2. Increased costs to provide additions or revisions to equipment required by substitute equipment shall be

sole responsibility of this Contractor.

1.7 SYSTEM FUNCTION

******* EDIT *******

A. General Alarm: A general alarm in the building shall initiate the following:

1. Alarm all common area horns and strobes.
2. Alarm all residential unit horns and strobes.

******DELETE IF NO DOOR HOLDERS******

3. Release all magnetic door holders.

******END******

4. Release all secured exit door locks to fail in the open position.
5. Release all fire shutters.

******END******

******DELETE IF NO DUCT DETECTORS******

B. Air Handler Shutdown: Activation of a duct detector shall cause its associated air handler to shut down immediately. Detector reset shall allow motor to restart automatically.

******END******

******DELETE IF NO ELEVATOR******

C. Elevator Recall:

1. Activation of an elevator detector shall initiate the following:

    a. Base building general alarm.
    b. Signal elevator equipment for elevator recall.
    c. Release door holders at the elevator door in the immediate vicinity.
    d. Close smoke/fire dampers at elevator machine room (activated detector must be on same floor as machine room).

2. Activation of the elevator equipment room smoke detector shall signal elevator equipment for machine room fire annunciation.
3. Detectors shall only be reset by manual operation at the Main Control Panel.

******END******

******DELETE IF NO SMOKE OR SMOKE/FIRE******

D. Smoke and Smoke/Fire Damper**:**

1. Activation of any smoke or smoke/fire damper detector shall initiate the following:

    a. Base building supervisory signal.
    b. Close all smoke and smoke/fire dampers.
    c. Immediate shut down of associated air handling equipment.

2. System reset shall allow air handling equipment to restart automatically.

E. Carbon Monoxide Detector: Activation of detector shall initiate supervisory alarm at Control Panel.

F. Notification Appliances**:**

1. All audible notification devices shall sound a synchronous temporal tone until signal silence. All visible notification devices shall flash in a synchronous one Hz pattern until system is reset.
2. Provide strobes with sufficient light output (candela) to comply with Code. Contractor shall provide strobes for room size and spacing requirements to meet Code.

******DELETE IF NO DOOR HOLDERS******

G. Magnetic Door Holders: Magnetic door holders shall release upon the following condition:

1. Base building general alarm.
2. Local smoke detector on either side of door in alarm.
3. Thirty seconds after loss of 120 volt power.

******* END *******

H. System Power: The Main Control Panel shall include standby batteries with charger, sufficient to power the system per NFPA-72 requirements. Provide 24-hour minimum backup.

1.8 WIRING REQUIREMENTS

A. General Requirements:

1. Drawings indicate fire alarm devices required. Number and size of conductors shall be provided per the fire alarm system manufacturer's recommendations with a maximum loading of 70% of circuit capacity.
2. Horns/strobes and strobes shall be wired for synchronized temporal sounding Class B wiring. Wiring shall be tagged and checked to ensure that it is free from shorts and grounds. All wiring shall be solid copper. Minimum wire size shall be #18 AWG for IDC "Zones" (Initiating Device Circuits), #14 AWG for NAC (Notification Device Circuits) and control circuits. All 120 volt circuits shall be #12 AWG.
3. All wiring shall be concealed. Where required by Code, all wiring shall be installed in a separate conduit system.
4. Wires in junction boxes and cabinets shall be neatly trained, tagged, and identified. Cabinets shall have red painted exteriors and markings as "FIRE ALARM SYSTEM". All junction box covers shall be spray painted red and labeled "Fire Alarm". All wiring shall be UL classified, type FPL, or FPLP. All wiring installed within plenum spaces shall be teflon coated.
5. A color-coded wiring system shall be maintained throughout the installation.
6. Connections to devices provided by others shall be coordinated with the installing contractor.

1.9 SUBMITTALS

A. Shop Drawings: Provide Shop Drawings in accordance with Section 26 00 10.

1. Shop Drawings submitted for approval shall contain the following minimum information.

   a. Complete sequence of operations.
   b. Complete custom system wiring diagram, showing a riser diagram on the building floor plan backgrounds, including all components capable of being connected to the system and interfaces to equipment supplied by others. Indicate on plans all initiating device circuits and alarm indicating appliance circuits.
   c. Complete battery and signal load calculations.
   d. Copy of project supervisor's NICET III certification.

B. Shop Drawings shall be submitted to the Local Code Authority by the Contractor for review and approval prior to installation.

1.10 WARRANTY

A. The Contractor shall guarantee all materials and equipment to be free of defects that may develop in any part of their work, caused by faulty workmanship, material or equipment failures, for a minimum of one year from the date of final completion of the Project or for as long as normal equipment manufacturer warranties are in effect from the date of Owner acceptance of the Project, whichever is later.

B. During the warranty period, notification by letter, personal contact or telephone conversation of a problem with any electrical system, shall cause the Contractor to respond within one week, making repairs or corrections as necessary. After all repairs and corrections are complete, the Contractor shall notify the Engineer.

C. The Contractor shall agree to provide 24 hour service on call for emergency during warranty period.

1.11 MAINTENANCE CONTRACT

A. Maintenance Contract: The equipment manufacturer shall provide the Owner with a three year service contract to provide a minimum of two inspections and tests per year in compliance with NFPA-72 testing requirements, as well as all repairs not due to damage caused by vandalism or Acts of God. This contract shall commence upon expiration of the warranty.

1.12 TRAINING

A. Training: The equipment manufacturer shall provide the Owner with a minimum of two hours system operation training. The time and date of training shall be determined by the Owner.

1.13 MONITORING

A. General Requirements: Provide first year of Central Station Monitoring during warranty period at no additional cost to Owner. Owner shall provide for Central Station Monitoring after warranty period. Include all costs to install the Serial Digital Alarm Communication Transmitter (SDACT) including programming and initial test.

Part 2. - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: All equipment shall be as follows (Mircom catalog numbers are used to set the minimum standard for material and equipment):

******EDIT******

1. EST, #i064
2. Gamewell/FCI, #FCI E3
3. Mircom, #FX-2000/FX-351
4. Notifier, #NFS2-640
5. Siemens
6. Simplex

******END******

2.2 CONTROL/POWER EQUIPMENT

A. General Requirements**:** The following devices shall be provided where shown on the Drawings to provide a complete and fully functional system.

******* EDIT *******

1. Main Control Panel, with SDACT. Mircom FX-351 series.
2. Remote LCD Annunciator, recessed. Mircom Ram-300 Series.
3. Remote Signal Power Supply. Mircom BPS-802 Series.
4. IAM Module. Microm Addressable input Module MIX-100P Series.
5. IAM Module. Microm Addressable output Module MIX-100 Series.

******* END *******

2.3 DETECTION EQUIPMENT

A. General Requirements**:** The following devices shall be provided where shown on the Drawings:

******* EDIT *******

1. Manual Pull Station. Mircom MS-701 Series..
2. Smoke Detector, common areas. Mircom MIX-3100 Series.
3. Smoke Detector, common areas, with double throw, double pole auxiliary contacts. Microm BZZ4RB Series. **[Nursing Home]**

******END******

******DELETE IF NO DUCT DETECTOR******

4. Smoke Detector, duct. Microm DH-3000 Series.

******END******

5. Projected Beam Smoke Detector (pair). Microm BEAM200 Series.
6. Residential Smoke Detector with integral piezo horn (photoelectric/ionic, 120 volt, 9 volt dc battery backup). Kiddie #PI2010.
7. Residential Smoke Detector, handicapped and hearing impaired units with integral 177cd strobe and piezo horn (photoelectric, 120 volt, 9 volt dc battery backup, auxiliary form-A relay, auxiliary form-C relay, remote strobe capability). Gentex #7109CSX.
8. Residential Combination Smoke/Carbon Monoxide Detector (photoelectric/ionic, 9 volt dc battery back up, auxiliary form-A relay, auxiliary form-C relay). Gentex #GN-503F.
9. Residential Carbon Monoxide Detector with integral piezo horn (9 volt dc battery backup, auxiliary Form-A relay, auxiliary form-C relay). Gentex #CO1209F.

*******END******

10. Heat Detector, common areas (135°F FT, programmable from 135°F to 155°F). Mircom MIX-3300 Series.
11. Carbon monoxide detector. Mircom PRO-2000 Series

******* END *******

2.4 NOTIFICATION EQUIPMENT

A. General Requirements**:** The following devices shall be provided where shown on Drawings.

******* EDIT *******

1. Horn/Strobe, common areas. Gentex GEC 3 Series synchronous flash (15/30/75/110cd).
2. Horn/Strobe, sleeping areas. Gentex GES 3 Series synchronous flash (135/177/185cd). **[Use if NFPA 72 2007 or prior is adopted]**.
3. Low frequency Sounder/Strobe, sleeping areas. System Sensor #P2WH-LF synchronous flash (135/177/185cd) **[Use if NFPA 72 2010 or newer is adopted].**
4. Strobe, common areas. Gentex GES 3 Series synchronous flash (135/177/185cd).
5. Strobe, sleeping rooms. Gentex GES 3 Series synchronous flash (135/177/185cd).
6. Residential Remote Strobe, 120 volt. Gentex #GXS-120177.
7. Horn common areas. Gentex GEH Series.
8. Horn, sleeping areas. Gentex GEH Series. **[Use if NFPA 72 2007 or prior is adopted}.**
9. Low frequency Sounder, sleeping areas. Gentex GHLFW. **[Use if NFPA 72 2010 or newer is adopted].**
10. Chime/strobe, common areas. Gentex GEC 3 Series synchronous flash.
11. Sounder Base. Mircom B200SR Series.
12. Carbon monoxide detector base, with sounder base. Mircom PRO-2000 Series.
13. Weatherproof Horn/Strobe. Gentex WGEC Series.
14. Pull Station Local Alarm/Cover. Safety Technology International #STI-1100.
15. Cellular Alarm communicator. Telguard #TG-7FS.

B. Audio and audio/visual devices located in finished areas shall be white.

******* END *******

2.5 DOOR HOLDERS

******DELETE IF NO DOOR HOLDERS******

A. General Requirements**:** The following devices shall be provided where shown on the Drawings.

1. Magnetic Door Holder (24VDC). Mircom DH24120 Series.

******END******

******DELETE IF NO SMOKE OR SMOKE/FIRE******

2.6 SMOKE AND SMOKE/FIRE DAMPERS

A. General Requirements**:** The following devices and connections shall be provided where shown on the Drawings.

1. Provide smoke detectors and/or relays to close smoke and smoke/fire dampers in accordance with one or more of the applicable methods listed in the International Building Code (IBC). Methods used shall be approved by the Local Code Authorities prior to installation.
2. Provide 120 volt circuit(s) to smoke and smoke/fire damper(s) from dedicated 20/1 breaker(s) in the mechanical/electrical room panel. Provide locking device on breaker(s).

******END******

******DELETE IF NO ELEVATOR******

2.7 ELEVATOR STATUS AND ALARM

A. Elevator Status and Alarm:

1. Provide monitoring relay on the feeder to the shunt trip breaker or fused disconnect. Connect to the Main Control Panel for a trouble alarm upon loss of power.
2. Provide an annunciator zone to monitor the elevator equipment room and elevator pit smoke and/or heat detectors. Connect to elevator controller per manufacturer's requirements.

******END******

******DELETE IF NO DUCT SMOKE******

2.8 DUCT SMOKE DETECTORS

A. Duct Smoke Detectors:

1. All roof mounted HVAC equipment containing duct smoke detectors shall be marked with signage that is plainly legible and easily read from the roof access point. Signage shall be a unit number identification that is included on zone maps. The HVAC equipment access doors shall also be signed to indicate the location of the duct smoke detector. Zone map shall show location of HVAC equipment, corresponding unit number, location of duct detector and location of remote indicator.
2. Provide remote indicators for duct smoke detectors located above ceiling tile, out of sight or in areas requiring special means of access. Remote indicators shall be located directly below the HVAC equipment location, within five feet horizontally.
3. Duct smoke detectors shall report as a trouble signal and shall be resettable at the Main Control Panel.
4. Provide manufacturer's specification sheet showing that detector is listed for ambient temperatures associated with mounting and sensing location.

******END******

2.9 REMOTE SIGNAL POWER SUPPLY EQUIPMENT

A. General Requirements: Provide remote signal power supplies to provide a complete and fully functional system. These power supplies shall be connected to a 120 volt unswitched power circuit and be complete with standby batteries and battery charger. Power supplies shall be located throughout building to properly power system. Coordinate exact locations with Architect prior to installation.

Part 3. - EXECUTION

3.1 INSTALLATION

A. General Requirements:

1. Provide all wiring, conduit, junction boxes and outlet boxes required for installation of a complete system.
2. Each alarm initiating device shall be a separate alarm point on the system. In an alarm condition, the alarming device shall be indicated on an alpha-numeric display at the Main Control Panel and the Remote Annunciator.
3. Provide all wiring, conduit, junction boxes and outlet boxes required for installation of a complete system.
4. Smoke detectors shall be installed at least 3 feet beyond the edge of all ceiling fans.

*******KEEP IF RESIDENTIAL STAND ALONE DETECTORS*******

5. Interconnect all residential smoke detectors within a unit in tandem, so that all detectors alarm whenever one detector alarms.
6. Provide residential smoke detectors with integral 177cd strobes in all handicapped and hearing impaired units. Refer to Architectural Plans for location and quantities of all handicapped units and hearing impaired units, with locations selected by Architect prior to construction. For bidding purposes, assume hearing impaired units are located at the furthest distance from the Main Control Panel.

******END******

******KEEP IF RESIDENTIAL SYSTEM DETECTORS WITH SOUNDER BASE******

7. Program unit smoke detectors to provide a steady alarm upon local activation and a temporal alarm upon building activation.

8. Program unit smoke detectors so that all detectors alarm when over one detector alarms.
9. Provide 177cd strobes in all handicapped and hearing impaired units. Refer to Architectural Plans for location and quantities of all handicapped units and hearing impaired units, with locations selected by Architect prior to construction. For bidding purposes, assume hearing impaired units are located at the furthest distance from the Main Control Panel.

******END******

******DELETE IF NOT SPRINKLED******

10. Provide equipment and connections required to monitor all flow switches, tamper switches and air pressure switches, provided by the Sprinkler Contractor.
11. Provide dedicated power and control connections to air compressor(s), where provided.

******END******

12. **Provide connections to fire pump controller alarms, provided by the Sprinkler Contractor. Provide connections to the emergency generator alarms if the emergency generator is connected to the fire pumps.**

******VERIFY WITH MECHANICAL******

13. Provide 24 volt DC connection from the Main Control Panel to the domestic water service solenoid valve. Valve shall close upon sprinkler system water flow.

******END******

******DELETE IF NO ELEVATOR OR NO SHUNT TRIP BREAKER******

14. Provide heat detector(s) within 24 inches of sprinkler head(s) located within elevator pit(s), if sprinklered. Connect to shunt trip breaker.
15. Provide heat detector(s) within elevator equipment room(s). Connect to shunt trip breaker.

******END******

******DELETE IF NO ELEVATOR******

16. Provide smoke detectors within five feet of all elevator doors and in elevator equipment rooms for elevator recall.
17. Smoke detectors shall be located a minimum of 36" from the outside edge of mechanical diffusers. Coordinate with Mechanical Contractor. Provide additional detectors to maintain Code required coverage between detectors.
18. Provide control for each elevator relief damper. Control shall consist of a switch, keyed to the local fire department's master key, located adjacent to the main level elevator door that opens the damper when turned. Provide an amber lamp adjacent to switch those lights when damper is open. Contractor shall provide 120 volt power to the damper release mechanism and end switch.

******END******

******EDIT****[KEEP FOR AUTO DIALER CONNECTION]**

19. Provide two RJ-31X telephone jacks adjacent to the Main Control Panel for connection to the SDACT. Provide ¾-inch conduit with dual telephone lines between the Main Control Panel and telephone backboard for Central Station interconnection.

******END******

******EDIT****[KEEP FOR WIRELESS CONNECTION]**

20. Provide required connections, in conduit, between the Main Control Panel and Cellular Alarm Communicator for Central Station interconnection.

******END******

21. Devices shall be mounted at the following heights, unless noted otherwise. Distances shall be measure to center of devices from finished floor.

    a. Detectors ceiling
    b. Horn/Strobes 84"
    c. Pull Station 42"

22. Main Control Panel and Remote Annunciator(s) shall be flush mounted at a location approved by the Local Fire Marshal.
23. Circuits used for life-safety systems shall be provided with tamper devices (circuit breaker lock).
24. Contractor shall review Architectural Drawings prior to bid and include connection and control of additional door holders not shown on the Electrical Drawings.
25. At exit doors, interconnect electric strikes and magnetic locks to release upon alarm.

3.2 TESTS AND INSPECTION

A. General Requirements: As a part of this Contract, provide periodic system testing to NFPA and local authority requirements, including all documentation. Within one week of the end of the warranty period, perform an additional annual test and replace all equipment not meeting acceptance criteria. Replaced elements shall be documented and documentation shall be provided to Owner.

END OF SECTION

DIVISION 27 – 30

1. Not included on this sheet

DIVISION 31

SITE CLEARING – 31 10 00

1. SCOPE OF WORK: Provide all site clearing as needed to accommodate new work and as illustrated in the contract documents.
2. SECTION INCLUDES: Clearing and protection of vegetation. Removal of existing debris.
3. REFERENCE STANDARDS:
   - 3.1. MnDOT Standard Specifications for Construction: Standard Specifications for Construction, Latest Edition, published by the Minnesota Department of Transportation.
   - 3.2. CEAM Standard Specifications: Standard Specifications, Latest Edition, published by the City Engineers Association of Minnesota.
   - 3.3. ASTM International:
     a) ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
     b) ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb:£'ft3 (600 kN-mlm3))
     c) ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
     d) ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
     e) ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
     f) ASTM D30 17 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
   - 3.4. Local utility standards when working within 24 inches of utility lines
4. SUBMITTALS: Site Plan Showing: Vegetation removal limits. Areas for temporary construction and field offices.
5. SITE CLEARING: Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
6. EXISTING UTILITIES AND BUILT ELEMENTS: Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits. Protect existing utilities to remain from damage. Do not disrupt public utilities without permit from authority having jurisdiction. Protect existing structures and other elements that are not to be removed.
7. VEGETATION SCOPE: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.
   - 7.1. Do not remove or damage vegetation beyond the limits indicated on drawings. If not specifically illustrated the following shall be coordinated on site with the requirements of the project by the contractor:
     a) 40 feet outside the building perimeter.
     b) 10 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
     c) 15 feet each side of roadway curbs and main utility trenches.
     d) 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.
     e) Exception: Specific trees and vegetation indicated on drawings to be removed.
     f) Exception: Selective thinning of undergrowth specified elsewhere.

7.2. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain at vegetation removal limits.

7.3. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

7.4. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.

7.5. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

7.6. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

7.7. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.

7.8. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

7.9. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

7.10. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

8. DEBRIS: Remove debris, junk, and trash from site. Leave site in clean condition, ready for subsequent work. Clean up spillage and wind-blown debris from public and private lands.

GRADING – 31 22 00

1. SCOPE OF WORK: Provide all necessary rough and finish grading to accommodate elevations indicated on the contract documents. All grading shall in general slope away from the finished floor of buildings and direct the flow of water to drain into the storm water management system.
2. SITE CLEARING: Provide clearing, grubbing and removal of site debris as required to execute the work. Dispose of all debris and soil if applicable in environmentally sound and Code approved manner. During all operations maintain positive drainage and control of soil erosion and sediment in an approved manner. All trees and shrubs shall have stumps removed to a minimum of 12 inches below grade. Strip and store topsoil for use in Final Grading and Landscaping. All waste disposal shall comply with the requirements of the local authority.
3. ROUGH GRADING: Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded. When excavating through roots, perform work by hand and cut roots with sharp axe.
4. SOIL REMOVAL: Stockpile topsoil & subsoil to be re-used on site; remove remainder from site. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.
5. FINISH GRADING: Where topsoil is to be placed, scarify surface to depth of 3 inches. Place topsoil where required to level finish grade. Remove roots, weeds, rocks, and foreign material while spreading. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade. Lightly compact placed topsoil.
6. TOLERANCES: Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

EXCAVATION AND FILL – 31 23 00

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Site grading.
   1. Excavation and stockpiling soils for reuse on site or salvage by Owner.
   2. Placement and compaction.
B. Providing suitable soils from offsite sources.
C. Removing excess or unsuitable soils.
D. Subgrade preparation for pavement and sidewalk areas.
E. Placing and compaction of granular subbase and aggregate base materials.
F. Fine grading of open areas (not including planting soil).

1.02 RELATED REQUIREMENTS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2333 – Trenching and Backfilling
C. Section 32 1216 – Asphalt Paving
D. Section 32 1313 – Concrete Paving
E. Section 33 4000 – Storm Drainage Utilities

1.03 REFERENCES

A. Minnesota Department of Transportation (Mn/DOT) Standard Specifications for Construction, current edition with supplements.
B. ASTM International (ASTM)
   1. C136 – Test Method for Sieve Analysis of Fine and Coarse Aggregate
   2. D698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor)
   3. D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method
   4. D1557 – Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (Modified Proctor)
   5. D2487 – Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
   6. D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
   7. D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
   8. D4632 – Test Method for Grab Breaking Load and Elongation of Geotextiles
   9. D4751 – Test Method for Determining Apparent Opening Size of a Geotextile.

1.04 DEFINITIONS

A. Open Areas: General lawn areas.
B. Soil Classification: All excavation is unclassified, except for rock excavation.
C. Rock Excavation
   1. Excavation of any hard natural substance which requires the use of drilling, explosives, or special impact tools; such as jackhammers, sledges, chisels, or similar devices; specifically designed for use in ripping, cutting or breaking rock, but exclusive of common trench excavating equipment, as determined by the Owner.
   2. The material shall be continuous, boulders or detached rock greater than 1 cubic yard in volume.
D. Unsuitable Soils: Soils unsatisfactory for proposed use by composition, moisture content or contamination, as determined by the Testing Laboratory.
E. Suitable Soils: Soils satisfactory for proposed use by composition, as determined by the Testing Laboratory that may require moisture conditioning.
F. Unauthorized Excavation: Excavation beyond the limits established for line and grade, except as necessary for soil conditioning or correction approved by the Owner.

G. Subgrade: Transition surface between elements of construction such as subsoil-topsoil, subsoil-drainage fill, subsoil-aggregate base, etc.
H. Special Use Areas: Areas that contain designed surface improvements such as athletic fields, filtration basins, gardens, etc.

1.05 SYSTEM DESCRIPTION

A. Pavements
1. Work of this section includes excavation to suitable soil subgrade or removal of unsuitable soils to a depth of three feet beneath the bottom of the pavement section, including aggregate base; whichever is less; and placing and fine grading Subsoil Backfill, Granular Backfill, or Drainage Fill as indicated in the Details; and placing and fine grading Aggregate Base.
2. Grade subsoil subgrade to drain to perimeter subsoil drainage piping.
3. Allow time for installation of drainage piping.
4. Provide soil correction deeper than three feet, or alternate method for pavement support, as recommended by the Testing Laboratory and approved by the Owner

1.06 SEQUENCING AND SCHEDULING

A. Order of Work Elements
1. General
a. Obtain prior written approval from Owner and provide coordination for documentation required by Related Sections and Regulatory Authorities before deviating from the following sequence.
b. Phase Work to minimize exposure of large expanses of soil.
2. Temporary construction access, parking, and staging areas.
3. Temporary and permanent ditches, swales, and diversions.
4. Temporary storm water ponds and basins.
5. Mass excavation and embankment of the site.
6. Subsoil and subbase preparation for pavement and special use areas.
7. Finish and fine grading including aggregate base for pavement areas.

B. Notification
1. Contact Gopher State One Call for utility location services 72 hours minimum prior to beginning Work.
2. Notify Testing Laboratory when items of work requiring observations or testing are scheduled and allow time for same.
3. Provide required advance notification to permitting and code officials for observation and inspection.

C. Coordinate the schedule to maintain the Critical Path for concurrent or subsequent Work specified in Related Sections, the Owner's continuing operations on site, or work adjacent to the site in support of the Project.
D. Obtain necessary permissions from Owner or Regulatory Authorities for work that must be performed outside of normal work hours, on weekends, or legal holidays; either as necessary to maintain the schedule or for the Contractor's convenience.

PART 2 PRODUCTS

2.01 GENERAL

A. Existing Materials
1. It is the intent of these specifications that existing material be used for its highest and best use until such supply is depleted or uneconomical to obtain.
2. Materials in each designated use area (i.e. lawns, pavements, etc.) shall be utilized to the greatest extent practicable as recommended by the Testing Laboratory and approved by the Owner.
3. Prior approval is required for excavation of on-site borrow sources not designated on the Drawings.

B. Control moisture content of materials to obtain optimum compaction characteristics as recommended by the Testing Laboratory.
   1. Add moisture to soils that are below optimum moisture.
   2. Blend dry soils with soils that are above optimum moisture or spread and allow them to dry.
   3. Material shall be near optimum moisture content when placed.
C. Do not use materials that are frozen or that contain frost, ice, or snow.
D. Materials shall be free from contaminants including direct contamination or contamination of runoff from industrial areas, or insecticides and herbicides used in commercial agriculture or nursery production.
E. Soil materials shall not contain stones larger than 6 inches in greatest dimension and not more than fifteen percent of the stones by weight shall be larger than 2-1/2 inches.
F. Top 6 inches of subsoil shall be free from stones greater than 3 inches.
G. Materials shall not contain slag or recycled bituminous or concrete material unless otherwise specified.

2.02 MATERIALS
A. Subsoil: Clean mineral soils.
B. Granular Materials
   1. General: Clean, sound, durable particles of sand, gravel, quarry, or mine rock.
   2. Backfill: Pit or crusher run material meeting Mn/DOT 3149.2D.
   3. Drainage Fill: Free draining material, except carbonate rock, meeting Mn/DOT 3149.2J.
   4. Sand: Pit run material meeting Mn/DOT 3149.2K.
   5. Aggregate Base: 100% crushed meeting Mn/DOT 3138.2A1, Class 5.
C. Geotextile: UV stabilized, non-woven, needle-punched fabric meeting Mn/DOT 3733 Type V.
   1. Grab Tensile Strength: 200 lb.
   2. Seam Breaking Strength: 180 lb.
   3. Apparent Opening Size: #30 sieve

2.03 SOURCE QUALITY CONTROL
A. Test for purposes of classifying for suitability and provide source information on all imported materials including granular materials.
   1. Dry and Wet Densities
   2. Liquid and Plastic Limits
   3. Sieve Analysis
   4. Cohesion
   5. Unconfined Compressive Strength
   6. Other tests as the Testing Laboratory may recommend with Owner approval.
B. Provide certification, in lieu of testing, from Manufacturers or Suppliers of materials approved during the most recent production season by local or state authorities, with verification that materials delivered are the same as approved.
C. Provide qualification testing or certification for changes in source.

PART 3 EXECUTION

3.01 EXAMINATION
A. Site Verification of Conditions
   1. Record by photograph or video the condition of adjacent or on site items that are to remain that show evidence of existing damage that might be construed as related to or caused by work of this section.
   2. Provide notification and coordination for marking locations of existing underground and overhead utilities and appurtenances.
      a. Comply with utility service provider requirements for protection, support, or relocation.
      b. Conduct investigative excavations as necessary to ensure that no conflicts exist with the proposed construction.
      c. Notify Owner upon discovery of conflict's and provide documentation as requested.

3. Verify project bench marks are correctly referenced and identify required lines, levels, and contours for proper execution of the Work.
4. Verify that Work of Related Sections necessary for initiation of Earth Moving has been completed and is approved.
5. Verify areas to receive fill or backfill are free of debris, snow, ice, or water and ground surfaces are not frozen.
6. Verify available quantities of approved site salvaged or reprocessed material.

B. Beginning Earth Moving indicates acceptance of site conditions and assumed responsibility.
1. Notify Owner of unsatisfactory conditions preventing timely and proper completion of the Work.
2. Discontinue work only in affected area and notify the Owner upon discovery of unknown utilities or concealed conditions.

3.02 PREPARATION

A. Protection of Persons
1. Comply with regulations, applicable building codes, and ordinances for work zone safety relative to operation of heavy equipment and side walls and slopes of excavations.
2. Provide design and necessary shoring, bracing, sheet piling, or other methods where adequate slopes are prohibited by space limitations, stability of material encountered, or forces imposed by excavation equipment or area traffic.
3. Remove temporary supports when no longer needed as Work progresses.
4. Close excavations with side slopes steeper than 2 horizontal to 1 vertical at the end of the workday or barricade and post with lights.

B. Protection of Property
1. Protect and maintain benchmarks and monuments established for the Work.
   a. Provide service of licensed Professional Land Surveyor for any needed relocation.
2. Protect plant material to remain.
   a. Provide or maintain temporary protection measures consistent with requirements of Related Sections.
3. Protect utilities, structures, and equipment which are newly constructed or to remain.
   a. Provide temporary support as needed to prevent movement or settlement.
   b. Place backfill uniformly around structures to prevent wedging action.
   c. Monitor use of heavy and vibratory equipment and provide alternate methods if risk of damage is present.
   d. Provide soil cover, planks, or other protective covering over pavements that must be crossed or travelled to prevent damage by extreme loads or lugged or tracked equipment.
   e. Provide overfill of material at utilities with less than 3 feet of cover until ready for finish grading.
   f. Remove temporary supports when no longer needed as Work progresses.
4. Use of explosives is not permitted.

C. Surface Preparation
1. Surface compact and proof roll exposed cleared or cut areas scheduled to receive pavement or controlled embankment.
2. Subcut excessively loose or soft areas of subsoil not capable of consolidation with ordinary compaction methods or approved soil stabilization measures.

3.03 GENERAL EARTH MOVING

A. Equipment: Use equipment adequate in size and capacity to complete the Work in a timely manner without undue waste or over-compaction of materials.

B. Extents: Perform excavation including soil correction, and construct embankments of every type of suitable material encountered to the lines, grades, and elevations indicated on the Drawings and specified herein.

C. Observations, Sampling, and Testing

1. Allow sufficient time for sampling, testing, and classification for use of subsoil materials that change or vary as observed by the Testing Laboratory.
2. Allow sufficient time for testing of exposed subgrades and each lift of embankment or fill material prior to placing additional material.
3. Proof roll exposed subgrades and completed fills beneath pavements, including oversize, in the presence of the Testing Laboratory.

D. Embankment and Backfill
1. Prepare slopes steeper than 5 horizontal to 1 vertical by over excavating and flattening the slope in terraces not less than 10 feet in width prior to placing fill.
2. Scarify and recompact existing surface soils that are within two feet of finished grade or subgrade and beneath pavements and utility structures to a depth of one foot or as recommended by the Testing Laboratory.
3. Place suitable material in maximum loose lifts of 8 inches or as otherwise specified and compact.
4. Adjust lift thickness or compaction methods based on recommendations by the Testing Laboratory if testing shows that material density is easily achieved or cannot be achieved.
5. Provide minimum oversize for controlled fill beneath pavements and utility structures extending 2 feet beyond the base of structures and 1 foot beyond the pavement limits, and 1:1 down and out or as recommended by the Testing Laboratory.

E. Finish Grading
1. Blend transition areas between changes in grade uniformly and smoothly in the absence of a distinct toe, top, ditch, or ridgeline.
2. Provide uniform slopes between spot elevations and contours shown.

F. Repairs
1. Correct unauthorized excavation with material recommended by the Testing Laboratory.
2. Recondition or replace softened soils or areas disturbed as a result of construction operations, freezing, or wetting of soils.
3. Scarify and rework soils as necessary in areas sensitive to overcompaction, i.e. haul routes over lawn areas.

G. Rock: Immediately notify Owner upon discovery of rock.

3.04 SOIL CORRECTION

A. Excavation
1. Over-excavate in critical areas beneath pavements, utility structures, and special use areas as necessary to remove existing unsuitable soil, weak soils, or unconsolidated fill.
2. Provide subcut, including necessary oversize, to the depth of unsuitable soil or a minimum of 3 feet, whichever is less.
3. Termination depths of excavations beyond the minimum shall be determined by the Owner based on recommendations by the Testing Laboratory.

B. Subgrade Preparation
1. Provide for observation and testing of exposed surfaces at termination depth of soil removal.
2. Surface compact, scarify and recompact, or provide additional soil correction as recommended and approved by the Owner.

C. Backfilling
1. Backfill with suitable material as specified for new construction.
2. Use material obtained from site grading, other excavations, or salvage prior to importing from offsite sources.
3. Provide compaction as specified for each use area.

3.05 ROADWAYS, PARKING AREAS, DRIVES, AND WALKS

A. Cut Areas
1. Excavate to subgrade elevation of top of subsoil.
2. Surface compact exposed soil.
3. Proof roll in the presence of the Testing Laboratory.

4. Provide needed soil correction as specified and recommended by the Testing Laboratory and approved by the Owner or alternative means of pavement support that will benefit the Owner.

B. Embankment Areas
   1. Scarify and recompact or surface compact exposed soil to the oversize limits.
   2. Proof roll in the presence of the Testing Laboratory.
   3. Provide needed soil correction as specified and recommended by the Testing Laboratory and approved by the Owner.
   4. Construct controlled embankment with suitable material to the bottom of subbase or pavement section.

C. Subbase and Base Construction
   1. Fine grade subsoil subgrade to drain to perimeter subsurface drains.
   2. Allow for installation of any required subsurface drains or geotextile separator fabric.
   3. Install fabric with sewn seams or edge overlap as recommended by the Manufacturer.
   4. Construct subbase in 8 inch maximum loose lifts of Granular Backfill or Granular Drainage Fill as indicated on Drawings.
   5. Construct base in 4 inch maximum loose lifts of Aggregate Base or as called out in Drawing notes or shown on details.
   6. Do not allow construction traffic on geotextile fabric without a minimum of 4 inches of cover.

3.06 LAWNS AND OPEN AREAS

A. Cut soil or construct embankment to provide for a minimum depth of 6 inches of topsoil plus sod blanket in areas to receive sod.

B. Excess topsoil may be used in the upper 6 inches of subsoil beneath lawns with Owner approval.

C. Subcutting of existing granular soils to depths of up to 2 feet below finished subgrade of lawn areas is permitted if such material is used elsewhere on site and clean, suitable, common excavation replacement material is available.

3.07 TOLERANCES

A. Exterior Pavements
   1. Subgrade surfaces: Minus 0.10 feet to plus 0.05 feet
   2. Thickness of Granular materials: 0.05 feet
   3. Deviation from design slope: Not greater than 0.2% in 50 feet

C. Lawns and Open Areas
   1. Subgrade surfaces: 0.10 feet
   2. Deviation from design slope: Not greater than 0.4% in 50 feet

3.08 SPECIAL PRECAUTIONS

A. Ground and Surface Water Control
   1. Do not allow subsurface water to accumulate in excavations.
      a. Remove water to prevent soil changes detrimental to stability or workability of subsoil.
      b. Provide and maintain pumps, well points, suction and discharge lines, and any other dewatering system components necessary to convey water.
      c. Do not use excavations or partially installed utility lines as temporary drainage conveyances.
   2. Prevent surface water from flowing to excavations.
      a. All surfaces except ponds, basins, and wetlands shall be finished to drain.
      b. Establish and maintain temporary basins, ditches, and diversions as necessary to control flow across or around site and away from building and pavement areas.
      c. Do not use partially installed utility lines as temporary drainage conveyances.
   3. Coordinate and sequence Work and cooperate with Work of Related Sections required to prevent erosion and control sediment from dewatering operations.
      a. Convey water removed from excavations and diverted surface waters to collecting or runoff areas secured against sediment transport.
      b. Allow for installation of necessary erosion prevention and sediment control devices as Work progresses according to the means, methods, and sequence of construction.

c. Minimize exposure of disturbed soil surfaces by phasing and coordinating earth moving operations with final paving and turf establishment.

B. Dust Control
1. Use means necessary and practicable to prevent dust from becoming a nuisance and interfering with progress of the Work.
2. Prevent the transport of air born sediment from the site.
3. Sprinkle surfaces with water, and/or provide “snow fence” or temporary seed, mulch, or cover.
4. Provide necessary equipment, connections, meters, and transport and pay fees for use of water.
5. Monitor sprinkling to preclude runoff.
6. Provide recommendations to Owner for soil treatment that may be necessary for extreme conditions that cannot be mitigated with sprinkling.

C. Material Requiring Special Handling: Suspend work only in the affected area and provide required notification to the Owner and Regulatory Authorities upon discovery or verifiable suspicion of hazardous waste, contaminated material, or a constituent of concern.

3.09 FIELD QUALITY CONTROL

A. The Testing Laboratory shall conduct testing for each type of soil encountered and materials proposed for incorporation into the Work, perform observation of Earth Moving, and provide periodic reports and recommendations to the Owner and Engineer as subsoil conditions or materials may vary; including but not limited to the following.
1. Review test reports for materials to be provided from off site locations.
2. Testing and classification for suitability of use of materials encountered.
3. Observation of proof rolling.
4. Testing of exposed subgrades and bottom of excavations beneath pavements, utility structures, and prior to constructing embankments.
5. Observation of groundwater conditions.
6. Recommendations for soil correction, surface compaction, or alternative methods of stabilization.
7. Observation and testing of embankment construction.
8. Other tests as recommended by the Testing Laboratory and approved by the Owner.

B. Test methods shall be as indicated in References or as recommended by the Testing Laboratory and approved by the Owner.

C. Frequency of Compaction Testing
1. Parking lots: 1 per lift per 5,000 square feet, but not less than 3 per lift.
2. Roadways, drives, and walks: 1 per lift per lane per 350 feet, but not less than 2 per lift.
3. Lawns and Open Areas: 1 per lift per 10,000 square feet, but not less than 3 per lift.
4. Other testing recommended by the Testing Laboratory to verify constructability or compliance with the Specifications and approved by the Owner.

D. Material Density Requirements: Compact materials to not less than the following percentages of maximum dry density as determined by the Standard Proctor test or equivalent density determined by other method(s), unless noted otherwise.
1. All subsoil, except the upper 3 feet and controlled fill for utility structures: 95
2. Controlled fill for utility structures, except the upper 1 foot, and subsoil beneath pavements and exterior slabs 1 foot to 3 feet in depth: 98
3. Upper 1 foot of fill and all surface compaction for utility structures and pavements: 100
4. Granular Materials: 100
5. In non-critical open areas the Testing Laboratory may, at their option, verify compaction by visual observation or hand auger testing when the initial level of compactive effort has been established.

3.10 PROTECTION AND REPAIR

A. Protection
1. Protect newly graded areas from traffic.

2. Use of permanently constructed facilities for temporary staging, parking, and access will require written prior approval from the Owner.
3. Provide coordination for erosion protection or permanent surface restoration of completed graded surfaces.

B. Repair
1. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no cost.
2. Property to remain that is damaged by the Work of this Section shall be repaired to like or better condition, or replaced with new construction prior to acceptance as directed by the Owner.
3. Reestablish grades and material density in areas affected by traffic, subsequent Work, eroded areas, adverse weather, or settlement of soil.

EXCAVATION – 31 23 16

1. SCOPE OF WORK: Excavate to accommodate new structures and construction operations. Store all excavated materials in a location to not interfere with any tenant or construction activities as approved by the owner.
2. GEOTEXTILE FABRIC: Non-biodegradable, non-woven.
3. SECTION INCLUDES: Excavating for footings and slabs-on-grade. Temporary excavation support and protection systems.
4. REFERENCE STANDARDS: 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
5. SUBMITTALS: Temporary Support and Excavation Protection Plan. Project Record Documents: Record drawings at project closeout. Show locations of installed support materials left in place, including referenced locations and depths, on drawings. Shoring Installer's Qualification Statement. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.
6. QUALITY ASSURANCE: Temporary Support and Excavation Protection Plan:
   6.1. Indicate sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.
   6.2. Include drawings and calculations for bracing and shoring.
   6.3. Bracing and shoring design to meet requirements of OSHA’s Excavation Standard, 29 CFR 1926, Subpart P.
   6.4. Designer Qualifications: For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in City, STATE.
7. REFERENCE STANDARDS: MnDOT Standard Specifications for Construction, latest edition. CEAM Standard Specifications. Latest edition. Local utility standards.
8. EXAMINATION: Verify that survey bench mark and intended elevations for the work are as indicated.
9. EXCAVATING: Excavate to accommodate new structures and construction operations. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored. Do not interfere with 45 degree bearing splay of foundations. Cut utility trenches wide enough to allow inspection of installed utilities. Hand trim excavations. Remove loose matter. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control. Remove excavated material that is unsuitable for re-use from site. Remove excess excavated material from site.
10. GROUNDWATER: Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect. If the proposed excavation

extends more than 1 foot into the excavation, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by the Geotechnical Engineer.

11. CLEANING: Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00. Remove excavated material that is unsuitable for re-use from site. Remove excess excavated material from site.
12. PROTECTION: Divert surface flow from rains or water discharges from the excavation. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing. Keep excavations free of standing water and completely free of water during concrete placement.

TRENCHING – 31 23 16.13

1. SCOPE OF WORK: Excavate to provide a total scope of trenching required as needed to install the Work including but not limited to:
    1.1. Utility trench excavations with Compacted bedding under fill,
    1.2. Over utilities to subgrade elevations with Backfilling and compaction.
    1.3. Compliance with the pertinent state trenching act and laws, trench safety engineering design and OSHA compliance.
    1.4. Trench safety design shall be in compliance with applicable city and state codes and in compliance with federal regulations part 126 of OSHA, sub-part p is incorporated by reference.
    1.5. Store all excavated materials in a location to not interfere with any tenant or construction activities as approved by the owner.
2. SECTION INCLUDES: Backfilling and compacting for utilities outside the building to utility main connections.
3. REFERENCE STANDARDS: MnDOT Standard Specifications for Construction, latest edition. CEAM Standard Specifications, latest edition. Local utility standards.
4. DELIVERY, STORAGE, AND HANDLING: When necessary, store materials on site in advance of need. When fill materials need to be stored on site, locate stockpiles where indicated. Separate differing materials with dividers or stockpile separately to prevent intermixing. Prevent contamination. Protect stockpiles from erosion and deterioration of materials.
5. FILL MATERIALS: See Section 31 23 23 - Fill
6. EXAMINATION: Verify that survey bench marks and intended elevations for the work are as indicated.
7. PREPARATION: Identify required lines, levels, contours, and datum locations. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.
8. TRENCHING: Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored. Do not interfere with 45 degree bearing splay of foundations. Cut trenches wide enough to allow inspection of installed utilities. Hand trim excavations. Remove loose matter. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction. Remove excavated material that is unsuitable for re-use from site. Remove excess excavated material from site.
9. GROUND WATER: Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

9.1. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

10. PREPARATION FOR UTILITY PLACEMENT: Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill. Compact subgrade to density equal to or greater than requirements for subsequent fill material. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

11. BACKFILLING: Backfill to contours and elevations indicated using unfrozen materials. Fill up to subgrade elevations unless otherwise indicated. Employ a placement method that does not disturb or damage other work. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces. Maintain optimum moisture content of fill materials to attain required compaction density. Slope grade away from building minimum 2 inches in 3 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

12. OVER-EXCAVATION: Correct areas that are over-excavated.

    12.1. Thrust bearing surfaces: Fill with concrete.

    12.2. Under utility: Use pipe bedding material

    12.3. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

13. COMPACTION: Density Unless Otherwise Specified or Indicated: Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density. Reshape and re-compact fills subjected to vehicular traffic.

14. CLEANING: Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

FILL – 31 23 23

1. SCOPE OF WORK: Provide all necessary fill to accommodate scope as defined in this specification and elsewhere in the contract documents.

    1.1. Contractor to utilize appropriate fill where required

2. SECTION INCLUDES: Filling, backfilling, and compacting for footings, slabs-on-grade, paving, and site structures. Backfilling and compacting for utilities outside the building to utility main connections. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

3. REFERENCE STANDARDS: MnDOT Standard Specifications for Construction, latest edition. CEAM Standard Specifications, latest edition. Local utility standards. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); latest edition.

4. SUBMITTALS: Product Data for Manufactured Fill. Materials Sources: Submit name of imported materials source. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill. Compaction Density Test Reports. Designer's Qualification Statement. Testing Agency Qualification Statement. Specimen Warranty.

5. QUALITY ASSURANCE: Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the local jurisdiction. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

6. DELIVERY, STORAGE, AND HANDLING: When necessary, store materials on site in advance of need. When fill materials need to be stored on site, locate stockpiles where indicated. Separate differing materials with dividers or stockpile separately to prevent intermixing. Prevent contamination. Protect stockpiles from erosion and deterioration of materials.

7. WARRANTY: Correct defective Work within a five year period after Date of Substantial Completion. Provide ten year manufacturer warranty for manufactured fill material.

8. GENERAL FILL: Subsoil excavated on-site or sandy fill material. Graded. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris. Conforming to ASTM D2487 Group Symbol CL.
9. STRUCTURAL FILL: Subsoil excavated on-site. Graded. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris. Conforming to ASTM D2487 Group Symbol CL.
10. CONCRETE FOR FILL: As specified in Section 03 30 00; compressive strength of 2500 psi.
11. GRANULAR FILL: Coarse aggregate, conforming to State of Minnesota Highway Department standard.
12. SAND: Conforming to State of Minnesota Highway Department standard.
13. TOPSOIL: Friable loam; imported borrow. Select. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
14. SITE PIPE BEDDING: free of silt, clay, loam, friable or soluble materials, and organic matter. Graded in accordance with ASTM C 136; within the following limits:
    14.1. 1" sieve: 100 percent passing.
    14.2. 3/4" sieve: 90 to 100 percent passing.
    14.3. 3/8" sieve: 50 to 90 percent passing.
    14.4. No. 4 sieve: 35 to 80 percent passing.
    14.5. No. 10 sieve: 20 to 65 percent passing.
    14.6. No. 40 sieve: 10 to 35 percent passing.
    14.7. No. 200 sieve: 3 to 10 percent passing.
15. GEOTEXTILE FABRIC: Non-biodegradable, non-woven.
16. EXAMINATION: Verify that survey bench marks and intended elevations for the Work are as indicated. Identify required lines, levels, contours, and datum locations. See Section 31 22 00 for additional requirements. Verify subdrainage, dampproofing, or waterproofing installation has been inspected. Verify areas to be filled are not compromised with surface or ground water.
17. PREPARATION: Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill. Compact subgrade to density equal to or greater than requirements for subsequent fill material. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.
18. FILLING: Fill to contours and elevations indicated using unfrozen materials. Fill up to subgrade elevations unless otherwise indicated. Employ a placement method that does not disturb or damage other work. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces. Maintain optimum moisture content of fill materials to attain required compaction density. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas. Compaction Density Unless Otherwise Specified or Indicated: 97%. Reshape and re-compact fills subjected to vehicular traffic. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
19. OVER EXCAVATION: Correct areas that are over-excavated.
    19.1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
    19.2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
20. BURIED SITE UTILITIES IN TRENCHES: Contractor maintain utility trenches by pumping ground water seepage out of trenches during excavation and backfilling operations.
    20.1. Bedding: Use Site Pipe Bedding as per the Plan details. Compact at midpoint of pipe with pneumatic (mechanical) tamper on each side of pipe.
    20.2. Cover with general fill.

20.3. Compact trench, beginning at a point two feet above the pipe, with motorized compaction equipment in maximum 12 inch lifts to 95 percent of maximum dry density.

21. TOLERANCES:

21.1. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

21.2. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

22. CLEANING: Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

23. FIELD QUALITY CONTROL: Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180. If tests indicate work does not meet specified requirements, remove work, replace and retest.

TRENCHING AND BACKFILLING – 31 23 33

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavation and backfilling for site utilities and appurtenances.
B. Insulation with sand cushion.
C. Coordination for removal and replacement of improvements within trenching locations outside of general construction limits.

1.02 RELATED SECTIONS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2300 – Earthwork
C. Section 33 1000 – Water Utilities
D. Section 33 3000 – Sanitary Sewer Utilities
E. Section 33 4000 – Storm Drainage Utilities

1.03 REFERENCES

A. Minnesota Department of Transportation (Mn/DOT) Standard Specifications for Construction, current edition with supplements.
B. City of Princeton Engineering Standards
C. Occupational Safety and Health Administration (OSHA) 29 CFR, Part 1926, Sub Part P, “Excavations and Trenches”.
D. City Engineers Association of Minnesota (CEAM) Standard Specifications for Trench Excavation and Backfill/Surface Restoration, current edition.
E. Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMRB).
   1. Recommended Standards for Water Works, current edition
   2. Recommended Standards for Wastewater Facilities, current edition

1.04 DEFINITIONS

A. Definitions as described in Related Sections.
B. Granular Foundation: Material placed below the trench bottom as replacement for over excavated unsuitable soil.
C. Pipe Zone: Section area of trench, from trench bottom to one foot above outside top of pipe, containing bedding and encasement material.

1.05 SYSTEM DESCRIPTION

A. Performance Requirements
   1. Excavate to permit installation of utilities and appurtenances to the line and grade indicated on the Drawings; with sufficient width for inspections, placement of material within the pipe zone, and operation of compaction equipment; and sufficient depth for placement of foundation and bedding.

2. Provide maximum trench width measured at the top of the pipe zone equal to the outside pipe diameter plus 2 feet, or as shown on Drawings.
    a. Obtain prior approval from Owner for increased trench width that may be needed for placement of required sheeting or shoring.
    b. Provide pipe, bedding, or encasement materials of a higher Class, Type, or strength to support increased earth loads if excavation widths are exceeded for the convenience of the Contractor.
3. Obtain recommendations from the Testing Laboratory and prior approval from the Owner for increased trench depth that may be needed for correction of unsuitable or unstable soil.
4. Provide suitable materials recommended by the Testing Laboratory if excavation depths are exceeded without approval.
5. Backfill as specified to preclude settlement of trench material.
6. Notify Owner on discovery of rock.

B. Design Requirements
1. Comply with requirements of Regulatory Authorities for design that must be provided by a Licensed Design Professional.
2. Provide verifiable design for pipe, bedding, or encasement materials of a higher Class, Type, or strength to support increased earth loads if specified excavation widths are exceeded for the convenience of the Contractor or for installation methods other than open cut.
3. Provide design for temporary earth retention systems or support for structures.

1.06 SEQUENCING AND SCHEDULING

A. Begin at downstream ends for pipes carrying liquids by gravity.

B. Allow for placement and compaction of any specified pipe zone material before placing backfill.

C. Install insulation concurrent with backfilling.

D. Notification
1. Notify Gopher State One Call (651-454-0002) 72 hours prior to start of Work for utility location services.
2. Notify Testing Laboratory when items of Work requiring testing or observation are scheduled and allow time for same.

E. Coordinate the schedule with Work of Related Sections that may require installation or temporary shutdown of existing utilities outside of normal work hours.

1.07 WARRANTY

A. Warrant trenches against settlement and indemnify Owner against damage to improvements from settlement for a period of 2 years after project substantial completion.

PART 2 PRODUCTS

2.01 GENERAL

A. Soil material general requirements are as specified in Related Sections.

B. Excavated materials will be classified for use by the Testing Laboratory in accordance with requirements of Related Sections.

2.02 ACCESSORIES

A. Granular Foundation: Sound, durable, well graded natural or processed mineral aggregate with 100 percent passing the 1-1/2 inch sieve and not more than 10 percent passing the #4 sieve.

B. Sand Cushion: Sound, durable, sand and gravel particles with 100 percent passing the #4 sieve and not more than 8 percent passing the #200 sieve.

C. Insulation
1. Extruded rigid foam sheet material
2. Thermal Conductivity (maximum): 0.23 BTU/hour/square foot/degree Fahrenheit/inch thickness at 40 degrees Fahrenheit
3. Compressive Strength (minimum): 35 psi
4. Water Absorption (maximum): 0.25 percent by volume
5. Dimensions: 8 feet X 2 or 4 feet, 1 inch thick minimum

2.03 SOURCE QUALITY CONTROL

A. Verification of material provided from off site sources shall be in accordance with requirements of Related Sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough grading is complete in the area of Work.
   1. Provide notification to Owner of conditions detrimental to timely and proper completion of the Work.
   2. Beginning without notification indicates acceptance and assumed responsibility.
B. Identify required lines and levels and verify that benchmarks and control points for the Work are as indicated on the Drawings.
C. Identify known utilities affected by performance of the Work.
   1. Conduct investigation excavations as necessary to ensure that no conflicts exist with the Work.
   2. Notify Owner upon discovery of conflicts and proceed with Work in unaffected area.
   3. Comply with requirements of utility providers for temporary removal, shutdown, replacement, or protection of utilities in Work areas.
D. Verify that erosion protection and sediment controls are in place prior to beginning.

3.02 PREPARATION

A. Protection of Persons
   1. Provide temporary barricades as needed to prohibit unauthorized access to active areas of Work.
   2. Comply with regulations, applicable building codes, and ordinances for work zone safety relative to operation of heavy equipment and side walls and slopes of excavations.
   3. Provide design and necessary shoring, bracing, sheet piling, or other methods where adequate slopes are prohibited by space limitations, stability of material encountered, or forces imposed by excavation equipment or area traffic.
   4. Remove temporary supports when no longer needed as Work progresses.
   5. Close excavations with side slopes steeper than 2 horizontal to 1 vertical at the end of the workday or barricade and post with lights.
B. Protection of Property
   1. Protect and maintain benchmarks and monuments established for the Work. Provide service of Licensed Land Surveyor for any needed relocation.
   2. Protect plant material to remain. Provide or maintain temporary protection measures consistent with requirements of Related Sections.
   3. Protect utilities, structures, and equipment which are newly constructed or to remain.
      a. Provide temporary support as needed to prevent movement or settlement.
      b. Provide hand excavation as necessary when working around critical installations such as gas piping or power and communication lines.
      c. Place backfill uniformly around structures to prevent wedging action.
      d. Monitor use of heavy and vibratory equipment and provide alternate methods if risk of damage is present.
      e. Provide soil cover, planks, or other protective covering over pavements that must be crossed or travelled to prevent damage by extreme loads or lugged or tracked equipment.
      f. Provide overfill of material at utilities with less than 3 feet of cover until ready for finish grading.
      g. Remove temporary supports when no longer needed as Work progresses.
   4. Use of explosives is not permitted.
C. Maintenance of Traffic: Provide traffic control, signing, and notification to affected agencies or institutions in accordance with requirements of CEAM and Mn/DOT 1404 and 1710 when work interferes with a traveled roadway.

D. Surface Preparation
   1. Remove surface improvements and provide clearing in areas of excavation outside of general construction limits in accordance with requirements of CEAM.
   2. Provide coordination for removal and replacement of improvements within trenching areas located outside of the general construction limits.

E. Access
   1. Obtain written permission or permits from adjacent property owners if construction will infringe upon or limit access to their property.
   2. Sequence and schedule the Work to maintain access to the site for other trades, personnel requiring access by Regulatory Authorities, and emergency response vehicles.

3.03 TRENCHING

A. Use equipment adequate in size to complete the work in a timely manner.

B. Extents: Provide trenching of every type of material encountered to the lines and grades indicated on the Drawings.

C. Segregate excavated trench materials as recommended by the Testing Laboratory.
   1. Reuse the most suitable material as backfill.
   2. Make excavated select materials available for use elsewhere on the site to the greatest extent practicable.
   3. Remove unsuitable or excess material from site.

D. Excavate in advance of utility construction only as necessary to provide for coordination of related Work, timely verification of suitability of trench bottom, and unobstructed line and grade.

E. Provide excavation for below grade storm water management facilities.
   1. Excavate to the dimensions shown in accordance with recommendations of the system Manufacturer or as directed by the system installer.
   2. Excavate in designated infiltration areas with a toothed bucket, avoid smearing or compacting bottom and sidewalls of excavation, and remove remaining loose soil materials with hand tools.

F. Rock: Immediately notify Owner upon discovery of rock.

3.04 TRENCH BOTTOM

A. Excavate trench bottoms to provide continuous and uniform bearing for the full length of the pipe barrel for pipes not requiring specified bedding.

B. Machine excavation shall terminate slightly above grade necessary for utilities bedded directly on trench bottom.

C. Over excavate at bells for pipe not requiring bedding to provide for proper joints and placement of fittings.

D. Remove loose material and stones and complete final foundation shaping and excavation for bell holes using hand tools.

E. Allow for examination of materials removed and trench bottoms by the Testing Laboratory.

F. Bed pipe in accordance with requirements of Related Sections unless trench bottom is unsuitable for support of pipes, conduits, or structures.

G. Over excavate trench bottoms where support is determined unsuitable based on recommendations of the Testing Laboratory and approved by the Owner, and backfill with thoroughly compacted Granular Foundation material.

H. Correct unauthorized over excavation of trench bottom with Granular Foundation material or as recommended by the Testing Laboratory.

3.05 BACKFILLING

A. Backfill as soon as practical after completion of necessary observations and inspections and proper placement of pipe zone materials.
   1. Pipe zone material and placement is incidental to pipe installation.
   2. Select materials and installation for below grade storm water management systems shall be provided by the system installer.

B. Allow time for testing and observations as backfilling proceeds.

C. Compact backfill to achieve specified densities and fill to subgrade elevations within specified tolerances for each use area as described in Related Sections.
D. Backfill and compaction requirements apply equally to installations of irrigation, gas, electric, technology, and communications utilities.

3.06 REINSTALLATION

A. Provide coordination for reconstruction or replacement of surface improvements and features and underground facilities in areas of trenching outside of general constructions limits as specified for new construction or in accordance with requirements of CEAM.

3.07 SPECIAL PRECAUTIONS

A. Ground and Surface Water Control
   1. Do not allow water to accumulate in trenches.
      a. Remove water to prevent soil changes detrimental to stability of trenches.
      b. Provide and maintain pumps, well points, suction and discharge lines, and any other dewatering system components necessary to convey water.
      c. Do not use trenches or partially installed utility lines as temporary drainage conveyances.
   2. Provide temporary basins, ditches, or diversions to direct surface water flow around backfill material and away from open trenches.
   3. Coordinate and sequence Work and cooperate with Work of Related Sections required to prevent erosion and control sediment from dewatering operations.
      a. Convey water removed from trenches and diverted surface waters to collecting or runoff areas secured against sediment transport.
      b. Allow for installation of necessary erosion control devices as Work progresses according to the means, methods, techniques, and sequence of construction.
B. Material Requiring Special Handling: Suspend work only in the affected area and provide required notification to the Owner and Regulatory Authorities upon discovery or verifiable suspicion of hazardous waste or contaminated material.

3.08 FIELD QUALITY CONTROL

A. The Testing Laboratory shall conduct testing for each type of soil encountered and materials proposed for incorporation into the Work, perform observation of Trenching and Backfilling, and provide periodic reports and recommendations to the Owner and Engineer as subsoil conditions or materials may vary; including but not limited to the following.
   1. Testing of materials or review of reports of materials to be provided from off site locations.
   2. Testing and classification for suitability of use of materials encountered.
   3. Testing of trench bottoms prior to installing utilities.
   4. Observation of groundwater conditions.
   5. Recommendations for over excavation and soil correction.
   6. Observation and testing of trench backfill.
   7. Other tests as recommended by the Testing Laboratory and approved by the Owner.
B. Test methods shall be as indicated in Related Sections or as recommended by the Testing Laboratory and approved by the Owner and Engineer.
C. Frequency of Density Tests
   1. One test per lift per 100 feet of trench or each structure, randomly staggered for each lift.
   2. Additional testing approved by the Owner to verify compliance with the specifications.
   3. In non-critical areas the Testing Laboratory may verify compaction by visual observation or hand auger testing after the initial level of compactive effort has been established and verified.

EROSION AND SEDIMENT CONTROL – 31 25 00

PART 0 - ARCHITECTURAL

1. SCOPE OF WORK: Provide and install erosion prevention and control of sediment transport by wind or water. Provide structural measures shown and performance measures to prevent soil erosion. Provide

structural measures shown to control sediment transport. Provide additional measures to prevent erosion and control sediment in accordance with the means, methods, techniques, and sequence of construction.

2. CONTINUOUS INSPECTION AND MAINTENANCE: Provide inspection, maintenance, and repair of prevention and control devices. Schedule monitoring, cleaning, replacing, and reporting required by Regulatory Authorities. Provide removal and coordination for surface restoration on completion.
3. WORK AREA CLEANING: Provide cleaning in surrounding areas to remove sediment.
4. REFERENCE STANDARDS: MnDOT Standard Specifications for Construction, latest edition. CEAM Standard Specifications, latest edition. Local utility standards.
5. DESIGN AND PERFORMANCE REQUIREMENTS: Erosion prevention and sediment control devices and practices shown indicate the minimum. Provide additional design and implementation of Best Management Practices, consistent with References and Regulatory Requirements; and in accordance with the means, methods, techniques, and sequence of construction.
6. SEQUENCING AND SCHEDULING: Determine schedules for clearing, grading, storage of soil materials, utility installation, building excavation, paving, final turf restoration, and other work that constitutes land disturbance. Include schedule for installation of erosion prevention and sediment control measures in the SWPPP.
7. MATERIALS AND UNIT PRICES: Provide materials listed below for a whole and complete sediment control system. Provide unit prices for each material to be used.
    - 7.1. Silt Fence Machine Sliced: Basis of Measurement: By Linear Foot. Basis of Payment: Includes furnishing, installing, maintaining, and removing erosion and sediment control device.
    - 7.2. Wood Fiber Blanket (Ditch): Basis of Measurement: By Square Yard. Basis of Payment: Includes furnishing, installing, and maintaining.
    - 7.3. Seed and Mulch: Basis of Measurement: By Acre. Basis of Payment: Includes furnishing and application of seed, mulch and fertilizer.
    - 7.4. Erosion Control Blanket (Outlet Stabilization): Basis of Measurement: By Square Foot. Basis of Payment: Includes application and maintenance.
8. QUALITY ASSURANCE:
    - 8.1. Qualifications: Designers, installers, and inspectors of erosion prevention and sediment control devices shall have thorough knowledge of the References and requirements of the NPDES/SDS Permit. Those responsible for performance or supervision of the Work shall be authorized to render decisions on behalf of the Contractor.
    - 8.2. Regulatory Requirements: Minnesota Pollution Control Agency - NPDES/SDS Permit. Comply with permit for trash and debris removal, handling hazardous materials and waste, spill protection including concrete washout, inspections, cleaning, and removal of prevention and control devices. With the Owner, complete and submit the Notice of Termination when responsibility is complete. Comply with any additional permit or regulatory requirements of the City, State and other authorities having jurisdiction.
    - 8.3. The Contractor is responsible for cleanup and restoration of any stormwater system, river, stream, lake, reservoir, ground, roadway, or other property upon which sediment may be deposited.
    - 8.4. Pre-installation Meetings: Installers, inspectors, and those responsible for supervision of the Work shall attend pre-installation meetings for Work of Related Sections to provide for coordination for the SWPPP and land disturbing activity that may require temporary removal, relocation, or additional installation of prevention or control devices.
9. EXAMINATION: Examine areas affected by Work prior to beginning. Determine condition of site and downstream water conveyance system. Notify Owner of conditions that may be construed as being damaged by failure to complete Work. Provide documentation of detrimental conditions and inform Regulatory Authorities.

10. INSTALLATION: Install erosion prevention and sediment control devised at perimeter locations prior to disturbing soil. Install additional prevention and control devises as Work progresses. Install devices as specified in the References. Coordinate sequence with Work of Related Sections such that disturbed soils, stockpiles, dewatering discharge, concrete washouts, and drainage systems will not be unprotected. Remove and replace devices as needed for progress of construction.
11. FIELD QUALITY CONTROL: Maintain References on site. Provide for inspections and maintain log in accordance with NPDES/SDS Permit requirements.
12. INSPECTION: Inspect all prevention and control devices once weekly, after each 0.5" rainfall event, and daily during prolonged rainfalls.
13. REPAIR: Repair structural measures on detection of damage and replace filters when 50% of capacity is clogged.
14. CLEANING: Remove sediment when 33% of available up slope storage of device is full. Provide street sweeping and other measures to clean up sediment transported beyond the project limits.
15. REMOVAL: Remove temporary devices after permanent ground cover has been established. Provide coordination for surface restoration at locations of removal.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Provide prevention against erosion and control of transport of sediment by wind or water.
   1. Provide structural measures indicated on Drawings and performance measures during execution of the Work to prevent erosion of soils.
   2. Provide internal and perimeter structural measures indicated on Drawings to control transport of sediment.
   3. Provide additional performance and structural measures where needed to prevent erosion and control sediment as the Work progresses, coordinated with Work of Related Sections.

B. Provide inspection, maintenance, and removal of erosion prevention and sediment control devices.
   1. Schedule monitoring, cleaning, replacing, and reporting as required by Regulatory Authorities.
   2. Provide removal of devices and coordination for surface restoration.

C. Provide cleaning in surrounding areas to remove sediment transported off site.

1.02 RELATED SECTIONS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2300 – Excavation and Fill
C. Section 31 2333 – Trenching and Backfilling
D. Section 33 4000 – Storm Drainage Utilities

1.03 REFERENCES

A. City of Princeton Engineering Standards.
B. Minnesota Pollution Control Agency (MPCA), *State of Minnesota Stormwater Manual*, 2005 edition with current updates.
C. Metropolitan Council, *Minnesota Urban Small Sites BMP Manual: Stormwater Best Management Practices for Cold Climates*, 2001 edition.
D. Minnesota Department of Transportation (Mn/DOT), Standard Specifications for Stormwater Management and Erosion Control, current edition with supplements.

1.04 DEFINITIONS

A. Definitions as described in Related Sections.

1.05 SYSTEM DESCRIPTION

A. General: The project is required to be permitted under a National Pollutant Discharge Elimination System (NPDES) General Stormwater Permit for Construction Activity for all phases of the project.

B. Design and performance requirements
1. Erosion prevention and sediment control devices and practices indicated on the Drawings are the minimum requirement.
2. Provide additional design and implementation of Best Management Practices (BMPs), consistent with references and regulatory requirements of this Section; and in accordance with the means, methods, techniques, procedures, and sequence of construction.
3. Remove and dispose of temporary devices when areas contributing run off are stabilized and provide coordination for surface restoration in areas occupied by devices.

1.06 SUBMITTALS
A. Permits: Evidence of permits applied for and received.
1. Submit at pre-construction meeting.
2. For information only.

1.07 QUALITY ASSURANCE
A. Qualifications
1. Designers, installers, and inspectors of erosion prevention and sediment control devices shall have thorough knowledge of the References and requirements of the NPDES Permit.
2. Those responsible for performance or supervision of the Work shall be authorized to render decisions on behalf of the Contractor.
B. Regulatory requirements
1. Minnesota Pollution Control Agency - NPDES Permit
a. With the Owner, provide a Storm Water Pollution Prevention Plan (SWPPP) for this project, incorporating the project Drawings and Specifications relating to erosion prevention, sediment control, and final restoration of all disturbed surfaces.
b. Complete and submit the permit application and pay necessary fees.
c. Comply with permit requirements for trash and debris removal, handling and storing potentially hazardous materials and waste, spill protection including concrete washout, site inspections, cleaning and maintenance, and removal of erosion prevention and sediment control devices.
d. With the Owner, complete and submit the Application for Permit Transfer/Modification or Notice of Termination when responsibility for Work of this project or phase is complete.
2. Other: Comply with any additional permit or regulatory requirements of the City, County, water management organization, or other Regulatory Authority.
3. Damages: The Contractor is solely responsible for required cleanup and restoration of any storm water conveyance system, river, stream, lake, reservoir, ground, roadway surface, or other property upon which sediment may be deposited as a result of failure to provide proper controls.
C. Pre-construction meetings: Installers, inspectors, and those responsible for performance or supervision of the Work shall attend pre-construction meetings for Work of Related Sections to provide for coordination of the SWPPP prior to beginning any demolition or land disturbing activity or subsequent construction that may require temporary removal, relocation, or additional installation of erosion prevention or sediment control measures or devices.

1.08 SEQUENCING AND SCHEDULING
A. Determine the sequence and schedules for site clearing and grading, temporary storage of soil materials, utility installation, building excavation, paving, final turf restoration, and all other work that constitutes land disturbing activity.
B. As Work progresses, include detailed schedule for installation of erosion prevention and sediment control measures in the SWPPP.

PART 2 - PRODUCTS
2.01 MATERIALS
A. Materials shall be as specified in the SWPPP or noted on the Drawings.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine all areas affected by Work prior to start of land disturbing activities.
B. Determine extent and condition of on-site and downstream surface water conveyance system.
C. Notify Owner of conditions that may be construed as being damaged by failure to complete work.
D. Provide documentation of detrimental downstream conditions that may be construed as being caused by the Work and inform Regulatory Authorities of such condition prior to beginning.

3.02 INSTALLATION

A. Install erosion prevention and sediment control devices at perimeter locations indicated on Drawings prior to initiation of soil disturbing activities.
B. Install additional erosion prevention and sediment control devices as Work progresses in accordance with the means, methods, techniques, procedures, and sequence of construction.
C. Install devices as specified in the References or noted on the Drawings.
D. Interface with Other Work
    1. Coordinate installation sequence with schedules for Work of Related Sections, such that disturbed soil areas, temporary stockpiles, dewatering discharge locations, and drainage systems will not be unprotected.
    2. Remove and replace erosion prevention and sediment control devices as needed for progress of construction and coordination between Work of Related Sections.

3.03 FIELD QUALITY CONTROL

A. Maintain copies of References at the project site.
B. Provide for inspections and maintain log in accordance with NPDES Permit requirements.

3.04 MAINTENANCE

A. Inspect all erosion prevention and sediment control devices a minimum of once weekly while Work is active, after each run-off event, and daily during prolonged rainfalls.
B. Repair all structural measures immediately on detection of damage.
C. Replace filters when capacity is reduced to 50 percent by clogging.
D. Remove sediment deposits when 33 percent of available storage space within or up slope of control device is met or exceeded.
E. Off site cleaning: Provide street sweeping and any other measures required to immediately clean up sediment transported beyond the project limits.

3.05 REMOVAL

A. Remove temporary erosion prevention and sediment control devices after permanent ground cover on runoff contributing areas has been established and approved by the Owner.

B. Provide coordination for final surface restoration at locations of removal as designated for new construction in the surrounding area.

TERMITE CONTROL – 31 31 16

1. SCOPE OF WORK: The Contractor shall employ a certified exterminator and treat the entire building area. Work shall be completed in accordance with governing health regulations for rodent and insect control.
2. REFERENCE STANDARDS: Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 1947 (Revised for latest edition).
3. SUBMITTALS: Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements. Test Reports: Indicate regulatory agency approval reports when required. Test Reports: Submit termite-resistant sheet manufacturer's summary

of independent laboratory and field testing for effectiveness in subterranean termite exclusion. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements. Certificate of compliance from authority having jurisdiction indicating approval of toxicants. Manufacturer's Instructions: Indicate caution requirement. Record and document moisture content of soil before application. Maintenance Data: Indicate re-treatment schedule. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

4. QUALITY ASSURANCE: Installer Qualifications: Company specializing in performing this type of work and Licensed in the local jurisdiction.
5. WARRANTY: Provide five year installer's warranty against damage to building caused by termites.
   5.1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
   5.2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.
6. TOXICANT CHEMICAL: EPA (Title 7, United States Code, 136 through 136y) approved; synthetically color dyed to permit visual identification of treated soil. And/Or EPA (1) approved; synthetically color dyed to permit visual identification of treated soil. Mix toxicant to manufacturer's instructions.
7. EXAMINATION: Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment. Verify final grading is complete.
8. APPLICATION - CHEMICAL TREATMENT: Comply with requirements of U.S. EPA and applicable state and local codes. Spray apply toxicant in accordance with manufacturer's instructions.
9. LOCATIONS: Apply toxicant at following locations as applicable to the project:
   9.1. Under Slabs-on-Grade. Apply toxicant immediately prior to installation of vapor barrier.
   9.2. In Crawl Spaces.
   9.3. At Both Sides of Foundation Surface. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
   9.4. Soil Within 10 feet of Building Perimeter For a Depth as required by the manufacturer’s warranty.
   9.5. Re-treat disturbed treated soil with same toxicant as original treatment.
   9.6. If inspection or testing identifies the presence of termites, re-treat soil and re-test.
10. PROTECTION: Do not permit soil grading over treated work.

DIVISION 32

AGGREGATE BASE COURSES – 32 11 23

1. SCOPE OF WORK: Provide all necessary aggregate and fabric as required by the project's scope of work and the contract documents.
2. SECTION INCLUDES: Aggregate base course. Geotextile fabric for under bituminous paving. Aggregate surfacing.
3. GEOTEXTILE FABRIC: Shall be Woven Geotextile Fabric. Shall be polymeric filaments or yarns such as polypropylene, polyethylene, polyester, or polyamide formed inot a stable network such that the filaments/yarns retain their relative position to each other. Shall be delivered to the Project with an opaque plastic covering to prevent degradation due to ultraviolet rays of the sun or contamination with mud, dirt, dust or debris. Rolled geotextile shall be identified by manufacturer, product name, and roll number, both on the outside wrap and inside core as well as other requirements of ASTM D 4873. Shall have a minimum Grab Tensile Strength of 200 pounds as per ASTM D 4632. Shall have a maximum Apparent Opening Size of 30 U.S. Standard Sieve Size.
   3.1. Install geotextile in accordance with manufacturer's instructions.
   3.2. Place on finished subgrade to a point 1 foot beyond proposed back of curb.

3.3. Minimum overlap is 2 feet. An alternate to the overlap method is a sewn J seam with two rows of stitching.

3.4. Replace damaged geotextile with a minimum patch size of damaged area plus three feet.

4. COURSE AGGREGATE: Coarse virgin aggregate, conforming to the State Department of Transportation Standard Specifications.

5. FINE AGGREGATE: Sand. Conforming to the State Department of Transportation Standard Specifications.

6. AGGREGATE PLACEMENT: Place by end dumping adjacent to geotextile or over previously placed aggregate. Dumping on geotextile is not permitted. Traffic directly on geotextile is not permitted.

6.1. Vibratory compaction shall not be used on initial lift over geotextile.

6.2. Place aggregate to a total compacted thickness shown in the Plan details for each type of pavement section.

6.3. Compact to 98 percent of maximum dry density.

6.4. Place aggregate in maximum 4 inch layers and mechanically compact to specified density.

6.5. Level and contour surfaces to elevations and gradients indicated.

6.6. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

6.7. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

7. SOURCE QUALITY CONTROL: If tests indicate materials do not meet specified requirements, change material and retest. Provide materials of each type from same source throughout the Work.

8. EXAMINATION: Verify substrate has been inspected, gradients and elevations are correct, and is dry.

9. PREPARATION: Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting. Do not place aggregate on soft, muddy, or frozen surfaces. Construction signage and barricades for the work within the highway right-of-way shall conform to the latest revisions of the Manual of Uniform Traffic Control Devices. This work shall be at no additional cost to the Owner.

10. TOLERANCES: Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge. Variation From Design Elevation: Plus 0 inch, minus 1/2 inch.

11. FIELD QUALITY CONTROL: Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

12. CLEANING: Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

BITUMINOUS CONCRETE PAVING – 32 12 16

PART 0 - ARCHITECTURAL

1. SCOPE OF WORK: Provide and install all new paving as illustrated in the contract documents. It is the contractor's responsibility to ensure that finished parking lot and drives have not low spots that will hold water. 100% drainage is required.

1.1. Slopes at accessible parking spaces and access aisles shall not exceed 1:48 or 2% in all directions

1.2. A maximum of 1/4" threshold shall be provided where access aisles transition up to curb ramps.

2. SECTION INCLUDES: Aggregate base course. Double course bituminous concrete paving. Surface sealer.

3. REFERENCE STANDARDS: All materials and products used shall comply with State Department of Transportation Standard Specifications for Highway Construction.

4. QUALITY ASSURANCE: Perform Work in accordance with State Highway Standards. Mixing Plant:

Conform to State Highway Standards. Obtain materials from same source throughout.

5. FIELD CONDITIONS: Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.
6. MATERIALS
   - 6.1. Aggregate for Base Course, Binder Course, and Wearing Course: in accordance with State Highway Standards.
   - 6.2. Base Course: State Department of Transportation Highways standards.
   - 6.3. Seal Coat: AI MS-19, sand type.
7. ASPHALT PAVING MIXES AND MIX DESIGN
   - 7.1. Base Course, Binder Course, and Wearing Course: State Department of Transportation Highways standards.
   - 7.2. Submit proposed mix design of each class of mix for review prior to beginning of work.
8. EXAMINATION: Verify that compacted subgrade is dry and ready to support paving and imposed loads. Verify gradients and elevations of base are correct. Test Roll
9. BASE COURSE: Place and compact base course.
10. PREPARATION - TACK COAT: Apply tack coat in accordance with manufacturer's instructions. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.
11. PLACING ASPHALT PAVEMENT - DOUBLE COURSE: Place asphalt binder course within 24 hours of applying primer or tack coat. Place wearing course within two hours of placing and compacting binder course. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
12. SEAL COAT: Apply seal coat to surface course in accordance with State Department of Transportation Highways standards.
13. TOLERANCES: Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge. Variation from True Elevation: Within 1/2 inch.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt roadways, fire lanes, driveways, parking surfaces, trails, and walkways.
B. Patching asphalt pavement.
C. Pavement marking.

1.02 RELATED SECTIONS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2300 – Earthwork
C. Section 32 1313 – Concrete Paving
D. Section 33 4000 – Storm Drainage Utilities

1.03 REFERENCES

A. City of Princeton Engineering Standards.
B. Minnesota Department of Transportation (Mn/DOT) Standard Specifications for Construction, current edition with supplements.
C. American Association of State Highway Transportation Officials (AASHTO).
   1. M20/ASTM D946 – Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
   2. M140/ASTM D977 – Specification for Emulsified Asphalt.
   3. M208/ASTM D2397 – Specification for Cationic Emulsified Asphalt.
   4. M226/ASTM D3381 – Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
   5. M248 – Specification for Ready-Mixed White, Blue, and Yellow Traffic Paints.

6. M320/ASTM D6373 – Specification for Performance-Graded Asphalt Binder.

D. ASTM International (ASTM).
1. C33 – Specification for Concrete Aggregates.
2. C131 – Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
3. D1074 – Test Method for Compressive Strength of Bituminous Mixtures.
4. D2950 – Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
5. D5581 – Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.

E. Asphalt Institute: Mix Design Methods for Asphalt Concrete, Manual MS-4, Marshall Stability Method.

1.04 SYSTEM DESCRIPTION

A. Design Requirements
1. Provide a mix design for each type of pavement from locally available materials.
2. Meet the requirements of the References, the local Regulatory Authorities, as specified herein, or as recommended in the Geotechnical Report; whichever results in the higher quality.
3. In Lieu of Mix Design: Provide certification from the asphalt supplier of mixes approved during the most recent production season by local or state authorities, with verification that mixes delivered are the same as approved.

B. Performance Requirements: Compacted asphalt in vehicular areas shall provide Marshall Stability of not less than 1125 and contain air voids of 3.0 to 3.5 percent.

1.05 SEQUENCING AND SCHEDULING

A. Do not begin paving until abutting concrete has received a minimum 7 days of cure time and curbs have been backfilled sufficient to provide support against displacement.

B. Coordinate the schedule to allow time for placing embedded items, final adjustment of utility castings, and removal and replacement of sediment control devices.

C. Notify the Testing Laboratory when items of work requiring observation or testing are scheduled and allow time for the same.

D. Allow pavement to cool to ambient temperature before applying pavement marking paint.

E. Obtain necessary permissions from the Owner or Regulatory Authorities for Work that must be performed outside of normal work hours; either as necessary to maintain the schedule, minimize interference with traffic, or for the convenience of the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

A. General
1. Public Improvements: Comply with design standards of the public Regulatory Authority for materials and mixes used within public rights of way or easements.
2. Meet Performance Requirements listed in Part 1, System Description, and the following minimum criteria for all other.

B. Wear Course Aggregate
1. Coarse Fraction
a. Clean, sound, durable particles of crushed stone or gravel and sharp sand.
b. Maximum dimension of coarse fraction shall not exceed 2/3 of pavement course lift thickness.
2. Fine Fraction
a. Upper limit: Clean sharp sand, screenings from aggregate crushing process.
b. Lower limit: Rock flour, Portland cement

C. Base and Binder Course Aggregate: May contain recycled or reclaimed material content up to the limits allowed by local or State standards.

D. Asphalt Binder
1. Wear Course: AASHTO M320, PG 58-28

2. Base and Binder Courses: May contain up to 50 percent recycled asphalt pavement unless noted otherwise on Drawings.

2.02 ACCESSORIES

A. Tack Coat: Emulsified asphalt, SS-1, SS-1H, CSS-1, or CSS-1H, diluted with up to 50 percent of volume with water.
B. Pavement Marking Paint: Chlorinated rubber-alkyd type, AASHTO M248 (Federal Specification TT-P-115F), Type II, factory mixed, and non-bleeding.
C. Herbicide: Round Up, Monsanto Corp.

2.03 SOURCE QUALITY CONTROL

A. Obtain materials from the same source throughout construction.
B. Test aggregate for hydrophilic properties and determine if anti-stripping additive is required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify aggregate base was placed as specified in Related Sections.
B. Verify utility castings are set in full bed of grout and have been adjusted to final elevations.
C. Verify cure time for abutting concrete.
D. Verify curbs have been backfilled to subgrade with compaction as specified.

3.02 PREPARATION

A. Protection of Persons
   1. Provide temporary barricades as needed to prohibit unauthorized access to active Work areas.
   2. Sequence and schedule the Work to maintain access to the site for personnel requiring access by Regulatory Authorities and emergency response vehicles.
   3. Provide traffic control, signing, and notification to affected agencies or institutions in accordance with requirements of Mn/DOT Sections 1404 and 1710 when work interferes with a traveled roadway.
B. Protection of Property
   1. Protect benchmarks and monuments established for the Work.
   2. Protect adjacent finished surfaces from overspray of tack coat material, staining with paving material, or by wheel tracking.
   3. Prevent displacement of abutting structures or embedded objects by wedging action of spreading or compacting equipment.
C. Surface Preparation
   1. Remove loose material from aggregate base or provide surface recompaction.
   2. Apply prime and tack coats to provide uniform coverage on abutting contact surfaces and subgrade surfaces and allow drying time.
   3. Wash and sweep pavement surfaces before application of pavement markings and allow drying time.

3.03 PLACING MIX

A. Place mixture by paving machine in nominal 10 foot wide strips.
B. Place areas inaccessible to paving machine by hand and spread to uniform thickness with rakes or lutes.
C. Place each course of paving in as complete segments as practicable to minimize cold joints for subsequent Work.
D. Complete each course and allow time for observation and testing prior to placing subsequent courses.
E. Construct joints to ensure continuous bond between adjoining strips and to have the same texture, density, and smoothness of adjacent paving.
F. Adjust width of strips to provide overlapping of joints between courses to the greatest extent practicable.

3.04 COMPACTING

A. Begin initial rolling of strips at outside edges or edges abutting adjacent paving or structures.
B. Roll joints between strips immediately after pavement will bear roller weight without excessive displacement.
C. Continue rolling while mixture is hot until specified density is achieved and roller marks are eliminated.
D. Compact mixture in areas inaccessible to rollers with hot vibratory plate compactors or hand tampers.

3.05 FIELD QUALITY CONTROL

A. Submit bag samples in the quantity determined by the Testing Laboratory and approved by the Owner from each day's production for Marshall density, stability, and extraction tests.
B. Determine constructed density with a portable nuclear testing device by random sampling on a 25 to 50 foot grid for each constructed lift.
C. The Owner reserves the right to take corings of the paving to verify field test results.
D. Test surface smoothness with a minimum 10 foot straight edge in the presence of the Owner.
E. Observations for ponded water shall be conducted by the Owner following a rainfall event that produces a measurable amount of runoff.

3.06 TOLERANCES

A. Compacted Density: The mean of density tests shall be 96 percent of the Marshall density established in the laboratory with no test less than 92 percent.
B. Thickness
    1. Base Course: Minus 1/2 inch
    2. Binder and Wear Courses: Minus 1/4 inch
    3. Pavement Total Thickness: Minus 1/4 inch
C. Surface Smoothness: 3/16 inch in 10 feet
D. Depth of Ponded Water: 1/16 inch

3.07 PAVEMENT MARKING

A. Apply in 2 coats at Manufacturer's recommended rates.
B. Use equipment, masking, or templates to produce uniform sharp edges.

3.08 PROTECTION

A. Restrict traffic on new pavement until temperature is less than 140 degrees F.
B. Restrict traffic on pavement marking until dry.
C. Obtain prior approval for use of paving as temporary parking or construction staging surface.
    1. Provide additional protective covering when subjecting pavements to extreme construction traffic wheel loads or outriggers for lifting equipment.
    2. Provide protection against leaking fluids from vehicles that may soften or otherwise weaken pavement.
    3. Avoid static or slow speed turning movements by construction or delivery vehicles.

CONCRETE PAVING – 32 13 13

PART 0 - ARCHITECTURAL

1. SCOPE OF WORK: Provide and install new concrete paving as illustrated in the contract documents. Including:
    1.1. Sidewalks
    1.2. Trash enclosure slab
    1.3. All accessible parking stalls and access aisles
    1.4. Pavilion slab

1.5. Concrete curbing and gutter system at all parking, drive aisle and roadway

2. FIELD MEASUREMENTS: Verify actual locations of exterior concrete work and other construction to which concrete work must fit, by accurate field measurements before installation. Show recorded measurements on final Shop Drawings. Coordinate installation schedule with construction progress to avoid delay of the Work.
3. LAND SURVEY OR REQUIRED: The Contractor is to employ the services of a registered land surveyor to perform the specified layout work.
4. WARRANTY: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily required or replaced by the Contractor at his/her expense.
5. PAVING ASSEMBLIES: Comply with applicable requirements of ACI 301.
   5.1. Unless specifically noted elsewhere in the contract documents, at a minimum, concrete on grade shall be 4” thick with 6x6:1.4x1.4 WWM.
6. CONCRETE SIDEWALKS AND MEDIAN BARRIER: 3,000 psi 28 day concrete, 4 inches thick, grey color Portland cement, broom finish. Verify exact requirements with the local AHJ; if more stringent of if required color is different then those requirements shall apply.
7. FORM MATERIALS: The forms shall be of metal, wood or other suitable material, and shall be capable of sustaining the concrete in its proper position until set. Do not use aluminum materials in contact with concrete. Concrete form materials must be used in a manner to provide the surface finish specified.
8. FORM COATING MATERIAL: Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete. Side forms shall have a height at least equal to the edge thickness of concrete being formed. Flexible or curved forms shall be used on curves having a radius of 150 feet or less. Face forms for curbing shall conform to the shape and design of the curb.
9. CEMENT FOR NORMAL WEIGHT STRUCTURAL CONCRETE: ASTM C 150 Normal - Type I Portland type, grey color.
10. CEMENT FOR HIGH EARLY STRENGTH STRUCTURAL CONCRETE: ASTM C 150 Normal - Type III Portland type, grey color
11. Use only one type and brand of Portland Cement for all exposed concrete.
12. FINE AND COARSE MIX AGGREGATES: ASTM C33/C33M. Maximum nominal size of coarse aggregate shall be 3/4" for all concrete. Limits for deleterious substances and physical properties of coarse aggregate for concrete shall meet the requirements of ASTM C33, 3/4", Class 4S.
13. FLY ASH: ASTM C618, Class C or F.
14. All products shall be clean and free from deleterious amounts of acids, alkalies or organic materials.
15. AIR ENTRAINING: Admixture, conforming to ASTM C260, shall be used for all concrete.
16. MOISTURE-RETAINING COVER: ASTM C171, waterproof paper or polyethylene film.
17. LIQUID MEMBRANE CURING COMPOUND: ASTM C309, Type 2, Class B.
18. FORM RELEASE AGENT: Commercial product to facilitate stripping without staining or damaging concrete or impairing future concrete treatment.
19. EXPANSION JOINT AND ISOLATION JOINT FILLER: ASTM D1751, performed, resilient, non-extruding, asphalt impregnated joint filler, 1/2" thick unless otherwise indicated.
20. Provide granular cushion material under all other exterior concrete work.
21. EVAPORATION RETARDANTS: An evaporation-retarding agent may be used during the concrete finishing operation to control plastic cracking of the fresh concrete.
22. CONCRETE MIX DESIGN: as per ACI 301. Provide mixes meeting the following minimum requirements. Submit concrete mix design for each type of concrete. Mix designs must be reviewed prior to pouring concrete. Review is for conformance with specification requirements only. Contractor is responsible for performance. Unless specifically indicated elsewhere in the contract documents, all the following criteria

shall be met:

22.1. 28-day Compressive Strength: 4,000 psi.

22.2. Maximum Aggregate Size: 3/4" Class 4S (1/2” for exposed aggregate concrete).

22.3. Maximum Slump: 4".

22.4. Air Content ASTM C231: 6-1/2% ? ±1-1/2%.

22.5. Maximum Water/Cement Ratio: 0.40.

22.6. Concrete shall conform to the requirements of ASTM C94.

22.7. Provide concrete with workability such that it will fill the forms, without voids or honeycombs, when properly vibrated, without permitting materials to separate or excess water to collect on the surface.

23. EXAMINATION: Examine the areas and conditions under which the Work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected. Verify compacted subgrade is acceptable and ready to support paving and imposed loads. Verify gradients and elevations of base are correct.

24. BASE PLACEMENT: Spread granular cushion over prepared base to a total compacted thickness required for the Work. Place granular cushion base of Class 5 gravel or sand in maximum three (3") inch layers and roller compact. Level and contour surfaces to elevations and gradients indicated on the Drawings.

24.1. Compact placed aggregate materials to achieve compaction to 100 percent of its maximum dry density in accordance with ASTM D698.

24.2. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

24.3. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

25. PREPARATION: Moisten base to minimize absorption of water from fresh concrete. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement. Notify Architect minimum 24 hours prior to commencement of concreting operations.

26. FORMING: Place and secure forms to correct location, dimension, profile, and gradient. Assemble formwork to permit easy stripping and dismantling without damaging concrete. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement. Install forms to allow continuous progress of Work and so that forms can remain in place at least twenty-four (24) hours after concrete placement. Slipform equipment may be used if the resulting curb and gutter conforms to the shape as specified on the drawings and the finish is satisfactory to the Architect/Engineer.

27. ACCESSIBILITY: Sidewalks, paths and walkways shall meet applicable accessibility standards.

27.1. The accessible route is identified in the Contract Drawings. Survey, removal, regrading, new ADA compliant handrails or fall protection and replacement of concrete along the accessible route shall be scoped in detail and provided by the design-build contractor.

27.2. Replacement of all existing walks is required if they do not meet the slopes listed below. All new concrete walks shall be formed and installed to meet accessibility slopes:

a) Running slope not to exceed 1:20 or 5%.

b) Cross slope not to exceed 1:48 or 2%.

c) Slope at landings and 90-degree change in direction shall not exceed 1:48 or 2%.

d) Slopes in all directions at accessible parking and access aisles shall not exceed 1:48 or 2%.

e) Slopes at ramps with compliant handrails and landings shall not exceed 1:12 or 8%

f) Running slopes at curb ramps shall not exceed 1:12 or 8%

g) Slopes at flared sides of curb ramp shall not exceed 1:10 or 10%

27.3. Contractor required to use a smart level to verify all slopes meet requirements for accessibility prior to pouring.

a) 4 foot long minimum level shall be used.

b) Photo documentation shall be provided to Architect showing slopes have been verified.

c) All slopes are subject to the approval of the AHJ and the Owner.

28. PLACING CONCRETE: Place concrete in accordance with ACI 301 and comply with the requirements for mixing and placing concrete as herein specified.

28.1. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

28.2. Immediately before concrete placement, dampen base to reduce absorption. Standing water will not be permitted.

28.3. Do not place concrete on frozen ground.

28.4. Incorporate all concrete admixtures into the concrete at the ready-mix plant.

28.5. Reject concrete not placed within 90 minutes of initial mix.

28.6. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

28.7. Place concrete to pattern indicated on the Drawings or as directed by the Architect/Engineer.

28.8. Place concrete by methods that prevent segregation of the mix. Consolidate concrete along the face of the forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement and side forms.

28.9. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

29. EXPANSION JOINTS: Joints shall be filled with one-half (1/2") inch thick pre-formed joint filler material and shall be installed in the following locations:

29.1. At the beginning and end of all curved sections.

29.2. Where all new concrete surrounds, adjoins or abuts any existing fixed objects, such as fire hydrants, valve boxes, manholes, light poles, flag poles, curbs, walks or other rigid structures.

29.3. At sixty (60') foot maximum spacing or as indicated on the drawings.

30. CONTRACTION JOINTS: Curbing shall be provided with contraction joints at ten (10') feet on center or as indicated on the Drawings.

31. JOINTS - GENERAL: All joints shall be vertical and straight. Transverse joints shall be placed at right angles to the longitudinal axis of the Work. Joints shall align with similar joints in adjoining work where practical.

31.1. The panels shall be square where practicable and generally have not more than 36 square feet of area.

31.2. The joints shall align with like joints in adjoining work unless the work is isolated by ½ inch isolation joints.

31.3. All joint work shall coordinate precisely with grids, modules and radials as prescribed on the Drawings.

31.4. All joints and edges of walk shall be rounded with a 1/8-inch radius tool.

31.5. Contraction joints shall extend to at least 1/3 the walk thickness and shall be approximately 1/8 inch wide.

31.6. Expansion and isolation joints shall be ½ inch wide and shall be equal in depth to the full thickness of the slab.

32. FINISHING

32.1. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radius edge 1/4 inch radius.

32.2. Curbs and Gutters: Light broom, texture parallel to pavement direction.

32.3. Inclined Vehicular Ramps: Broom perpendicular to slope.

32.4. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

33. JOINT SEALING: Prepare joints and sealing compounds in accordance to the manufacturers installation instructions. Install sealing compounds where indicated on Drawings in accordance with manufacturer's instructions and ASTM D3406.

34. FIELD QUALITY CONTROL: An independent testing agency will perform field quality control tests. Provide free access to concrete operations at project site and cooperate with appointed firm.

35. COMPRESSIVE STRENGTH TESTS: Make one set of test cylinders (three per set) ASTM C31, for each day's pour in excess of one cubic yard for each type of concrete. If day's pour exceeds 25 cubic yards, make one set of test cylinders for each additional 50 cubic yards or fraction thereof. Cure cylinders in same proximity to and protected and cured in same manner as in-place concrete from which taken. Deliver one cylinder to independent testing lab at 7 days and 2 cylinders for testing at 28 days.

36. SLUMP TESTS: Furnish and maintain a slump cone and tamping rod. Test first batch of each type of concrete delivered for each day's pour, plus one test for each 25 cubic yards or fraction thereof, ASTM C143.

37. ENTRAINED AIR TESTS: Furnish and maintain a properly calibrated pressure-type air meter. Test first batch of air entrained concrete delivered for each day's pour plus one test for each 50 cubic yards or fraction thereof, ASTM C231.

38. PROTECTION: Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

PART 1 GENERAL

1.01 SECTION INCLUDES

1. Portland cement sidewalks and curbs.

1.02 RELATED SECTIONS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2300 – Earthwork
C. Section 32 1216 – Asphalt Paving
D. Section 33 4000 – Storm Drainage Utilities

1.03 REFERENCES

A. City of Princeton Engineering Standards.
B. Minnesota Department of Transportation (Mn/DOT) Standard Specifications for Construction, current edition with supplements.
C. ASTM International (ASTM).
    1. A185 – Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
    2. C31 – Practice for Making and Curing Concrete Test Specimens in the Field.
    3. C33 – Specification for Concrete Aggregates.
    4. C39 – Test Method for Compressive Strength of Cylindrical Concrete Specimens.
    5. C94 – Specification for Ready-Mixed Concrete.
    6. C131 – Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
    7. C150 – Specification for Portland Cement.
    8. C172 – Practice for Sampling Freshly Mixed Concrete.
    9. C260 – Specification for Air-Entraining Admixtures for Concrete.
    10. C309 – Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    11. C494 – Specification for Chemical Admixtures for Concrete.
    12. D1751 – Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

13. D1752 – Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

D. American Concrete Institute (ACI): SP-15 – Field Reference Manual: Standard Specifications for Structural Concrete with Selected ACI and ASTM References.

E. International Code Council/American National Standards Institute (ICC/ANSI): A117.1, 705 Detectable Warnings.

1.04 SYSTEM DESCRIPTION

A. Design Requirements
1. Provide a mix design for each type of concrete from locally available materials.
2. Meet the requirements of the References, of the local Regulatory Authorities, as specified herein, or as recommended in the Geotechnical Report; whichever results in the higher quality.
3. In Lieu of Mix Design: Provide certification from the concrete producer of mixes approved during the most recent production season by local or state authorities, with verification that mixes delivered are the same as approved.

B. Performance Requirements:
1. 28 day compressive strength: Not less than 4,000 psi
2. Entrained air content: 5 to 8 percent
3. Maximum Water/Cement Ratio: 0.49
4. Slump: 4 inches

1.05 SEQUENCING AND SCHEDULING

A. Install curbs, etc. in advance of abutting asphalt paving to provide minimum 7 day cure time.

B. Provide other sequencing and scheduling as indicated in Related Sections.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cement: Type 1A, or Type 1 with approved air-entraining admixture.

B. Coarse Aggregate: Non-reactive crushed quarry or mine trap rock of igneous or metamorphic types; including basalt, diabase, gabbro, gneiss, quartzite, or granite.

C. Fine Aggregate: Washed, sharp, natural or crushed sand consisting of particles of sound durable rock of igneous or metamorphic origin.

D. Exposed Aggregate: Washed river rock, 3/4 inch minus; verify color and texture.

E. Recycled content; including aggregates, fly ash, slag, or other constituent; shall be used only to the amounts and quality as allowed by local or state Regulatory Authorities' standards, on recommendation of the Testing Laboratory with approval of the Owner.

F. Admixtures for workability, water reducing, retarding, or accelerating shall be used only on recommendation of the Testing Laboratory and approval of the Owner.

2.02 ACCESSORIES

A. Form Materials
1. Plywood, metal, metal framed plywood, or other panel type materials providing full depth, continuous, straight, smooth exposed surfaces.
2. Use flexible or curved forms for 100 foot radius or less.

B. Form-Release Agent: Commercially formulated that will not bond with, stain, or affect surfaces nor impair subsequent treatments, attachments, or finishes.

C. Joint Filler: Conforming to References.

D. Curing Compound: White, water based, dissipating, membrane forming – Type 2, Class B

E. Fiber Reinforcement: Virgin polypropylene fibrillated fibers, type MD, 1.5 lb./CY mixed at plant.

2.03 SOURCE QUALITY CONTROL

A. All materials, admixtures, and accessories shall conform to References.

B. Obtain materials from the same source throughout construction.

C. Provide all prequalification testing and obtain approval for change in source.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify aggregate base was placed as specified in Related Sections.
B. Verify utility castings are set in full bed of grout and all embedded items have been installed.

3.02 PREPARATION

A. Protection of Persons
   1. Provide temporary barricades as needed to prohibit unauthorized access to active Work areas.
   2. Sequence and schedule the Work to maintain access to the site for personnel requiring access by Regulatory Authorities and emergency response vehicles.
   3. Provide traffic control, signing, and notification to affected agencies or institutions in accordance with requirements of Mn/DOT Sections 1404 and 1710 when work interferes with a traveled roadway.
B. Protection of Property
   1. Protect benchmarks and monuments established for the Work.
   2. Protect adjacent finished surfaces from splashing or smearing with concrete material or curing compound.
C. Surface Preparation
   1. Remove loose material from aggregate base or provide surface recompaction.
   2. Moisture condition base in accordance with ACI Standards.
D. Forming
   1. Provide qualified personnel for the establishment of line and grade from benchmarks and baselines established for the Work.
   2. Place and adequately secure forms to prevent displacement.
   3. Assemble and coat forms to permit stripping without damage to pavement.
   4. Coordinate formwork with Work of Related Sections to facilitate placement of embedded items such as sidewalk grates, trench drains, and the like.
   5. Machine placement by slip form may be used at the Contractor's option.
      a. Provide appropriate mix design for slip form construction.
      b. Provide full depth expansion joints and specified depth of contraction joints at the spacing indicated.
E. Joint Fillers
   1. Place full width and depth at all expansion joints and as shown on the Drawings.
   2. Place plumb and in alignment or coincident with contraction or decorative tooled joints.
   3. Place with top flush to concrete surfaces or depressed 1/2 to 3/4 inch where joint sealer is indicated.
   4. Secure to prevent displacement during concreting operations.
   5. Protect top edges with temporary pre-manufactured cap.

3.03 CONCRETE PLACING

A. Place and consolidate concrete in accordance with References.
B. Place in one course of monolithic construction eliminating "cold" construction joints to the greatest extent practicable.
C. Remove and discard placed concrete back to the nearest planned joint when concreting is interrupted such that placed concrete has reached the flash set point or for more than one-half hour.
D. Install embedded detectable warning strips and drainage grate appurtenances in accordance with manufacturer's recommendations.

3.04 JOINTS

A. General
   1. Align joints across abutting sidewalks, curbs, and pavements paying particular attention to spacing of expansion joints and special scoring patterns indicated on Drawings.
   2. Divide panels into nominally equal areas with tooled joints unless indicated otherwise.

3. Sawn contraction joints are permitted only as indicated on the Drawings or to increase the depth of tooled joints for the Contractor's convenience.

B. Expansion Joints
1. Install transverse joints at the following maximum intervals.
   a. Sidewalks and Maintenance Strips: 40 feet and 5 to 10 feet each side of sidewalk grates spaced to match nominal scoring pattern.
   b. Curbs: 60 feet, 5 to 10 feet each side of curb drain inlets, and ends of curved sections
2. Install lateral joints against abutting surfaces where concrete is confined between or penetrated by rigid structures or furnishings such as buildings, stoops, planters, pole supports or bases, posts, utilities and sleeves, thicker pavement sections, etc.
3. Install additional joints where indicated on Drawings.

C. Contraction Joints
1. Install joints to coincide with tooled joints at not greater than the following nominal intervals.
   a. Sidewalks: 8 to 10 feet
   b. Curbs and Aprons: 12 to 15 feet
2. Install additional joints where indicated on Drawings.
3. Tool or saw joints to 1/3 the nominal thickness of the pavement section or curb.

3.05 FINISHING AND CURING

A. Edging
1. Tool joints and edges with 1/8 inch radius tool or as indicated on Details.
2. Retool edges and joints following broom finishing leaving trowel finish tool marks when indicated on Drawings.
3. Clean out expansion joints.

B. Surface Finishes
1. Sidewalks: Light broom perpendicular to direction of travel.
2. Curbs: Medium broom perpendicular to direction of travel.

C. Curing
1. Apply curing compound on all exposed surfaces immediately after finishing.
2. Apply uniformly in accordance with Manufacturer's recommendations at a minimum rate of one gallon per 200 square feet.
3. Apply compound on exposed surfaces if forms are removed before 7 days of cure time.

3.06 TOLERANCES

A. Comply with ACI 117 tolerances and the following.
1. Lateral Alignment and Spacing of Bars and Dowels: 1 inch
2. Vertical Alignment of Bars and Dowels: 1/4 inch
3. Joint Spacing: 2 inches
4. Joint Width: Plus 1/8 inch
5. Thickness: Minus 1/4 inch in any dimension
6. Elevation: Plus or minus 1/8 inch
7. Plumb and Alignment: Plus or minus 1/4 inch in 10 feet
8. Surface Smoothness: 1/4 inch in 10 feet
9. Ponded Water Depth: 1/16 inch
10. Contraction Joint Depth: Minus 1/8 inch

B. Provide tolerance checking in the presence of the Owner, if requested.

3.08 FIELD QUALITY CONTROL

A. Tests and Observations
1. Conduct tests in accordance with References.
2. Obtain a minimum of two sets of test cylinders for compressive strength testing for each type of concrete placed daily.
3. Test for slump and air content.
4. Provide field curing of additional cylinders for testing results of cold weather placing and curing.

5. Obtain additional cylinders and perform higher frequency of daily testing if recommended by the Testing Laboratory and approved by the Owner.

B. The Owner reserves the right to take corings of the concrete or to order non-destructive testing to verify field test results.

C. Observations for ponded water will be conducted by the Owner with the Contractor present following a rainfall event that produces a measurable amount of runoff.

3.09 PROTECTION

A. Protect newly placed concrete from detrimental effects of the weather in accordance with References.

B. Do not allow traffic on roadways, drives, or aprons until minimum cure time of 14 days has passed or as recommended by the Testing Laboratory.

C. Do not allow vehicular traffic or storage of concentrated loads on unreinforced or minimally cured concrete.

D. Do not allow direct contact with concrete surfaces of any material that may cause staining or discoloration.

E. Delay placing of curbs across temporary haul roads or provide temporary ramps and covering of curbs that must be traveled over.

3.10 CLEANING

A. Sweep pavement and remove stains and discoloration prior to final inspection.

PARKING BUMPERS – 32 17 13

1. SCOPE OF WORK: Place wheel stops where indicated in the contract documents. At a minimum an allowance for new wheel stops shall be included at each accessible parking stall and any stall that is signed.
2. WHEEL STOPS: Precast, 3.5% minimum air entrained concrete; 4000 psi minimum compressive strength. Each stop shall be reinforced with two No. 4 deformed steel reinforcing bars, minimum. Provide chamfered corners and drainage slots on underside, and provide holes for dowel-anchoring to substrate. Unless indicated otherwise, provide stops of half octagonal configuration and 36-inch length.
   2.1. Precast wheel stops shall be manufactured for the intended purpose by a company or firm specializing in the manufacture of precast concrete parking appurtenances.
3. ADHESIVE FOR BONDING DOWEL TO WHEEL STOP: As proposed by Contractor and approved by the manufacturer, suitable for application.
4. STEEL BARS FOR INSTALLATION: Galvanized 5/8” diameter steel dowels or galvanized No. 5 steel reinforcing bars.
5. INSTALLATION: Securely attach wheel stops into at-grade concrete and at-grade asphalt pavement with not less than two galvanized steel dowels embedded in holes cast into wheel stops. Firmly bond each dowel to wheel stop and to pavement. At concrete pavement, drill holes in pavement for dowels. At parking structure slabs, epoxy to slab.

PAINTED PAVEMENT MARKINGS – 32 17 23 13

1. SCOPE OF WORK: Provide all striping and painting as indicated in the contract documents. At a minimum the contractor should include all parking bays, crosswalks, arrows, handicapped symbols and curb markings required for a whole and complete parking/traffic control system as described in the contract documents.
   1.1. Striping color to be verified with the local code official. If required, accessible parking stalls may be a different color.
   1.2. Coordinate with local official for all fire zone or other required painting.
2. LAYOUT PLAN: Contractor to provide a striping layout plan to the Owner and Architect for approval prior

to proceeding with the work. Include color of all striping as verified by the local official.

3. LINE AND ZONE MARKING PAINT: MPI No. 97 Latex Traffic Marking Paint.
4. DELIVERY, STORAGE, AND HANDLING: Deliver paint in containers of at least 5 gallons accompanied by batch certificate. Store products in manufacturer's unopened packaging until ready for installation. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
5. FIELD CONDITIONS: Do not install products under environmental conditions outside manufacturer's absolute limits.
6. EXAMINATION: Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
7. PREPARATION: Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
8. CLEANING: Clean surfaces thoroughly prior to installation. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.
    8.1. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
9. INSTALLATION – GENERAL: Begin pavement marking as soon as practicable after surface has been cleaned and dried. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
10. APPLICATION: Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends. Apply paint in one coat only. Wet Film Thickness: 0.015 inch, minimum. Length Tolerance: Plus or minus 3 inches. Width Tolerance: Plus or minus 1/8 inch.
11. PARKING LOTS: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
12. SYMBOLS: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.
13. DRYING, PROTECTION, AND REPLACEMENT: Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method. Replace removed markings at no additional cost to Owner.

TACTILE WARNING SURFACING – 32 17 26

1. SCOPE OF WORK: Locate tactile warnings at a minimum:

1.1. All curb ramps

1.2. All parking access aisles, including from accessible stalls, building entrances, at side walk corners or any other access from the sidewalk to the parking area

1.3. In compliance with ADA Standards

1.4. As direct by the AHJ.

2. PRICING: Provide a price for each unit pricing. Include minimum six full width units.
3. SEALANT: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.
4. INSTALLATION, GENERAL: Install in accordance with manufacturer's written instructions. Locate relative to curb line in compliance with PROWAG, Sections 304 and 305. Orient so dome pattern is aligned with the direction of ramp.

SLURRY SEAL – 32 23 23

1. SCOPE OFWORK: Provide an allowance for slurry seal of all new bituminous paving installed prior to applying pavement markings.
2. REFERENCE STANDARDS: All materials and products used shall comply with State Department of Transportation Standard Specifications for Highway Construction.
3. QUALITY ASSURANCE: Perform Work in accordance with State Highway Standards. Mixing Plant to conform to State Highway Standards. Obtain materials from same source throughout.
4. REGULATORY REQUIREMENTS: Conform to paving work on public property: Caltrans 2006 Standard Specifications, Section 37-2 Slurry Seal, ISSA 2005 Recommended Performance Guidelines for Emulsified Asphalt Slurry Seal and ASTM D 3910-98
5. FIELD CONDITIONS: Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.
6. SEAL COAT DESIGN: The Contractor shall design the seal coat using DOT's seal coat design method. Base the design on the traffic volume(s) and pavement condition(s). Determine the starting application rate for the bituminous material and seal coat aggregate. Provide the following design information to the Project Engineer, two weeks before construction is to begin:

   6.1. Test results.

   6.2. Seal coat aggregate design application rate.

   6.3. Bituminous material design application rate.

   6.4. Loose unit mass [weight] of the aggregate.

   6.5. Bulk specific gravity of the aggregate.

   6.6. 150 pound sample of each proposed aggregate source.

   6.7. After the seal coat design has been established, the aggregate supplied to the Project shall conform to the QC tolerances in Table above. The tolerance range does not extend the specification limits set in Table.

7. EXECUTION: Apply seal coat to surface course in accordance with State Department of Transportation Highways standards as well as in strict accordance to the manufacturer's instructions.
8. CURBING: Any overlay or building up of existing surfaces shall not impact the required separation of walkaways and adjacent vehicular areas. Separation from walks and hazardous vehicular areas shall be provided throughout. Curbs shall be 6” in height minimum.
9. APPLICATION OF SEAL COAT: Prior to construction, calibrate the aggregate spreader in accordance with ASTM D5624, in the presence of the Engineer. The allowable deviation in the amount of aggregate spread on each of the rubber mats shall not exceed ±0.5 kg/m2 [± 1 pound per square yard] in the transverse direction, or ± 0.5 kg/m2 [± 1 pound per square yard] in the longitudinal direction, from the

design application rate. Provide uniformly moistened aggregates, which are damp at the time of placement. Immediately (within one minute) after the bituminous material has been sprayed, apply the aggregates. The speed of the spreader shall be such that the aggregates are not rolling over, and starting and stopping of the spreader is minimized. The edges of the aggregate applications shall be sharply defined. Previously used (sweeping) aggregates will not be allowed.

SPLASH BLOCKS – 32 30 00

1. SCOPE OF WORK: Provide a new splash block at each downspout termination. Slope away from building to drain into storm water management system.
   1.1. As an alternate to the base bid, provide total cost to provide and install all required splash blocks. Also include unit pricing.
2. PREFABRICATED CONCRETE SPLASH BLOCKS: Minimum 12" x 24" or, if located in a landscape buffer, provide drainage to the defined edge of the buffer. Tie splash blocks into under sidewalk drains.
3. EXAMINATION: Verify that all components are free of defects prior to installation.
4. INSTALLATION: Install in accordance with manufacturer's instructions. Install splash blocks to provide positive drainage away from the building and towards the natural downgrade of the site or to any designed swales. (2" drop in 24")

CHAIN LINK FENCE – 32 31 13

1. SCOPE OF WORK: Provide and install new chain link fence in the garage complying with local ordinance for look and location in locations as illustrated on the contract documents.
   1.1. At a minimum the contractor should include 16 linear feet of fence with all appropriate posts, rails, corner posts, caps, link, concrete etc. for a whole and complete system.
   1.2. Fence should be full height of garage with 7’-0” high gate
2. SECTION INCLUDES: Posts, rails, and frames. Wire fabric. Concrete. Accessories.
3. SUBMITTALS: Product Data: Provide data on fabric, posts, accessories, fittings and hardware.
4. SHOP DRAWINGS: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.
5. QUALITY ASSURANCE: Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.
6. WARRANTY: Correct defective Work within a five year period after Date of Substantial Completion. Provide five year manufacturer warranty for all material and labor.
7. POSTS, RAILS, AND FRAMES: Formed from hot-dipped galvanized steel sheet, ASTM A653/A653M, HSLAS, Grade 50, with G90 (Z275) zinc coating.
8. WIRE FABRIC: ASTM A392 zinc coated steel chain link fabric.
9. CONCRETE: Type specified in Section 03 30 00.
10. COMPONENTS
    10.1. Line Posts: 1.9 inch diameter.
    10.2. Corner and Terminal Posts: 2.38 inch diameter.
    10.3. Top and Brace Rail: 1.66 inch diameter, plain end, sleeve coupled.
    10.4. Fabric: 2 inch diamond mesh interwoven wire, 6 gage, 0.1620 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.
    10.5. Tension Wire: 6 gage, 0.1620 inch thick steel, single strand.

10.6. Tie Wire: Aluminum alloy steel wire.

11. ACCESSORIES: Caps: Cast steel galvanized; sized to post diameter, set screw retainer. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.
12. FINISHES: Components and Fabric: Vinyl coated, black color as selected, over coating of 1.8 oz/sq ft galvanizing. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M. Accessories: Same finish as framing. Color(s): Black.
13. EXAMINATION: Verify that areas are clear of obstructions or debris.
14. PREPARATION: Remove Obstructions and debris.
15. INSTALLATION: Install framework, fabric, accessories and gates in accordance with ASTM F567. Place fabric on outside of posts and rails. Set terminal and gate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff. Line Posts shall be drive set 40" minimum below grade. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one bay from end and gate posts. Provide top rail through line post tops and splice with 6 inch long rail sleeves. Position bottom of fabric 2 inches above finished grade. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips. Install bottom tension wire stretched taut between terminal posts. Do not attach the hinged side of gate to building wall; provide gate posts. Install hardware and gate with fabric full mesh infill to match fence. Ground fence.
16. TOLERANCES: Maximum Variation From Plumb: 1/4 inch. Maximum Offset From True Position: 1 inch. Do not infringe on adjacent property lines.
17. FIELD QUALITY CONTROL: Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines. Fence Height: Randomly measure fence height at three locations or at areas that appear out of conformance against design. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

SEEDING – 32 92 19

1. SCOPE OF WORK: Provide an allowance as part of the base bid to completely install and restore all areas affected by construction activity, to comply with the contract documents and as per the Owner's direction.
2. SEED MIXTURE: Residential Turf Grass: Kentucky Blue Grass at 50 percent, Creeping Red Fescue Grass at 30 percent, Red Top at 10 percent and Norlea Perennial Rye at 10 percent.
3. SEEDING: Apply seed at a rate of 3-4 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly. Do not seed areas in excess of that which can be mulched on same day. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.
4. SOIL MATERIALS: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
5. MULCHING MATERIAL: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
6. FERTILIZER: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil.
7. FERTILIZING: Apply fertilizer in accordance with manufacturer's instructions. Apply after smooth raking of topsoil and prior to roller compaction. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
8. WATER: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

SODDING – 32 92 23

1. SCOPE OF WORK: Provide an allowance as part of the base bid to completely install and restore all areas affected by construction activity, to comply with the contract documents and as per the Owner's direction.
2. SOD: TPI, Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners. Shall be 50 percent Kentucky Blue Grass.
3. LAYING SOD: Moisten prepared surface immediately prior to laying sod. Lay sod immediately after delivery to site to prevent deterioration. Lay sod smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil. After sod and soil have dried, roll sodded areas to ensure good bond between sod & soil & to remove minor depressions and irregularities. Roll sodded areas with roller not exceeding 200 lbs.
4. TOPSOIL: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay, or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.
5. FERTILIZER: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.
6. FERTILIZING: Apply fertilizer in accordance with manufacturer's instructions.

PLANTS – 32 93 00

1. SCOPE OF WORK: Provide an allowance as part of the base bid to provide and install all new planting as illustrated in the contract documents.
2. DESIGN: If required by the AHJ the Contractor shall, as part of the base contract, engage the services of a licensed Landscape Architect to provide all required documents to the AHJ and the Contractor's Landscaper.
3. FIELD CONDITIONS: Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.
4. WARRANTY: One year. Include coverage for one continuous growing season; replace dead or unhealthy plants.
5. REPLACEMENTS: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.
6. PLANTS: Species and size identified by Contractor's Landscaper or Landscape Architect, grown in climatic conditions similar to those in locality of the work.
7. PLANTING: Place plants for best appearance. Set plants vertical. Saturate soil with water when the pit or bed is half full of topsoil and again when full.
8. TOPSOIL: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 5.4 and maximum 7.0.
9. TOP SOIL MIX: A uniform mixture of 1 part peat and 3 parts topsoil by volume.
10. PLACING TOPSOIL: Spread topsoil to a minimum depth of 4 inches over area to be planted. Rake smooth.
11. FERTILIZER: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.
12. FERTILIZING: Apply fertilizer in accordance with manufacturer's instructions.
13. WATER: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.

14. MULCHING MATERIAL: Wood shavings, free of growth or germination inhibiting ingredients.
15. WRAPPING MATERIALS: Burlap.
16. STAKES: Softwood lumber, pointed end.
17. CABLE, WIRE, EYE BOLTS AND TURNBUCKLES: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.
18. MAINTENANCE: Provide maintenance at no extra cost to Owner; Owner will pay for water.

DIVISION 33

WATER UTILITIES – 33 10 00

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water piping and accessories for domestic consumption and fire protection.
B. Connection to building piping and water supply systems.
C. Bedding and encasement within the pipe zone.
D. Temporary water distribution for disrupted services.
E. Testing and disinfection.

1.02 RELATED SECTIONS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2333 – Trenching and Backfilling
C. Section 33 3000 – Sanitary Sewer Utilities
D. Section 33 4000 – Storm Drainage Utilities

1.03 REFERENCES

A. Minnesota Department of Health, Department of Labor and Industry, and State Plumbing Code.
B. City Engineers Association of Minnesota (CEAM): Standard Specification 2611 – Water Main and Service Line Installation, current edition.
C. City of Princeton Engineering Standards.
D. Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMRB), Recommended Standards for Water Works, current edition.
E. Minnesota Department of Transportation Standard Specifications for Construction (Mn/DOT), current edition with supplements.
F. American Water Works Association (AWWA)
    1. C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems
    2. C151 – Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
    3. C153 – Ductile-Iron Compact Fittings for Water Service
    4. C500 – Metal-Seated Gate Valves for Water Supply Service
    5. C509 – Resilient-Seated Gate Valves for Water Supply Service
    6. C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances
    7. C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
    8. C651 – Disinfecting Water Mains
    9. C800 – Underground Service Line Valves and Fittings
    10. C900 – Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4in. – 12in., for Water Distribution
G. ASTM International (ASTM)
    1. A48 – Specification for Gray Iron Castings
    2. B88 – Specification for Seamless Copper Water Tube
H. National Fire Protection Association (NFPA) Standard 24 – Installation of Private Fire Service Mains and Their Appurtenances
I. Underwriters Laboratory

J. Factory Mutual

1.04 DEFINITIONS

A. Definitions as described in Related Sections.

B. Hydrant Assembly: Branch connection for hydrant including tee, extension piping, gate valve, valve box and riser, ties and restraints, drainage fill, markers, and hydrant.

1.05 SYSTEM DESCRIPTION

A. Temporary Distribution: Provide design, obtain approval from Regulatory Authorities, and install and maintain temporary potable and fire protection water supplies for all users affected by the Work until permanent connections have been approved and put in service.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate Work to coincide with sequence of Work of Related Sections, schedule of building plumbing construction, work by the Water Utility, or work adjacent to the site in support of the Project.

B. Do not begin installation until Excavation and Fill is complete in area of installation.

C. Notification

1. Notify Testing Laboratory and allow time for necessary tests and inspections that may occur on a daily basis.
2. Notify permitting and code officials for required observations, testing, and inspections.

D. Provide all notifications and coordination for temporary shutdown of existing service, which may also include Work performed outside of regular work hours, on weekends, or holidays; either as necessary to maintain the schedule, minimize impacts of temporary shutdown, or for the convenience of the Contractor.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Ductile Iron (DIP)

1. Pipe: AWWA C151 with cement mortar lining, Class 52
2. Joints: Mechanical joint within 10 feet of buildings or sewers (storm and sanitary); push on elsewhere.
3. Fittings: AWWA C153

B. Polyvinyl Chloride (PVC)

1. Pipe: AWWA C900, grade and pressure class equivalent to Class 52 DIP
2. Joints and Fittings: As specified for DIP.

C. Copper

1. Pipe: ASTM B88, Type K, Soft Annealed Temper
2. Joints: Complying with local standards and the State Plumbing Code
3. Valves, Stops, and Fittings: Cast brass, flared or compression type, conforming to local standards and AWWA C800.

2.02 HYDRANTS

A. Hydrants, hydrant assemblies, accessories, and requirements for drainage fill shall meet all standards of, and be approved by, the local utility service provider and fire protection agency.

2.03 VALVES

A. Gate Valves

1. General
   a. In accordance with locally approved pattern.
   b. Non-rising stem with O-ring stem seals.
   c. Cut tooth steel gears housed in ductile or cast iron extended type grease cases.
   d. Open indicating arrow, manufacturer's name, pressure rating, and year of manufacture cast into body.
   e. Two inch square operating nut opening counterclockwise.

f. Mechanical joints.
2. AWWA C500: Two faced, double disc.
3. AWWA C509: Single disc with resilient seat bonded or mechanically attached to gate or valve body.

B. Tapping Valves: Conforming to requirements of the Water Utility.

2.04 ACCESSORIES

A. Curb Stop Service Boxes
1. Gray iron conforming to ASTM A48, Class 20 minimum.
2. 18 inches of adjustment for burial depth indicated on details.

B. Valve Boxes
1. Ductile or cast iron conforming to ASTM A48, Class 30 minimum.
2. Three piece adjustable screw type riser with 5-1/4" shaft for bury depth indicated on details.
3. Lid with cast letters indicating WATER.

C. Valve Housings and Meter Boxes: Manhole, vault, or other enclosure as indicated on Drawings.

D. Joint Restraints: Meeting local requirements or the following where no standard applies.
1. Retainer Glands: Ductile iron by American, US Pipe, Mega-Lug, or approved substitute for 2 times line pressure plus water hammer.
2. Tied Joints: Stainless steel nuts, bolts, and rods.
3. Thrust Blocking: 3000 psi Portland cement concrete. Mn/DOT 2461, Type 3, Grade B.

E. Polyethylene Tube and Sheet Material: Conforming to AWWA C105, 8 mil nominal thickness, and tape recommended by Manufacturer.

F. Bedding and Encasement: As indicated on details or recommended by pipe Manufacturer.

G. Indicator Post: Conforming to requirements and approved by the local fire protection agency or Water Utility.

H. Location Marking
1. Terminal ends: 4X4 nominal wood post
2. Plastic Pipe: Detectable tape or tracer wire meeting local requirements.

2.05 SOURCE QUALITY CONTROL

A. Obtain test reports or certificates for material composition and gradation of Bedding, Encasement, and Drainage fill material as specified in Related Sections.

B. Obtain material from same source throughout construction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify benchmarks and baselines established for layout are set consistent with Drawings.

B. Verify locations of building drains and collector service requiring coordination for connection.

C. Verify Earth Moving is complete in area of installation.

3.02 PREPARATION

A. Provide qualified personnel for the establishment of line and grade from benchmarks and baselines established for the Work.

B. Provide equipment, implements, and tools adequate in size to complete the work safely and in a timely manner.

C. Remove foreign matter and dirt from joints, gaskets, and inside of pipe before lowering into trench.

3.03 PIPE INSTALLATION

A. Install pipe and appurtenances in accordance with applicable References and Manufacturer's recommendations for each type of pipe and appurtenant item.

B. Verify that trench is excavated for specified depth of cover and bottom is acceptable providing support for the full barrel of the pipe as specified in Related Sections.

C. Install Bedding as indicated in details.

D. Lower materials into trench without dropping.
E. Secure each pipe length at the midpoint with specified Encasement or suitable backfill material before installing the next length of pipe.
F. Mark the spigot end of each pipe prior to laying for verification that the joint has been seated to the full depth of the bell.
G. Provide blocking, anchoring, and restraint of pipe and fittings in accordance with Manufacturer's recommendations, details, and Water Utility standards.
H. Install Encasement or backfill material within the pipe zone after joint seals are affected, necessary testing is completed and approved, and other conditions will permit.
I. Install material equally on both sides of pipe with hand tools or hand guided mechanical equipment to prevent jarring or wedging out of alignment.
J. Install Encasement material in accordance with pipe manufacturer recommendations.
K. Provide plugs or stoppers in end of pipe when pipe laying is not in progress.
L. Seal pipe left open for future connection with a manufactured plug or other approved method and mark with a 4X4 wood post, with the top 2 feet painted blue, with bottom set one foot in front of and one foot above pipe end and terminating 2 feet below grade.

3.04 BUILDING SERVICE INSTALLATION

A. General
1. Install building services as specified for distribution piping.
2. Provide connection to stub from building when available or plug terminal end of service at connection point with a manufactured plug and mark with wood post.

B. Copper Service Pipe
1. Install pipe 1-1/4 inch diameter and smaller in one piece between corporation stop and curb stop.
2. Install larger diameter pipe and all other pipe elsewhere in standard manufactured roll lengths.
3. Install corporation stops, expansion loops, curb stops, and service boxes in accordance with Water Utility standards, details, and CEAM.

3.05 INSTALLATION NEAR SEWERAGE UTILITIES

A. Parallel
1. Maintain 10 foot separation between outside of pipe to outside of sewerage and drainage utility pipes and structures where possible.
2. Verify that sewerage and drainage piping has been constructed and tested to water main standards for full length between structures when within 10 feet of water utilities. Maintain vertical separation of pipes and bottom of trench bench configuration in accordance with requirements of the Department of Health and applicable References.

B. Crossings
1. Locate uncut pipe section such that joints are equidistant each side of crossing.
2. Provide vertical separation of 18 inches between outside of pipes with preference for water above sanitary sewer.
3. Provide coordination for insulating water main as indicated on the Drawings, if depth of cover is less than 8 feet, or as required by the Water Utility.

3.06 HYDRANT ASSEMBLY INSTALLATION

A. Install hydrants plumb with pumper nozzle oriented to the access lane.
B. Install hydrants for required depth of cover with traffic flange elevation relative to finished surface as indicated on details.
C. Install hydrant valves, support blocking, ties, anchorage devices, drainage pits, and above ground hydrant markers in accordance with local Water Utility standards and details.

3.07 VALVE INSTALLATION

A. Install gate valves at locations shown on Drawings with valve box and riser or valve pit structure.
1. Center valve boxes over the operating nut with risers plumb.

2. Install pit structures on a prepared and compacted base in accordance with details.
3. Provide ties and support blocking in accordance with requirements of Water Utility and details.

B. Obtain prior approval from the Water Utility before installing isolation valves for the convenience of the Contractor.
1. Isolation valves shall be supplied at the Contractor's expense.
2. Leave isolation valves in an open condition and bury without valve boxes or risers on completion of testing unless directed otherwise by the Water Utility.

3.08 ACCESSORY INSTALLATION

A. Install drainage blow offs, air vents, indicator posts, and polyethylene corrosion protection in accordance with Water Utility requirements, References, and Manufacturer's recommendations.

3.09 FIELD QUALITY CONTROL

A. Observation and testing for Trenching and Backfilling is specified in Related Sections.
B. Provide coordination for necessary inspections by Regulatory Authorities.
C. Provide disinfection and hydrostatic testing in accordance with References, the plumbing code, and the Department of Health.
D. Provide electrical conductivity testing in accordance with CEAM.
E. Provide all necessary equipment and incidental items to complete disinfection and testing.
F. Operational Inspection/Demonstration
1. Public: Operation of valves and hydrants shall be conducted by the Water Utility for systems installed within Public right-of-way or easements.
2. Private: Operation of valves and hydrants shall be conducted by the Owner and observed by the Contractor and Engineer in accordance with CEAM.

3.10 ADJUSTING

A. Make final adjustments of structure top castings, valve box risers, and curb stop service boxes to finished grade before final surfaces are completed.
B. Set structure tops and valve box lids 1/4 to 1/2 inch below pavement in traffic areas, flush elsewhere.

SANITARY SEWER UTILITIES – 33 30 00

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewer structures, appurtenances, and accessories.
B. Gravity sewer piping and force mains.
C. Connection to building and collection systems.
D. Bedding and encasement within the pipe zone.
E. Coordination for installation of grease traps, sand/oil separators, etc.
F. Temporary sewage handling for disrupted services.
G. Testing.

1.02 RELATED SECTIONS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2333 – Trenching and Backfilling
C. Section 33 1000 – Water Utilities
D. Section 33 4000 – Storm Drainage Utilities

1.03 REFERENCES

A. Minnesota Department of Health, Department of Labor and Industry, and the State Plumbing Code.
B. City Engineers Association of Minnesota (CEAM): Standard Specification 2621 – Sanitary Sewer and Storm Sewer Installation, current edition

C. City of Princeton Engineering Standards.
D. Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMRB), Recommended Standards for Water Works, current edition.
E. Minnesota Department of Transportation Standard Specifications for Construction (Mn/DOT), current edition with supplements.
F. American Association of State Highway Transportation Officials (AASHTO) M198 – Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
G. ASTM International (ASTM)
1. A48 – Specification for Gray Iron Castings
2. C443 – Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
3. C478 – Specification for Precast Reinforced Concrete Manhole Sections
4. D1785 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
5. D2321 – Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
6. D2665 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
7. D3034 – Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
8. D3212 – Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
9. D3311 – Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
10. F679 – Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
11. F794 – Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
12. F891 – Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core
13. F949 – Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
14. F1866 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and (DWV) Fabricated Fittings

H. American Water Works Association (AWWA)
1. C151 – Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids
2. C900 – Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4in. – 12in., for Water Distribution

1.04 DEFINITIONS

A. Definitions as described in Related Sections.

1.05 SYSTEM DESCRIPTION

A. Temporary Sewage Handling: Provide design, obtain approval from Regulatory Authorities, and install and maintain temporary storage and hauling, or bypass pumping, of sanitary sewer flows for all users affected by the Work until permanent connections have been put in place.

1.06 SUBMITTALS

A. Permits: Evidence of permits applied for and received.
1. Submit at pre-construction meeting.
2. For information only.
B. Product Data
1. Verification that products furnished meet specified requirements.
2. Submit at pre-construction meeting.
3. For information only.
C. Samples: Provide coordination for obtaining samples of granular materials.
D. Quality Assurance
1. Test reports for Bedding and Encasement material.

a. Submit 14 days prior to delivery.
b. For information only.

2. Reports for leakage and deflection tests.
   a. Submit with final pay request.
   b. For information only

E. Project Record Documents
1. Locations of piping and appurtenances, if installed different from Drawings.
2. Submit prior to request for final payment.

1.07 QUALITY ASSURANCE

A. Material and gradation testing or certifications required for SOURCE QUALITY CONTROL of Bedding and Encasement material are as specified in Related Sections.
B. Marking: Pipe and structures shall be clearly marked as to type and strength with ASTM or other standard referenced.
C. Regulatory Requirements
1. Obtain necessary permits, comply with local codes and standards, and requirements of the Minnesota Department of Health, the Department of Labor and Industry, and the State Plumbing Code.
2. Provide higher quality of materials or performance over that specified when required by Regulatory Authorities.
D. Work by Sewer Utility: Verify extent of work to be provided, or inspections to be conducted, by Sewer Utility relating to connections and pipe or appurtenant installation within Public rights-of-way and easements.
E. Pre-construction Meeting: Schedule and attend a coordination meeting with the representative of the Sewer Utility, the building plumbing Contractor, Contractors performing Work of Related Sections, and the Owner.

1.08 DELIVERY, STORAGE AND HANDLING

A. Granular Materials: Requirements for granular materials are as specified in Related Sections.
B. Shipping and Handling
1. Prevent damage to pipe and structure joints, contamination of interiors, and avoid jolting contact, dropping, or dumping.
2. Lift large pipe sections and manhole sections by cast lift holes with devices provided or other methods recommended by the Manufacturer.
C. Acceptance at Site
1. Inspect materials at time of unloading.
2. Reject materials that are damaged, with unsound joint surfaces, damaged gaskets, or any defects or imperfections that will preclude installation to a water tight condition.
D. Storage and Protection
1. Schedule delivery to preclude long term storage on site.
2. Store materials in a clean and secured location outside of active work zones and away from traveled ways until time of installation.
3. Provide protection recommended by the Manufacturer for products susceptible to UV degradation.

1.09 PROJECT CONDITIONS

A. Environmental requirements are as specified in Related Sections.
B. Temporary Shutdown
1. Provide proper notification to all affected property owners for temporary shutdown of public system for short durations.
2. Provide bypass pumping when one half of available storage of existing system will be exceeded during shutdown.
   a. Obtain approval from Regulatory Authorities before shutting down service.
   b. Maintain pumping until new construction has been approved.

1.10 SEQUENCING AND SCHEDULING

A. Coordinate Work to coincide with sequence of Work of Related Sections, schedule of building plumbing construction, work by the Sewer Utility, or work adjacent to the site in support of the Project.

B. Do not begin installation until Earth Moving is complete in area of installation.

C. Notification

1. Notify Testing Laboratory and allow time for necessary tests and inspections that may occur on a daily basis.
2. Notify permitting and code officials for required observations, testing, and inspections.

D. Provide all notifications and coordination for temporary shutdown of existing service, which may also include Work performed outside of regular work hours, on weekends, or holidays; either as necessary to maintain the schedule, minimize impacts of temporary shutdown, or for the convenience of the Contractor.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride (PVC)

1. Gravity Pipe
   a. Conforming with requirements of ASTM D3034 and ASTM F679 – SDR 35/26, Schedule 40, or of the size and strength shown on the Drawings.
   b. Corrugated PVC with smooth interior shall conform to ASTM F949 for size and wall thickness shown.
2. Pressure Pipe: Conforming to AWWA C900 with Compact Ductile Iron fittings.
3. Joints
   a. Gravity: Push-on with elastomeric gasket bonded to the recess of the bell end conforming to ASTM D3212.
   b. Pressure: Mechanical joints within 10 feet of buildings or water utilities, push-on elsewhere.

B. Ductile Iron Pipe (DIP)

1. Conforming to AWWA C151 with cement mortar lining, Class 52
2. Joints: Mechanical joints within 10 feet of buildings and water utilities, push-on elsewhere.

2.02 STRUCTURES

A. Precast concrete riser sections, base and top slabs, cones, and grade (adjusting) rings: Conforming to requirements of ASTM C478 and Mn/DOT 2506.

1. Air entrained concrete with 5 – 7 percent air content.
2. Through wall lift holes are not permitted.
3. Base for outside drops shall be monolithic with the structure base.

B. Joints: O-ring CX-2 gaskets or full thickness mastic recommended by the structure manufacturer for relatively watertight condition.

C. Top Slabs: Meeting AASHTO HS-20 Highway Loading Design.

D. Pipe Connections

1. Direct: Gasketed, flexible, leak tight connection.
2. Outside Drops: Ductile Iron Pipe or pre-cast in accordance with details.

E. Cast Iron Frames and Lids: Gray Iron conforming to ASTM A48.

1. Class 30 or better of nominal dimensions and weights shown on the Plans.
2. Machine milled bearing surfaces.
3. Lids shall have cast lettering indicating SANITARY SEWER.

2.03 APPURTENANCES AND ACCESSORIES

A. Tees, Wyes, and Fittings

1. Integral to the pipe of the same type, strength, or class specified for pipe.
2. Fittings for connecting dissimilar materials shall be specially manufactured for the intended purpose and shall comply with requirements of the Department of Health and the Plumbing Code.

3. Fittings for C900 shall be ductile iron.

B. Concrete
   1. 3000 psi Portland Cement Concrete meeting requirements of Mn/DOT 2461, Type 3, Grade B.
   2. Concrete exposed to weather shall be air entrained.

C. Mortar: One part Type S Masonry Cement and 2 parts clean, sharp sand with 7 -10 percent air entrainment meeting requirements of ASTM C270.

D. Steps: Cast in place Aluminum, Cast Iron, or Steel Reinforced Plastic in conformance with Mn/DOT Standard Plate 4180J.

E. Bedding and Encasement
   1. Flexible Pipe: Granular materials complying with ASTM D2321, Type 1.
   2. Rigid Pipe: Suitable on site material generated from Trench Excavation or Earth Moving operations.

F. Location Marking
   1. Terminal ends: 4X4 nominal wood post
   2. Plastic Pipe: Detectable tape or tracer wire meeting local requirements.

2.04 SOURCE QUALITY CONTROL

A. Obtain test reports or certifications for material and gradation of Bedding and Encasement material as specified in Related Sections.

B. Obtain approved material from the same source throughout construction.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify benchmarks and baselines established for layout are set consistent with Drawings.

B. Verify locations of building drains and collector service requiring coordination for connection.

C. Verify Excavation and Fill is complete in area of installation.

3.02 PREPARATION

A. Provide qualified personnel for the establishment of line and grade from benchmarks and baselines established for the Work.

B. Provide equipment, implements, and tools adequate in size to complete the work safely and in a timely manner.

C. Provide bypass pumping for active sewers requiring interruption for completion of the Work.

D. Remove foreign matter and dirt from joints, gaskets, and inside of pipe before lowering into trench.

3.03 PIPE INSTALLATION

A. Begin laying pipe at the downgrade end of the system.

B. Verify that trench bottom is acceptable providing support for the full barrel of the pipe as specified in Related Sections.

C. Install Bedding for flexible pipe as indicated in Details.

D. Lower materials into trench without dropping.

E. Set bell ends of pipe in the upgrade direction.

F. Provide plugs or stoppers in end of pipe when pipe laying is not in progress.

G. Secure each pipe length at the midpoint with specified Encasement or suitable backfill material before installing the next length of pipe.

H. Mark the spigot end of each pipe prior to laying for verification that the joint has been seated to the full depth of the bell.

I. Install and connect joints in accordance with Manufacturer's recommendations and References.

J. Install Encasement or backfill material in accordance with pipe Manufacturer's recommendations within the pipe zone after joint seals are effected, necessary testing is completed and approved, and other conditions will permit.

K. Install material equally on both sides of pipe with hand tools or hand guided mechanical equipment to prevent jarring or wedging out of alignment.

L. Install Encasement material for flexible pipe in accordance with ASTM D2321.
M. Seal pipe left open for future connection with a manufactured plug or other approved method and mark with a 4X4 wood post with bottom set one foot in front of and one foot above pipe end and terminating 2 feet below grade.

3.04 STRUCTURE INSTALLATION

A. Orient structures such that cones and slab openings will be over steps with steps installed nominally over the outlet pipe.
B. Set bases on properly prepared and compacted subbase to provide full support to the completed unit.
C. Assemble risers and cone sections with gaskets for a leak tight condition.
D. Set bottom riser sections and top slabs in a full bed of mastic or mortar. Solid sewer block and mortar construction of structure bottom is only permitted if called out on Drawings.
E. Cone and top slab elevations shall be within 12 inches of final grade to permit placement of not more than six nominal 2 inch adjusting rings.
    1. Set adjusting rings in full beds of mortar and surround with a concrete collar when shown on Details.
    2. Rings shall not deviate more than 1/4 inch from plumb per each ring.
F. Shape bottoms of structures with concrete to the midpoint of the lowest pipe to provide uniform flow through invert troughs and adjacent sloped top benches of not less than 2 percent.

3.05 APPURTENANCE INSTALLATION

A. Set casting assemblies in a full bed of mortar without shims or blocking and surround with a concrete collar when shown on Drawings.
    1. Schedule final adjustment of castings to coincide with construction of finished surrounding surfaces.
    2. Set castings 1/4 to 1/2 inch below paved surfaces, and flush with lawn or open areas as reflected on Drawings.
B. Service Installation
    1. Install service pipes as specified for main line piping, as shown on Details, and conforming to standards of Regulatory Authorities.
    2. Orient service wyes and tees such that the invert of the service pipe matches the midpoint of the collector.
    3. Provide bends not exceeding 22-1/2 degrees for the connection.
C. Connect service pipe to building drain at a point outside the building when shown.
    1. Coordinate termination points of connection with building mechanical contractor.
    2. Plug terminal end of service and mark with wood post if connection is not available.

3.06 INSTALLATION NEAR WATER UTILITIES

A. Parallel
    1. Maintain 10 foot separation between outside of pipe and structures to outside of water utilities where practical.
    2. Construct pipe to water main standards for full length between structures and pressure test to a minimum of 150 psi when within 10 feet of water utilities.
    3. Maintain vertical separation of pipes and bottom of trench bench configuration in accordance with the Department of Health and applicable References.
B. Crossings: Locate uncut pipe section such that joints are equidistant each side of crossing.

3.07 FIELD QUALITY CONTROL

A. Observation and testing for Trenching and Backfilling is specified in Section 02333.
B. Provide the following minimum testing of the installed system and any additional testing required by Regulatory Authorities.
    1. Clean pipe system and structures prior to testing by jetting or flushing with a ball.
    2. Do not flush sediment or debris into downstream receiving systems.
C. Gravity Pipe

1. Deflection Test
    a. Perform deflection testing of all flexible pipe a minimum of 30 days after trenches have been backfilled to rough grade.
    b. Use a rigid ball or 9 point mandrel (Mn/DOT Memorandum 98-24-B-01) with diameter equal to 95 percent of the actual inside pipe diameter.
    c. The ball or mandrel shall pass through the pipe without the aid of mechanical pulling devices for a successful test.
2. Leakage Test: Perform leakage testing in accordance with subpart 2621.3F of CEAM Standard Specifications.

D. Pressure Pipe: Force main shall be tested as specified for water main in Related Sections at a pressure of 2 times the operating pressure plus water hammer.

STORM DRAINAGE UTILITIES – 33 40 00

PART 1 GENERAL

1.01 SECTION INCLUDES

1. Storm drainage piping, structures, appurtenances, and accessories.
2. Connection to collection systems.
3. Subsoil drainage piping and accessories.
4. Bedding and encasement within the pipe zone.
5. Structural management systems for detention and release of storm water.
6. Temporary bypass for disrupted services.
7. Testing.

1.02 RELATED SECTIONS

A. Provisions of the Contract including Contracting and General Requirements.
B. Section 31 2300 – Excavation and Fill
C. Section 31 2333 – Trenching and Backfilling
D. Section 32 1216 – Asphalt Paving
E. Section 32 1313 – Concrete Paving

1.03 REFERENCES

A. Minnesota Department of Health, Department of Labor and Industry, and the State Plumbing Code.
B. City Engineers Association of Minnesota (CEAM): Standard Specification 2621 – Sanitary Sewer and Storm Sewer Installation, current edition
C. City of Princeton Engineering Standards.
D. Minnesota Department of Transportation Standard Specifications for Construction (Mn/DOT), current edition with supplements.
E. American Association of State Highway Transportation Officials (AASHTO)
    1. M198 – Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
    2. M252 – Specification for Corrugated Polyethylene Drainage Pipe (3" - 10")
    3. M294 – Specification for Corrugated Polyethylene Pipe, 12 to 60 inch Diameter
F. ASTM International (ASTM)
    1. A48 – Specification for Gray Iron Castings
    2. C76 – Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
    3. C270 – Specification for Mortar for Unit Masonry
    4. C361 – Specification for Reinforced Concrete Low-Head Pressure Pipe
    5. C443 – Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
    6. C478 – Specification for Precast Reinforced Concrete Manhole Sections
    7. D1785 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
    8. D2321 – Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

9. D2665 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
10. D3034 – Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
11. D3212 – Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
12. D3311 – Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns
13. F477 – Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
14. F679 – Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
15. F794 – Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
16. F891 – Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core
17. F949 – Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings
18. F1336 – Specification for Poly (Vinyl Chloride) (PVC) Gasketed Sewer Fittings
19. F1866 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and (DWV) Fabricated Fittings
20. F2306 – Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

1.04 DEFINITIONS

A. Definitions as described in Related Sections.

1.05 SYSTEM DESCRIPTION

A. Temporary Bypass: Provide design, obtain approval from Regulatory Authorities, and install temporary bypass pumping or diversion of storm sewer flows for users affected by the Work until permanent connections have been put in place.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate Work to coincide with sequence of Work of Related Sections, work by the Sewer Utility, or work adjacent to the site in support of the Project.
B. Do not begin installation until Excavation and Fill is complete in area of installation.
C. Notification
   1. Notify Testing Laboratory and allow time for necessary tests and inspections that may occur on a daily basis.
   2. Notify permitting and code officials for required observations, testing, and inspections.

1.07 MAINTENANCE

A. Provide periodic inspections and maintenance of the systems, including sediment removal, until all surfaces contributing runoff have been permanently restored and the Notice of Termination or a transfer for the NPDES/SDS permit has been submitted as specified in Related Sections.
B. If unexpected amounts of sediment occur within systems, or noticeable erosion or sediment transport has occurred on exposed areas of the site, examine downstream conveyance systems and provide cleaning as needed.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride (PVC)
   1. Pipe: Conforming to requirements of ASTM D3034 and ASTM F679 – SDR 26 or of the size and strength requirements shown on the Drawings.
   2. Joints: Push-on with elastomeric gasket bonded to the recess of the bell end conforming to ASTM D3212.
B. Reinforced Concrete Pipe (RCP)
   1. Pipe

a. Conforming to requirements of ASTM C76 of size and strength Class shown on the Drawings.
b. Through wall lift holes are not permitted unless noted.

2. Joints: Rubber O-ring (CX-4) or profile joints conforming to ASTM C361, ASTM C443, or AASHTO M198.

C. High Density Polyethylene (HDPE)

1. Subsoil Drainage Tubing
   a. Pipe: Conforming to AASHTO M252.
   b. Joints: Hinged split coupler joints for drainage applications.

2.02 STRUCTURES

A. Precast concrete riser sections, base and top slabs, cones, and grade (adjusting) rings: Conforming to requirements of ASTM C478 and Mn/DOT 2506.
1. Air entrained concrete with 5 – 7 percent air content.
2. Through wall lift holes are not permitted.
3. Base for outside drops shall be monolithic with the structure base.

B. Joints: O-ring CX-2 gaskets or full thickness mastic recommended by the structure manufacturer for relatively watertight condition.

C. Top Slabs: Meeting AASHTO HS-20 Highway Loading Design.

D. Pipe Connections: Gasketed, flexible, leak tight connection.

E. Cast Iron Frames, Covers, and Grates
1. Gray Iron Castings conforming to ASTM A48.
2. Class 30 or better of nominal dimensions and weights shown on the Drawings.
3. Machine milled bearing surfaces.
4. Covers shall have cast lettering indicating STORM SEWER.
5. Grates submitted for substitution shall have equivalent or greater free open area.
6. Grates in traveled ways shall be bicycle safe.

2.03 APPURTENANCES AND ACCESSORIES

A. Tees, Wyes, and Fittings
1. Integral to the pipe of the same type, strength, or class specified for pipe.
2. Fittings for connecting dissimilar materials shall be specially manufactured for the intended purpose and shall comply with requirements of the Department of Health and the Plumbing Code.

B. Concrete
1. 3000 psi Portland Cement Concrete meeting requirements of Mn/DOT 2461, Type 3, Grade B.
2. Concrete exposed to weather shall be air entrained.

C. Mortar: One part Type S Masonry Cement and 2 parts clean, sharp sand with 7 -10 percent air entrainment meeting requirements of ASTM C270.

D. Steps: Cast in place Aluminum, Cast Iron, or Steel Reinforced Plastic in conformance with Mn/DOT Standard Plate 4180J.

E. Bedding and Encasement
1. Flexible Pipe: Granular materials complying with ASTM D2321, Type 1.
2. Rigid Pipe: Suitable on site material generated from Trench Excavation or Earth Moving operations.
3. Subsoil Drains: Sound, durable, pit run or crusher run material meeting the following gradation requirements: Mn/DOT 3149.2J with Mn/DOT 3733 Type II nonwoven geotextile.

Sieve Size	Percent Passing
1 inch	100
3/4 inch	75-100
# 4	0-60
# 40	0-50
# 200	< 3

F. Trench Drains: Pre-formed or cast in place to the nominal dimensions shown with grate indicated or approved substitute capable of carrying HS-20 traffic loads.
G. PVC Drain Inlets: Inlet and dome/light duty grate manufactured by Nyloplast-ADS, London, Ohio (612-296-7692) or approved substitute.
H. Pipe Sock: Woven or non-woven furnished on pipe by Manufacturer
I. Location Marking
1. Terminal ends: 4X4 nominal wood post
2. Plastic Pipe: Detectable tape or tracer wire meeting local requirements.

2.04 SOURCE QUALITY CONTROL
A. Obtain test reports or certifications for material and gradation of Bedding and Encasement material as specified in Related Sections.
B. Obtain approved material from the same source throughout construction.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify rough grading is complete and essential permanent or temporary storm water management facilities are in place and ready to receive runoff from the constructed system.
B. Verify benchmarks and baselines established for layout are set consistent with the Drawings.

3.02 PREPARATION
A. Provide qualified personnel for the establishment of line and grade from benchmarks and baselines established for the Work.
B. Provide equipment, implements, and tools adequate in size to complete the work safely and in a timely manner.
C. Remove foreign matter and dirt from joints, gaskets, and inside of pipe before lowering into trench.

3.03 PIPE INSTALLATION
A. Begin laying pipe at the downgrade end of the system.
B. Verify that trench bottom is acceptable providing support for the full barrel of the pipe as specified in Related Sections.
C. Install Bedding for flexible pipe as indicated in Details.
D. Lower materials into trench without dropping.
E. Set bell ends of pipe in the upgrade direction.
F. Provide plugs or stoppers in end of pipe when pipe laying is not in progress.
G. Secure each pipe length at the midpoint with specified Encasement or suitable backfill material before installing the next length of pipe.
H. Mark the spigot end of each pipe prior to laying for verification that the joint has been seated to the full depth of the bell.
I. Install and connect joints in accordance with Manufacturer's recommendations and References.
J. Install Encasement or backfill material in accordance with pipe Manufacturer's recommendations within the pipe zone after joint seals are effected, necessary testing is completed and approved, and other conditions will permit.
K. Install material equally on both sides of pipe with hand tools or hand guided mechanical equipment to prevent jarring or wedging out of alignment.
L. Install Encasement material for flexible pipe in accordance with ASTM D2321.
M. Seal pipe left open for future connection with a manufactured plug or other approved method and mark with a 4X4 wood post with bottom set one foot in front of and one foot above pipe end and terminating 2 feet below grade.

3.04 STRUCTURE INSTALLATION
A. Locate structures such that curb inlet castings will be set with proper orientation for curb boxes, and cones and slab openings will be over steps with steps installed nominally over the outlet pipe.

B. Set bases on properly prepared and compacted subbase to provide full support to the structure.
C. Assemble risers and cone sections with gaskets for a leak tight condition. Provide steps in cone and riser sections where the depth of the structure is 4 feet or more when measured from the rim elevation to the lowest portion of the concrete bottom bench.
D. Set bottom riser sections and top slabs in a full bed of mastic or mortar. Solid sewer block and mortar construction of structure bottom is only permitted if called out on Drawings.
E. Set cone and top slab elevations within 12 inches of final grade to permit placement of not more than six nominal 2 inch adjusting rings.
   1. Set adjusting rings in full beds of mortar and surround with a concrete collar when shown on Details.
   2. Rings shall not deviate more than 1/4 inch from plumb per each ring.

3.05 APPURTENANCE INSTALLATION

A. Cast Iron Frames, Grates, and Covers
   1. Set frames in a full bed of mortar without shims or blocking and surround with a concrete collar when shown on Details.
   2. Schedule final adjustments to coincide with construction of finished surrounding surfaces.
   3. Set rims 2 inches below gutter flow lines, 1/4 to 1/2 inch below paved surfaces, and flush with lawn or open areas.
B. Service Fittings
   1. Orient wyes and tees such that the invert of the service pipe matches the midpoint of the collector.
   2. Provide bends not exceeding 22-1/2 degrees for the connection.
C. Install trench drains concurrent with installation of pavements to the dimensions shown.
D. Install drain inlets in accordance with Manufacturer's recommendations.

3.06 FIELD QUALITY CONTROL

A. Observation and testing for Trenching and Backfilling is specified in Section 2333.
B. Provide the following minimum testing of the installed system and any additional testing required by Regulatory Authorities.
   1. Clean pipe system and structures prior to testing by jetting or flushing with a ball.
   2. Do not flush sediment or debris into downstream receiving systems.
C. Leakage Test
   1. Provide leakage testing for portions of the system meeting location, subsoil, or groundwater conditions as described in Minnesota Rule 4715.2820, Subp. 2a. B.
   2. Provide testing as required therein.

3.07 PROTECTION

A. Verify that erosion prevention and sediment control measures are in place or that final surfaces are permanently restored upstream of all drainage structures before requesting final inspection and quitting the site.

SUBDRAINAGE – 33 41 00

1. SCOPE OF WORK: Provide and install whole and complete subdrainage system as illustrated in the contract documents.
2. SECTION INCLUDESL Building Perimeter, Retaining Wall, and Under-Slab Drainage Systems. Playground drainage system. Filter aggregate and fabric and bedding.
3. REFERENCE STANDARDS: ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; latest edition.
4. SUBMITTALS: Shop Drawings: Indicate dimensions, layout of piping, high and low points of pipe inverts, gradient of slope between corners and intersections. Manufacturer's Certificate: Certify that products meet or exceed specified requirements. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

5. REGULATORY REQUIREMENTS: Conform to applicable code for materials and installation of the work of this section.
6. PIPE MATERIALS: Polyvinyl Chloride Pipe: ASTM D2729; plain end, 4 inch inside diameter; with required fittings. Use perforated pipe at subdrainage system; unperforated through sleeved walls.
7. AGGREGATE AND BEDDING: Filter Aggregate and Bedding Material: Granular fill as specified in Section 31 23 23.
8. ACCESSORIES: Pipe Couplings: Solid plastic. Filter Fabric: Water pervious type, black polyolefin.
9. EXAMINATION: Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout Drawings.
10. PREPARATION: Hand trim excavations to required elevations. Correct over-excavation. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.
11. INSTALLATION: Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions. Place drainage pipe on compacted impervious fill. Place pipe with perforations facing down. Mechanically join pipe ends. Install pipe couplings. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations. Refer to Section 31 23 23 for compaction requirements. Do not displace or damage pipe when compacting. Place impervious fill over drainage pipe aggregate cover and compact.
12. PROTECTION: Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.