ARCHITECTURAL SPECIFICATIONS

SECTION 01045
CUTTING AND PATCHING

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. The General provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this section.

1.02 WORK INCLUDED

A. Cutting and patching as required to:

1. Make the several parts of the work fit properly;
2. Uncover work to provide for installing, inspecting, or both, of ill-timed work;
3. Remove and replace work not conforming with the Contract Documents;
4. Remove and replace defective work.

B. Related work:

1. In addition to other requirements specified, upon the Consultant request, uncover work to provide for inspection by the Consultant of covered work, and remove samples of installed materials for testing.
2. Do not cut or alter work performed under separate contracts without the CONSULTANT written permission.

1.03 SUBMITTALS

A. Requests for the CONSULTANT Consent:

1. Prior to cutting which affects structural safety, submit written request to Consultant to proceed with the cutting.
2. Should the conditions of the Work, or schedule indicate a required change of materials or methods for cutting and patching, so notify the Consultant and secure his written permission and the required Change Order prior to proceeding.

B. Notices to the Consultant:

1. Prior to cutting and patching performed pursuant to a Change Order per the Consultant instructions, submit cost estimate to the Consultant. Secure Consultant approval of cost estimates and type of reimbursement before proceeding with cutting and patching.

2. Submit written notice to the Consultant designating the time work will be uncovered, to allow the Consultant observation.

PART 2 PRODUCTS

2.01 MATERIALS

A. For replacement of items removed, use materials complying with pertinent sections of these Specifications.

2.02 PAYMENT OF COSTS

A. The OWNER will reimburse the CONTRACTOR for cutting and patching performed pursuant to a written Change Order, after claim for such reimbursement is submitted by the CONTRACTOR. Perform all cutting and patching needed to comply with the Contract Documents at no additional cost to the OWNER.

2.03 RESPONSIBILITY

A. In the case of cutting, the trade requiring the cutting shall be responsible for cutting existing work to provide for passage, mounting, etc. of his work.

B. In the case of patching, patching shall be accomplished by the trade which installed the work requiring patching.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, patching or backfilling.

2. After uncovering the work, inspect conditions affecting installation of new work.

B. Discrepancies:

1. If uncovered conditions are not as anticipated, immediately notify the Consultant and secure needed directions.

2. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION PRIOR TO CUTTING

A. Provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the work.

3.03 PERFORMANCE

A. Perform excavating and backfilling as required under pertinent other Sections of the Specifications.

1. Perform cutting and demolition by methods which will prevent damage to other portions of the Work and provide proper surfaces to receive installation of repair and new work.

2. Perform fitting and adjusting of products to provide finished installations complying with the specified tolerances and finishes for new work unless specifically authorized otherwise.

END OF SECTION 01045

SECTION 01300
SUBMITTALS

1.01 GENERAL

A. Submit to the consultant the shop drawings, product data and samples required by the respective specification sections.

B. Related requirements specified elsewhere:

1. Contract Closeout: Section 01700.

C. Definitions

1. Shop Drawings: Original drawings, prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate some portion of the Work; showing fabrication, layout, setting or erection details.

2. Product Data: Manufacturer's standard schematic drawings, catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.

3. Samples: Physical examples to illustrate materials, equipment and workmanship, and to establish standards by which completed Work is judged.

1.02 SHOP DRAWINGS

A. Prepared by a qualified detailer and stamped/signed by Subcontractor and Contractor prior to submittal to Consultant.

B. Identify details by reference to sheet and detail numbers shown on the Contract Drawings.

C. Reproductions for submittals: Opaque diazo prints: four (4) copies; sepia reproducibles: one (1) copy.

1.03 PRODUCT DATA

A. Manufacturer's standard schematic drawings:

1. Modify drawings to delete information which is not applicable to the Project.

2. Supplement standard information to provide additional information applicable to the Project.

B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other standard descriptive data.

1. Clearly mark each copy to identify pertinent materials, product or models.

2. Show dimensions and clearances required.

3. Show performance characteristics and capacities.

4. Show wiring diagrams and controls.

1.04 SAMPLES

A. Office Samples: Of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product or material, with integrally related parts and attachment devices.

2. Full range of color samples.

3. After review, samples may be used in construction of project.

B. Field samples and mock-ups: As required by each technical section.

1.05 CONTRACTOR RESPONSIBILITIES

A. Review Shop Drawings, Product Data and Samples prior to submission.

B. Verify:

1. Field measurements.

2. Field construction criteria.

3. Catalog numbers and similar data.

C. Coordinate each submittal with the requirements of the Work and of the Contract Documents.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by Consultant's review of submittals.

E. Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the Consultant's review of submittals, unless the consultant gives written acceptance of specific deviations.

F. Notify the Consultant in writing at time of submission of deviations in submittals from requirements of the Contract Documents.

G. Begin no work which requires submittals until return of submittals with the consultant stamp and initial or signature indicating review.

H. After the Consultant's review, distribute copies.

1.06 SUBMISSION REQUIREMENTS

A. Schedule submissions at least 14 days before dates reviewed submittals will be needed.

B. Submit number of copies of Shop Drawings, Product Data and Samples per Section 1.02.

C. Submit the number of Samples specified in each of the specification sections.

D. Accompany submittals with a transmittal letter, in duplicate, containing:

1. Date
2. Project Title
3. Contractor's name and address.
4. The number of each Shop Drawing, Product Datum and Sample submitted.
5. Notification of deviations from the Contract Documents.

E. Submittals shall include:

1. Date and revision dates.
2. Project Title.
3. The names of:
   a. consultant
   b. Consulting Engineer (if applicable).
   c. Contractor.
   d. Subcontractor.
   e. Supplier.
   f. Manufacturer.
   g. Separate detailer when pertinent.
4. Identification of product or material.
5. Relation to adjacent structure or materials.

6. Field dimensions, clearly identified as such.

7. Specification section number.

8. Applicable standards, such as ASTM number or Federal Specifications.

9. A blank space, 3" x 4", for the Consultant's stamp.

10. Identification of deviations from the Contract Documents.

11. Contractor's stamp, initialed or signed, certifying to his review of submittal, verification of field measurements and compliance with the Contract Documents.

12. A professional seal shall be signed and affixed to all submittals requiring engineering by Contractor or his Subcontractors.

1.07 RESUBMISSION REQUIREMENTS

A. Shop Drawings

1. Revise initial drawings as required and resubmit as specified for initial submittal.

2. Indicate on the Drawings any changes which have been made other than those requested by the Consultant.

B. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.08 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of Shop Drawings and Product Data which carry the Consultant's stamp to:

1. Contractor's file.

2. Job site file.

3. Record documents file.

4. Subcontractors.

5. Supplier.

6. Fabricator.

B. Distribute samples as directed.

1.09 CONSULTANT'S DUTIES

A. Review submittals with reasonable promptness.

B. Review for:

1. Design concept of project.

2. Information given in the Contract Documents.

C. Review of a separate item does not constitute review of an assembly in which the item functions.

D. Affix stamp and initials or signature certifying to review of submittal.

E. Return submittals to the Contractor for distribution.

END OF SECTION 01300

SECTION 01600
MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. The General Provisions for the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this section.

1.02 REQUIREMENTS INCLUDED

A. Material and equipment incorporated into the work:

1. Conform to applicable specifications and standards;

2. Comply with size, make, type and quality specified, or as specifically approved in writing by the Consultants.

3. Manufactured and fabricated products:

   a. Design, fabricate and assemble in accordance with the best engineering and shop practices;

   b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.

   c. Two or more items of the same kind shall be identical, by the same manufacturer;

   d. Products shall be suitable for service conditions;

   e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

4. Do not use material or equipment for any purpose other than that for which it is designed or specified.

B. Materials removed from existing structures shall not be reused in the completed work unless specifically indicated or specified.

C. For material and equipment specifically indicated or specified to be reused in the Work:

1. Use special care on removal, handling, storage and reinstallation to assure proper function in the completed Work.

2. Arrange for transportation, storage and handling of products which require off-site storage, restoration or renovation. Pay all costs for such work.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of work shall comply with manufacturer's instructions, obtain and distribute copies of such instructions to parties involved in the installation, including one copy to consultant

1. Maintain one set of complete instructions at the job site during installation and until completion; include in project record documents.

B. Handle, install, connect, clean, condition, and adjust products in strict accordance with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with consultant for further clarification;

2. Do not proceed without clear instructions.

C. Perform work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

1. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.

B. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.

1.05 STORAGE AND PROTECTION

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

1. Store products subject to damage by the elements in weather tight enclosures.

2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

B. Exterior storage:

1. Store fabricated products above the ground, on blocking or skids to prevent soiling or staining. Cover products which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

2. Store loose or granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration.

D. Protection after installation:

1. Provide substantial coverings as necessary to protect installed products form damage from traffic and subsequent construction operations. Remove when no longer needed.

1.06 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Products list

1. Within 30 days after Contract date, submit to the consultant a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor.

B. Substitutions

1. Until a date no later than ten (10) days before the bids are due, the owner (consultant) will consider written requests from Bidders for substitution of products.

2. Submit a separate request for each product, supported with complete data, drawings and samples as appropriate, including:

a. Comparison of the qualities of the proposed substitution with that specified.

b. Changes in other elements required by this substitution.

c. Effect on Construction schedule.

d. Cost data comparing the proposed substitution with the product specified.

e. Any required license fees or royalties.

f. Availability of maintenance service, and source of replacement materials.

3. The owner (consultant) shall be the sole judge of the acceptability of the proposed substitution.

C. The owner (consultant /engineer) will notify the Bidders of the decision to accept a proposed substitution by addendum to the Bidding Documents.

END OF SECTION 01600

SECTION 01220

UNIT PRICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Measurement.
   2. Payment.

B. Related Sections:
   1. Individual specification sections.

1.2 UNIT PRICES

A. Provide unit prices for items listed, for inclusion in Contract, guaranteed to apply for duration of Project as basis for additions to or deductions from Contract Sum.

B. Take measurements and compute quantities.

C. Quantities and measurements indicated are for contract purposes only. Actual quantities and measurements supplied or placed in the work will determine payment.

D. Payment includes full compensation for all required labor, products, tools, equipment, plant, transportation, services, and incidentals, and for erection, application, or installation of an item of the Work.

E. Adjustments to Contract Sum will be made by Change Order based on net cumulative change for each item of the Work.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

3.1 UNIT PRICE SCHEDULE,

1. Basis of payment:
   a. Contract Sum to be based on quantities indicated on Drawings.
   b. Adjustments to Contract Sum will be made based on actual quantity of installed.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 GENERAL PROVISIONS

A. The General Provisions of the Contract, including the Conditions of the Contract (General, Supplementary and other Conditions, if any) and Division 1 as appropriate, apply to the Work specified in this section.

1.02 REQUIREMENTS INCLUDED

A. Procedures and submittals required at time of Project Completion as specified and referred to below.

1.03 RECORD DOCUMENTS

A. Refer to provisions in GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, and Section 01300 SUBMITTALS.

1.04 CLEANING UP

A. Refer to provisions in GENERAL CONDITIONS.

1.05 BREAKAGE AND REPAIR

A. Any new or existing work damaged due to the construction operations shall be replaced or repaired in a satisfactory manner by the CONTRACTOR causing such damage.

1.06 WARRANTY

A. Refer to Article 4.5 in the GENERAL CONDITIONS, Form HUD-5370-General Conditions for Construction Contacts. .

B. Refer to other sections of the specifications for additional guarantee requirements on specific items of work.

1.07 OPERATION & MAINTENANCE INSTRUCTIONS & MANUAL

A. Prior to final payment, the CONTRACTOR shall collect, neatly assemble, index and bind in loose leaf format with table of contents, all manufacturer's operation and service instruction books, cards, manuals, diagrams, etc. for each piece of equipment furnished under this contract and for other items of construction requiring maintenance. Turn this manual over to the OWNER at substantial completion.

A. Refer to other Sections of the specifications for specific requirements, including any requirements for instructional periods for OWNER'S personnel.

1.08 INSPECTION AND TEST CERTIFICATES

A. Before final payment, the CONTRACTOR shall turn over to the consultant/owner all inspection and test certificates required by law and ordinances and/or by the specifications. These include, but are not necessarily limited to:

Electrical Inspection Certificate
Plumbing Inspection Certificate

B. See other sections of the Specifications for other requirements.

1.09 DOCUMENTS REQUIRED PRIOR TO FINAL PAYMENT

A. Prior to the submission of an invoice for final payment, and before the issuance of a final certificate for payment in accordance with the provisions of the General Conditions, the CONTRACTOR shall file the following papers with to the Owner.

1. Warranty: See paragraph in this section;

2. Contractor shall provide to owner signed and sealed AIA Form G706 – Contractor's Affidavit of Payment of Debts and Claim.

3. Releases of Liens: See General Conditions, AIA Form G706A, or conform to the State law governing Mechanics' Liens.

4 Operation and Maintenance Manuals: See paragraph in this Section.

5. Project Record Documents: See paragraph in this section.

6. Copy of the completed list of items to be completed or corrected (punch list) certifying that the items have been completed or corrected as required.

7. Use and Occupancy Permits granted by the local authority having jurisdiction.

END OF SECTION 01700

SECTION 01705
PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF REQUIREMENTS

A. Definitions: Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Division 2 through 16. Time of closeout is directly related to "Substantial Completion", and therefore may be either a single time period for entire work or a series of time periods for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

1.03 PREREQUISITES TO SUBSTANTIAL COMPLETION

A. General: prior to requesting Engineer inspection for certification of substantial completion (for either entire work or portions thereof), complete the following and list known exceptions in request:

1. Include supporting documentation for completion as indicated in these contract documents.

2. Submit statement showing accounting of changes to Contract Sum.

3. Advise Owner of pending insurance change-over requirements.

4. Make final change-over of locks and transmit keys to Owner, and advise Owner's personnel of change-over in security provisions.

5. Complete start-up testing of systems, and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups and similar elements.

6. Complete final cleaning up requirements, including touch-up painting of marred surfaces.

7. Touch-up and otherwise repair and restore marred exposed finishes.

8. Contractor shall restore the site; grass, walk ways, and any concrete damage to its original condition.

B. Inspection Procedures: Upon receipt of Contractor's request, Architect will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, Architect will either prepare certificate of substantial completion, or advise Contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.04 PREREQUISITES TO FINAL ACCEPTANCE

A. General: Prior to requesting Engineer final inspection for certification of final acceptance and final payment, as required by General Conditions, complete the following and list known exceptions (if any) in request:

1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit updated final statement, accounting for additional (final) changes to Contract Sum.

3. Submit certified copy of Engineer final punchlist of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Architect.

4. Submit final meter readings for utilities, measured record of stored fuel, and similar data as of time of substantial completion or when Owner took possession of and responsibility for corresponding elements of the work.

5. Submit consent of surety.

6. Submit final liquidated damages settlement statement, acceptable to Owner.

7. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: Upon receipt of Contractor's notice that the work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Architect will reinspect the work. Upon completion of reinspection, Architect will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

1.05 RECORD DOCUMENT SUBMITTALS

A. General: Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions. General submittal requirements are indicated in "Submittals" sections. Do not use record

documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for Engineer reference during normal working hours.

B. Record Drawings: Maintain a white-print set (blue-line or black-line) of contract drawings and shop drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date. Note related change-order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.

C. Record Specifications: Maintain one copy of specifications, including addenda, change orders and similar modifications issued in printed form during construction, and mark-up variations (of substance) in actual work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable. Upon completion of mark-up, submit to Architect for Owner's records.

D. Record Product Data: Maintain one copy of each product data submittal, and mark-up significant variations in actual work in comparison with submitted information. Include both variations in product as delivered to site, and variations from manufacturer's instructions and recommendations for installation. Give particular attention to concealed products and portions of the work which cannot otherwise be readily discerned at a later date by direct observation. Note related change orders and mark- up of record drawings and specifications. Upon completion of mark-up, submit complete set to Architect for Owner's records.

E. Record Sample Submittal: Immediately prior to date(s) of substantial completion, Architect (and including Owner's personnel where desired) will meet with Contractor at site, and will determine which (if any) of submitted samples maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes. Comply with Engineer instructions for packaging, identification marking, and delivery to Owner's sample storage space.

F. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record- keeping and submittals in connection with actual performance of the work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Architect for Owner's records.

G. Maintenance Manuals: Organize maintenance-and-operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and

indexed (thumb-tabbed). Include emergency instructions, spare parts listing, copies of warranties, wiring diagrams, recommended "turn-around" cycles, inspection procedures, shop drawings, product data, and similar applicable information. Bind each manual of each set in a heavy-duty 2", 3-ring vinyl-covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

A. General Operating/Maintenance Instructions: Arrange for each installer of work requiring continuing maintenance or operation, to meet with Owner's personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds, and similar continuing commitments.

3.02 FINAL CLEANING

A. General: Special cleaning for specific units of work is specified in sections of Divisions 2 through 16. General cleaning during progress of work is specified in General Conditions and as temporary services in "Temporary Facilities" section of this Division. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required:

1. Remove labels which are not required as permanent labels.

2. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

3. Clean exposed exterior and interior hard-surfaced finishes, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

4. Wipe surfaces of mechanical and electrical equipment clean, including elevator equipment and similar equipment; remove excess lubrication and other substances.

5. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

6. Clean concrete floors in non-occupied spaces broom clean.

7. Vacuum clean carpeted surfaces and similar soft surfaces.

8. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

9. Clean light fixtures and lamps so as to function with full efficiency.

10. Clean project site (yard and grounds), including landscape development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.

B. Removal of Protection: Except as otherwise indicated or requested by Architect/Engineer, remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work during remainder of construction period.

C. Compliances

1. Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

2. Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.

END OF SECTION 01705

SECTION 02060
DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DESCRIPTION OF WORK

A. Extent of demolition is as shown and illustrated on the demolition plans/drawings.

1.03 SCHEDULE OF DEMOLITION WORK

A. Demolition requires removal and disposal, off site, of the following:

1. Interior building (Mechanical Room) construction as indicated on drawings.

2. Floor finishes down to subfloors (except where indicated).

Site items (sidewalks, etc.) as shown on plans.

B. Contractor shall carefully remove and store on site all re-usable items of value to Delaware State Housing Authority.

1.04 SUBMITTALS

A. Schedule: Submit proposed methods and operations of building demolition to consultant for review prior to start of work. Include in schedule coordination for shut-off, capping, and continuation of utility services as required.

1.05 CONDITION OF STRUCTURES

A. Owner assumes no responsibility for actual condition of structures to be demolished. Conditions existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work.

1.06 PARTIAL REMOVAL

Items of salvageable value to owner may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed.

A. Storage or sale of removed items on site will not be permitted.

1.07 EXPLOSIVES

A. Use of explosives will not be permitted.

1.08 TRAFFIC AND SHORING

Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

A. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

B. Provide interior and exterior shoring, bracing or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

1.09 DAMAGES

Promptly repair damages caused to adjacent facilities by demolition operations at no cost to owner.

1.10 UTILITY SERVICE

Maintain existing service panel for temporary services required for demolition equipment and lighting. All other elements shall be removed.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 DEMOLITION

A. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of work.

3.02 BUILDING DEMOLITION

Demolish building components completely and remove from site as shown on drawings. Use such methods as required to complete work within limitations of governing regulations.

A. Proceed with demolition in systematic manner.

B. Demolish concrete and masonry, or drywall as required in small sections.

C. Locate demolition equipment throughout structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

D. If asbestos is found on site, it is the responsibility of the owner to notify the proper authorities and remove all asbestos in a professional manner. Owner shall receive from authorities' written documentation verifying that site is free from asbestos.

3.03 FILLING VOIDS

Completely fill below-grade areas and voids resulting from demolition of structures.

A. Use satisfactory soil materials consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots and other organic matter.

B. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash and debris.

C. Place fill materials in horizontal layers not exceeding 6" in loose depth. Compact each layer at optimum moisture content of fill material to a density equal to original adjacent ground, unless subsequent excavation for new work is required. Minimum soil compaction to be 95%.

D. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

3.04 DISPOSAL OF DEMOLISHED MATERIALS

General: Remove from site debris, rubbish, and other materials resulting from demolition operations.

A. Burning of removed materials from demolished structures will not be permitted on site.

3.05 REMOVAL

A. Transport materials removed from demolished structures and dispose of offsite.

END OF SECTION 02060

SECTION 09250 - GYSPUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.

B. Related Sections include the following:
1. Division 6 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
2. Division 6 Section "Sheathing" for gypsum sheathing.
3. Division 7 Section "Fire-Resistive Joint Systems" for wall assemblies that incorporate gypsum board.
4. Division 7 Section "Joint Sealants" for acoustical sealants installed in assemblies that incorporate gypsum board.
5. Division 9 Section "Gypsum Veneer Plaster" for gypsum base for veneer plaster and for other components of gypsum-veneer-plaster finishes.
6. Division 9 painting Sections for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

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

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. 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.
1.

1.5 STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Gypsum Co.
b. BPB America Inc.
c. G-P Gypsum.

d. Lafarge North America Inc.
e. National Gypsum Company.
f. PABCO Gypsum.
g. Temple.
h. USG Corporation.

B. Regular Type:

1. Thickness: 1/2 inch
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling .

C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch
2. Long Edges: Tapered.

D. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board.

1. Core: As indicated on Drawings 5/8 inch
2. Long Edges: Tapered.

E. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8 inch
2. Long Edges: Tapered.

3.

2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping drying-type, all-purpose compound.

   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping drying-type, all-purpose compound.

4. Finish Coat: For third coat, use setting-type, sandable topping drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound drying-type, all-purpose compound high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish .

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations, and trim

edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: As indicated on Drawings Vertical surfaces, unless otherwise indicated.
2. Ceiling Type: [As indicated on Drawings Ceiling surfaces.
3. Foil-Backed Type: [As indicated on Drawings] <Insert requirements>.
4. Abuse-Resistant Type: [As indicated on Drawings] <Insert requirements>.
5. Moisture- and Mold-Resistant Type: [As indicated on Drawings] <Insert requirements>.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels [vertically (parallel to framing)] [horizontally (perpendicular to framing)], unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints rounded or beveled edges and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 3: Where indicated on Drawings

3.5 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250

SECTION 09900
PAINTING

PART I - GENERAL

1.01 DESCRIPTION

A. Work specified herein:

1. Painting Interior and Exterior of Mechanical Room Including Doors and Modified doors

1.02 QUALITY ASSURANCE

A. Provide primers and other undercoat paint produced by same manufacturer as finish coats(Paint manufacturer and color, including paint Number to be provided by DSHA)

B. Use only thinners approved by paint manufacturer and use only within recommended limits.

1.03 SUBMITTALS

A. Company – PPG/Glidden (Only-No Substitution Permitted)
Low luster enamel tinted to Dover White; 1433-0110V
Gripper Primer 3210-1200 tinted to Dover White

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1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of materials: Deliver paint products in their manufacturer's original containers, with labels intact.

B. Storage of Materials:

1. Store only acceptable Project materials on the Project site.

2. Store all paint materials and painting equipment in an assigned area.

3. Comply with all applicable safety and health regulations.

1.05 JOB CONDITIONS

A. Environmental Requirements:

1. Comply with the manufacturer's recommendations as to the environmental conditions under which their paints and painting systems can be applied successfully.

2. Do not apply finish coats in areas where dust is being generated.

B. Protection:

1. Remove and protect finish hardware, factory-finished work and similar items or provide suitable in-place protection. Upon completion of painting in each room or space, carefully replace all items removed and all in-place protection. Use only skilled mechanics for removal and replacement.

2. Protect adjoining work against damage or soiling from materials, tools and utensils used in painting. Use drop cloths of adequate size, free of holes, to protect adjoining finished work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. DSHA SPECIFICATION
Company – PPG/Glidden (Only-No Substitution Permitted)
Low luster enamel tinted to Dover White; 1433-0110V
Gripper Primer 3210-1200 tinted to Dover White.

2.02 MIXING AND TINTING

A. At the Contractor's option, paints and enamels may be delivered ready-mixed and tinted, or they may be job-mixed and tinted.

B. Where thinning is necessary, follow label direction.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine surfaces scheduled to receive paint for conditions that will adversely affect execution, permanence or quality of Work and which cannot be put into an acceptable condition by means of the preparatory Work, specified in the following article.

B. Do not proceed with surface preparation or paint application until conditions are suitable.

3.02 PREPARATION OF SURFACES

A. Wood and Gypsum:

1. Clean wood surfaces of foreign substances with scrapers, mineral spirits and/or sandpaper. After priming fill holes and imperfections with wood filler and sand smooth.

B.. Cementitious Materials: Prepare concrete and cement plaster surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

1. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
2. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

3.03 APPLICATION

A. General Requirements:

1. Do not apply initial coat of paint until moisture content of surface to be painted is within the limitations recommended by the paint manufacturer.

2. Apply paints with suitable brushes, rollers and/or equipment.

a. Rate of application shall not exceed that recommended by the paint manufacturer.

b. Keep brushes, rollers and equipment clean, dry, free of contaminates and suitable for the finish required.

3. Comply with recommendations of product manufacturers for drying time between succeeding coats.

4. Vary slightly the color of successive coats.

5. Finish coats shall be smooth, free of brush marks, runs, sags, curtains, streaks, laps or pile-up of paints.

6. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.

7. Apply additional coats of paint as may be required to cover surfaces completely and to provide uniformity of color and appearance.

3.04 CLEANING

A. Touch up and restore finish where damaged.

B. Remove spilled, splashed or splattered paint from all surfaces.

C. Do not mar surface finish of items being cleaned.

D. Leave storage space clean and in condition required for equivalent spaces in Project.

3.05 PAINTING SCHEDULE

A. Surfaces not to be painted:

1. Stainless steel.

2. Non-ferrous metals.

3. Items furnished with factory applied final finish.

4. Concealed ductwork, pipe and conduit.

D. Interior Gypsum Wallboard: Flat finish

1. First coat: Interior flat primer coat.

2. Second coat: Interior flat finish coat.

END OF SECTION 09900

TABLE OF CONTENTS
MECHANICAL SPECIFICATIONS

DIVISION 15 - MECHANICAL

SECTION 15005
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Each contractor shall provide all cutting, fitting and patching as required to complete the work or to provide penetrations for installation of piping and ductwork related to the installation of the air handling units related to the new heat pumps.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Comply with specifications and standards for each product involved.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect existing condition, including work subject to damage or moving during cutting and patching.

B. Report unsatisfactory conditions to the Owner's Representative. Do not proceed until directed.

3.2 FIELD QUALITY CONTROL

A. Comply with manufacturer's recommendations and requirements for each product involved.

3.3 PERFORMANCE

A. Do not cut or alter another contractor's work without written consent of the Owner's Representative.

B. Execute cutting by methods which will prevent damage to other work.

C. Execute fitting and adjustments of products to provide a finished installation to comply with specified products, functions, tolerances and finished.

END OF SECTION 15005

SECTION 15050
BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Pipe sleeves.
3. Soldering procedures and techniques.
4. Equipment pads.
5. Mechanical identification.
6. Motors.

B. Related Sections:
1. Temperature controls
2. Testing, adjusting, and balancing:
3. Mechanical insulation:
4. Hydronic piping systems:
5. Electrical wiring and connections: Division 16

1.2 REFERENCES

A. ANSI A13.1-1981(1985) -- Scheme for the Identification of Piping Systems; 1981 (Reapproved 1985).

B. ASTM A 53-93a -- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless; 1993.

C. ASTM C 94-94 -- Standard Specification for Ready-Mixed Concrete; 1994.

D. CDA 404/0-R -- Copper Brass Bronze Product Handbook - Copper Tube for Plumbing, Heating, Air Conditioning and Refrigeration; Copper Development Association, Inc.; 1980.

E. MSS SP-58 -- Pipe Hangers and Supports--Materials, Design and Manufacture; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1993.

F. MSS SP-69 -- Pipe Hangers and Supports--Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1991.

G. MSS SP-89 -- Pipe Hangers and Supports--Fabrication and Installation Practices; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1991.

1.3 DESIGN REQUIREMENTS - PIPE HANGERS AND SUPPORTS

A. Conform to MSS SP-69.

B. Calculate weight balance to determine required supporting force at each spring hanger location.

C. Calculate weight balance to determine pipe weight load at each equipment connection.

D. Design hangers to support piping under all conditions of operation.

E. Design hangers to allow for piping expansion and contraction.

1.4 SUBMITTALS

A. Product Data:
1. Submit product data for each product specified in this section.

B. Shop Drawings:
1. Submit shop drawings which indicate the location and size of products specified in this section.

C. Quality Control Submittals: Submit the following:
1. Manufacturer qualification statement, for information.
2. Installer qualification statement, for information.

D. Coordination Drawings:
1. Prior to distribution of coordination drawings to affected installers, submit coordination drawings specified under "Coordination," for information.

E. Warranty: Submit signed copy of written warranty.

F. Coordination Drawings:
1. Prior to distribution of coordination drawings to affected installers, submit coordination drawings specified under "Coordination," for information.

1.5 COORDINATION

A. Coordination Drawings:
1. Prepare coordination drawings and distribute to affected installers.
2. Indicate:
a. Indicate hanger and support locations.
b. Project conditions.
c. Field measurements.
d. Required clearances.
e. Recommendations for avoidance of possible interferences.
3. Drawing scale: 1/4 inch equals 1 foot.
4. Use reproducible copy of drawings.

1.6 QUALITY ASSURANCE

A. Pipe Hangers and Supports: Conform to requirements for each piping system specified in other sections.

B. Manufacturer Qualifications: A company manufacturing products in this section and whose products have performed in a satisfactory manner under comparable conditions for a period of 5 years.

C. Installer Qualifications: A company installing products in this section and whose installations have performed in a satisfactory manner under comparable conditions for a period of 5 years.

1.7 PROJECT CONDITIONS

A. Determine working clearance around and between construction elements such as beams,

columns, walls, and ceilings.

B. Locations of pipe indicated on drawings are approximate unless dimensioned. Determine exact location before roughing in supports and hangers.

C. Field Measurements: Field-measure related work to ensure proper fit and clearance.

1.8 WARRANTY

A. Submit a written warranty for each product requiring the following:
   1. Manufacturer shall warrant all parts and labor for a period of 1 year starting from the date of substantial completion.
   2. Compressors and associated parts shall have 5 yr warranty as offered and provided by the respective parts.

PART 2 - PRODUCTS

2.1 PIPE HANGERS

A. Manufacturers: Provide products complying with requirements of the contract documents and made by one of the following:
   1. Carpenter and Paterson, Inc.
   2. Grinnell Corporation.
   3. B-Line Systems, Inc.
   4. Unistrut

B. Component Materials and Manufacture: Conform to MSS SP-58.

C. Selection: Conform to MSS SP-69.

D. Fabrication: Shop-fabricate supports for 2-1/2-inch pipe and larger in accordance with MSS SP-89.

2.2 PIPE SLEEVES

A. Material:
   1. Galvanized steel pipe; Schedule 40; Conforming to ASTM A 53.

B. Applications:
   1. Provide pipe sleeves at the following locations:
   2. Masonry walls and Floor slab penetrations

2.3 SOLDER MATERIALS

A. Federal law prohibits the use of solders containing lead in potable water systems. Select solder as recommended by the Copper Tube Handbook (CDA 404/0-R) for specific job conditions.

2.4 EQUIPMENT PADS

A. Description:
   1. Pad thickness: 4 inches minimum.
   2. Beveled edges height: 1 inch
   3. Reinforcing spacing: 9 inches, both ways
   4. Size pad to fit equipment, and dowel to the floor.

B. Provide anchor bolts.

C. Material:
   1. Concrete conforming to ASTM C 94.
   2. Strength: 3000 psi.

D. Provide concrete equipment pad for all base-mounted equipment.

E. Refer to Division 3 for equipment grouting.

2.5 MECHANICAL IDENTIFICATION PRODUCTS

A. Product Applications:
   1. Pipe 1 inch and smaller: Use valve tags.
   2. Pipe larger than 1 inch.
      a. Snap-on plastic markers.
      b. Adhesive labels.
      c. Painted legend using stenciled letters.
   3. Pipe identification may be omitted from:
      a. Sanitary drain piping.
      b. Storm piping.
      c. Equipment drains.
      d. Inaccessible piping.
   4. Valve tags:
      a. Identify each valve with a valve tag.
   5. Equipment:
      a. Engraved plastic nameplates.
      b. Adhesive labels.
      c. Painted legend using stenciled letters.

B. Snap-on Plastic Markers:
   1. Legend: Preprinted under clear, outdoor-grade acrylic plastic cover, reading forward and reverse. Include flow direction arrows.
   2. Fastener: Manufacturer's standard.

C. Valve Tags:
   1. Material: Stamped aluminum.
   2. Size: 1-1/2 inches.
   3. Shape: Round.
   4. Legend - top line: System abbreviation, 1/4 inch high.
   5. Legend - second line: Valve tag number as indicated on drawings, 1/2 inch high.
   6. Provide mounting hole at top of tag.
   7. Fasteners:
      a. Brass jack chain.
      b. Nickel bead chain.

D. Engraved Plastic Nameplates:
   1. Description: 3-ply plastic nameplate with contrasting letter color.
   2. Fasteners: Noncorrosive screws or rivets.

E. Adhesive Labels:
   1. Description: Pressure-sensitive vinyl with permanent adhesive.
   2. Banding tape: Vinyl with permanent adhesive. Include preprinted directional arrows in contrasting color.

F. Marking Paint:
   1. Quality: Permanent, nonfading, nonpeeling, exterior type stenciling enamel for spray or brush application.

2. Compatibility: Provide paint compatible with substrate and undercoatings.

G. Legends and Colors:
1. Pipe identification legend text: Indicate piping system using full name or standard abbreviation as indicated on drawings.
2. Pipe identification legend size: Conform to ANSI A13.1.
3. Pipe identification colors: Conform to ANSI A13.1.
4. Duct identification legend text: Indicate system using full name or standard abbreviation as indicated on drawings.
5. Duct identification colors: As scheduled.
6. Equipment identification legend text: Indicate system using full name or standard abbreviation and equipment tag number as indicated on drawings.
7. Equipment identification legend size: 1/2 inch, minimum.
8. Equipment identification colors: As scheduled.

2.6 MOTORS:

A. Provide energy efficient motors.

B. 1/2-horsepower and Smaller: Single phase.

C. Larger than 1/2-horsepower: 3-phase.

D. Provide motors with nameplate ratings to match electrical circuit characteristics shown on drawings.

E. Nameplate ratings:
1. 200 volts for 208 volt circuits.
2. 230 volts for 240 volt circuits.

2.7 FIELD MOUNTED STARTERS:

A. Provide starters with nameplate ratings to match electrical circuit characteristics shown on drawings.

B. Nameplate Ratings:
1. 200 volts for 208 volt circuits.
2. 230 volts for 240 volt circuits.

C. Furnish starters for all motors supplied with mechanical equipment.
1. Exception: Starters indicated in motor control centers are furnished by Division 16.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces intended to support products.

B. Verify that each product conforms to regulatory requirements and to specification requirements.

3.2 PREPARATION

A. Clean surfaces to receive work.

B. Protect surrounding elements from work of this section.

3.3 INSTALLATION

A. Soldering: Conform to the procedures and techniques for soldering described in the Copper Tube Handbook (CDA 404/0-R).

B. Keep a copy of the Copper Tube Handbook on the construction site for the duration of the work.

C. Equipment Pads:
   1. Equipment pads shall be true and level.

D. Motors: Mount and align motors to operate equipment without vibration, noise, or damage.

E. Starters: Mount starters true and level in locations shown on drawings.

3.4 BUILDING ATTACHMENTS AND FASTENERS

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

B. Do not cut or drill structural elements.

3.5 PIPE HANGERS AND SUPPORTS

A. Fabricate and install piping supports in accordance with MSS SP-89.

B. Keep a copy of "Pipe Hangers and Supports--Selection and Application" (MSS SP-69) on the construction site for the duration of the work.

C. Provide supplementary steel where required for pipe supports.

D. Install hangers and supports to prevent transmittal of movement and loading to connected equipment.
   1. Install hangers and supports to achieve required pipe slopes.
   2. Provide means for vertical adjustment on rigid hangers.

3.6 IDENTIFICATION

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

B. Identify piping systems in accordance with ANSI A13.1, using products specified in this section.
   1. Locate labels within 10 feet on each side of wall.
   2. Locate labels every 50 feet on continuous horizontal runs.
   3. Locate label at each change of direction and fitting.

C. Interface stencil marker painting with finish painting specified in Division 9.

3.7 ADJUSTING

A. Adjust hangers to distribute loads equally to attachments.

B. Adjust hangers to achieve proper piping slope.

END OF SECTION 15050

SECTION 15060

PIPING

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. The Contract Documents apply to this section.

B. Drawings show approximate general routing of principal service lines, however, execution of the work shall be coordinated more precisely as described in "Execution" of this section.

1.02 SCOPE

A. Includes all new piping as required for connecting the potable water heating and the heat pump systems

B. Includes all connections and alterations to existing pipings as required.

1.03 RELATED SECTIONS

A. Refer to section 1 5050 Basic Material

B. Refer to section 1 5 050 for pipe hangers and supports.

C. Refer to section 15242 for vibration isolation.

PART 2 - PRODUCTS

2.01 COPPER PIPING

A. Copper tubing shall be hard drawn, type as noted, conforming to ASTM Specification noted, and joined by method noted, and shall be used for the following:

1. Domestic hot and cold water piping - no-lead solder - type "L", ASTM B-88.
2. Refrigerant piping - silver solder, type "ACR", ASTM B-280.
3. Soil, waste and vent piping above-grade, except for urinal drains - type "DWV", ASTM B-306 - no-lead solder.

4. Drains from piping, pumps, relief valves, etc. - type "DWV", ASTM B-306 - no-lead solder.

5. Condenser water supply and return - type "L", ASTM B-88 - no-lead solder.

6. Heat pump supply and return piping - type "L", ASTM B-88, no-lead solder.

7. Cooling coil condensate drain piping – type "DMV", ASTM B-306- no-lead solder.

B. Flux used for soldering of copper piping shall conform to ASTM specification B813.

C. The soldering of copper piping shall be performed in conformance with the requirements of ASTM B828.

D. Solder metal shall conform to the requirements of ASTM B32.

E. Copper piping as specified may be used at the contractor's option for heating hot water, chilled water, heat pump loop, condenser water supply and return piping, laboratory gas and vacuum piping, and remote radiator coolant piping.

F. All copper piping 3-inches and larger on pressure systems shall be connected with braze joints.

PART 3 EXECUTION 3.01

3.01 SOLDERED AND BRAZED JOINTS

A. Soldered joints for the assembly of copper tubing lines shall be made with a non-corrosive flux and solder as noted for the service. Ends of tubing shall be cut square and all burrs and fins shall be removed. The surfaces of the tubing and fitting to be soldered shall be abrasively cleaned, and the tubing shall be inserted into the fitting to its full depth. After the joint has been made, all excess flux and solder shall be wiped off.

3.05 DRAINAGE PIPING, GENERALLY

A. Sanitary drainage and vent piping shall be installed in all respects in accordance with the applicable laws and regulations of the local authority. Any changes which must be made to conform to such laws and regulations shall be made by the contractor under this specification, as approved by the Owner's Agent and without cost to the Owner.

B. All fixtures and equipment requiring drainage and vents shall be connected to the drainage and vent systems, whether such fixtures or equipment are specified herein or in other specifications, or provided by the Owner.

B. Except as otherwise indicated on the drawings drain piping shall be installed with a fall of 1/4- inch per foot.

D. Traps shall be provided for all floor drains, fixtures, and other connections requiring same. All traps shall be provided with cleanouts which shall be made accessible.

E. All parts of the drainage system shall be vented as required by the laws regulating sanitary drainage.

F. Provide 6-pound lead flashings for vent lines through roofs, all soldered and made watertight. Flashings shall extend 9-inches into the roofing and shall be turned down 2-inches inside the vent pipe.

G. Provide fresh air intake connections for house traps of the sizes indicated on the drawings and conforming to code requirements.

H. Provide cleanouts (prior to dropping below grade) at foot of all sanitary stacks, vent, waste, and storm water risers, and at each change of direction, at the ends of branch runs, in straight runs as required by code and where indicated. Terminate as specified under "Cleanouts".

[I. Provide house sewers to conduct the sanitary and storm drainage from the building to the public sewer system, including all piping, trenching, shoring and/or pumping as required, backfilling, final connection to the city sewers, street openings and repaying as required to make the system complete.]

J. Make the connection to the city sewers, open the street and repave in accordance with the requirements of the municipal authorities having jurisdiction.]

K. Commence the sewer pipe installation at the connection to the municipal sewer with all spigot ends pointing in the direction of flow. Lay all pipes with ends abutting and in a true line, carefully centered to form a sewer with a uniform invert.]

3.27 FLUSHING

A. All new systems of copper piping shall be initially flushed with hot water to remove excess traces of flux within the piping. „

B. Refer to IMC and IPC requirements for flushing as required by code of these for flushing and sterilization requirements of all new piping systems.

END OF SECTION 15060

SECTION 15242
VIBRATION ISOLATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Vibration isolation.

1.2 RELATED WORK

A. Division 15 – Heat Pumps.

B. Division 15 Plumbing, and Mechanical Equipment

C. Division 15 – Heat Pump Condensers.

D. Division 15 – HP Air Handling Units with Coils.

1.2 REFERENCES

A. ASHRAE - Guide to Average Noise Criteria Curves.

1.3 QUALITY ASSURANCE

A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 1.

B. Indicate vibration isolator locations, with static and dynamic load on each, on shop drawings and described on product data.

C. Submit schedule of equipment served and isolation type for approval.

D. Submit manufacturer's installation instructions under provisions of Division 1.

1.5 CERTIFICATES

A. Submit manufacturer's certificate under provisions of Division 1 that isolators are properly installed and properly adjusted to meet or exceed specified requirements.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to the following:

1. Vibration Eliminator Co.

2. Korfund Dynamics Corp.

3. Amber/Booth Co.

2.2 VIBRATION ISOLATORS

A. Type 1: Closed spring mounts with one or more steel springs, leveling bolt, neoprene pad on base plate.

B. Type 2: Rubber-in-shear hangers, suitable for attachment to threaded rod.

C. Type 3: Rubber waffle pads, 30 durometer, minimum 1/2 inch thick, maximum loading 40 psi. Use neoprene in oily or exterior locations.

2.3 FABRICATION

A. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

B. Color code spring mounts.

C. Select springs to operate at 2/3 maximum compression strain, with 1/4 inch ribbed neoprene pads.

PART 3. EXECUTION

3.1 INSTALLATION

A. Install vibration isolators for motor driven equipment, including series powered fan boxes.

B. Provide spring isolators on piping connected to isolated equipment as follows: Up to 4 inch diameter, first three points of support, 5 inch diameter and over, first 5 points of support. Static deflection of first point shall be twice deflection of isolated equipment.

3.2 Installation Schedule (Follow equipment Manufacturer's recommendations for vibration isolation.)

ISOLATED EQUIPMENT	ISOLATOR TYPE
Pump	Type 3
Air Handling Unit	Type 1

END OF SECTION

SECTION 15250
MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe system insulation.
2. Duct system insulation.

B. Related Sections:
1. Duct
2. Hydronic piping systems:
3. Fire stopping and smoke stopping:

1.2 REFERENCES

A. ASTM C 533-85 (90) -- Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 1985 (Reapproved 1990).

B. ASTM C 534-88 -- Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 1988.

C. ASTM C 547-77 -- Standard Specification for Mineral Fiber Preformed Pipe Insulation; 1977.

D. ASTM C 553-92 -- Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 1992.

E. ASTM C 612-93 -- Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 1993.

F. ASTM E 84-91a -- Standard Test Method for Surface Burning Characteristics of Building Materials; 2010.

G. ASTM E 96-93 -- Standard Test Methods for Water Vapor Transmission of Materials; 1993.

H. National Commercial and Industrial Insulation Standards; Midwest Insulation Contractors Association; 1988.

I. NFPA 255-1990 -- Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 1990.

J. UL 723 -- Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 1983 (Revised 1987).

1.3 PERFORMANCE REQUIREMENTS

A. Flame Spread and Smoke Developed Ratings for Insulation and Ancillary Materials: Rated in accordance with ASTM E 84, NFPA 255, or UL 723. Affix manufacturer's stamp or label showing fire/smoke indexes on shipping containers or insulation.
1. Indoor mechanical insulation and ancillary materials:
2. Outdoor mechanical insulation and ancillary materials:

1.4 SUBMITTAL

A. Product Data: Submit for each type of mechanical insulation and accessory.

1.5 QUALITY ASSURANCE

A. Conform to "National Commercial and Industrial Insulation Standards" by the Midwest Insulation Contractors Association.

B. Manufacturer Qualifications: A company manufacturing insulation products which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

PART 2 - PRODUCTS

2.1 INSULATION MANUFACTURERS

A. Fiberglass Insulation:
   1. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable.

B. Flexible Elastomeric Insulation:
   1. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable.

C. Calcium Silicate Insulation:
   1. Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable.

2.2 PIPING INSULATION APPLICATIONS

A. Dual temperature piping (40 to 250 degrees F).
   1. Insulation materials: 1" fiberglass for piping up to 1" diameter, 1 1/2" fiberglass for piping larger than 1" diameter.

B. Potable water piping.
   1. Insulation materials: 1/2" fiberglass for all cold water piping. 1" fiberglass for hot water supply or return piping up to 2" diameter, 1 1/2" fiberglass for piping larger than 2" diameter.

2.3 DUCT INSULATION APPLICATIONS

A. Supply duct.
   1. Insulation material: 1" fiberglass.

2.4 EQUIPMENT INSULATION APPLICATIONS

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect substrates to receive mechanical insulation. Correct any unsatisfactory conditions before installing mechanical insulation.

3.2 PREPARATION

A. Remove dirt, dust, and moisture from surfaces before insulating.

B. Provide positive ventilation in enclosed areas where volatile materials are used to apply insulation.

3.3 INSTALLATION

A. Insulate piping systems after leak test results have been accepted.

B. Install insulation to attain a smooth and uniform surface. Abut insulation at joints. Do not fill gaps in joints with joint mastic or sealer. Remove and reinstall insulation with tight fitting joints.

C. Maintain vapor retarder on insulation.

D. Insulation shall be continuous on insulated piping and duct which penetrates walls and floors.

E. Exceptions: Some fire stopping/smoke stopping assemblies require a break in the insulation. Coordinate with installer of fire stopping/smoke stopping and maintain the insulation vapor retarder at breaks.

F. Do not install insulation on hot, wet, or dirty surfaces.

3.4 PIPE INSULATION

A. Piping Systems Requiring Insulation:
   1. Potable water piping.- Hot and Cold

B. Insulate valves, fittings, and similar items with the same material and thickness of insulation as applied to adjoining pipe run. Install factory-molded, precut, or job-fabricated insulation segments.
   1. Cover insulation with PVC covers and seal to maintain vapor retarder.

C. Abut pipe insulation and pipe hanger insulation inserts.

D. Seal joints with vapor retarder tape.

E. Unions and Strainers: Use removable insulation segments. Arrange segments to permit access to strainer removal cap or plug and unions by slitting tape at the joints.

F. Omit insulation from the following:
   1. Flanges on hot piping.
   2. Expansion joints.
   3. Fire protection piping.

3.5 DUCT INSULATION

A. Insulate the following duct:
   1. Supply and return duct.

3.6 EQUIPMENT INSULATION

A. Insulate equipment listed in Part 2 under EQUIPMENT INSULATION APPLICATIONS.

B. Apply insulation in removable segments on equipment access doors and other elements which require frequent removal for service.

3.7 INTERFACE WITH OTHER PRODUCTS

A. Equipment specifications, elsewhere in Division 15.

B. Pipe supports, elsewhere in Division 15.

C. Duct specifications, elsewhere in Division 15.

D. Fire stopping and smoke stopping specified as shown on drawing

3.8 EXISTING INSULATION

A. Repair or replace existing mechanical insulation which is damaged. Match thickness and material of existing mechanical insulation. Maintain vapor retarder between new and existing insulation.

3.9 PROTECTION

A. Instruct other installers of methods required to protect mechanical insulation from damage.

3.10 CLEANING

A. Clean insulation surfaces to achieve a new appearance.

B. Clean insulation, using materials and methods recommended by manufacturer.

END OF SECTION 15250

SECTION 15410
PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Potable Water System.
A. Pipe and fittings.
B. Specialties.
C. Shut off and Isolation Valves
D. Drains.
C. .Pipe, fittings and accessories.

B. Related Sections:
1. Pipe insulation: Elsewhere in Division 15

1.2 REFERENCES

A. ASME B16.15-1985 -- Cast Bronze Threaded Fittings, Classes 125 and 250; the American Society of Mechanical Engineers; 1985.

B. ASME B16.18-1984 -- Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2010 or as applicable by the City of Wilmington Codes.

C. ASME B16.26-1988 -- Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers; 2010

1.3 DEFINITIONS

A. Water Distribution System: The system includes potable water piping (hot and cold) through-out the site, the building and associated plumbing products inside building.

1.4 SUBMITTALS

A. Product Data: Submit for each product specified in this section.

B. Shop Drawings: Prepare and submit shop drawings showing layout of plumbing system components. Include component sizes, rough-in requirements, service sizes and all other information necessary to demonstrate compliance with requirements of contract documents.

C. Test Reports:
1. Comply with requirements of applicable code.

D. Qualifications Statements: Submit statements indicating compliance with qualifications requirements specified under "Quality Assurance."

E. Manufacturer's Instructions:
1. Submit for each product specified in this section.
2. Include installation procedures.
3. Include instructions for examination, preparation, and protection of adjacent work.

F. Operation and Maintenance:
   1. Submit maintenance and operating data for each product specified in this section.
   2. Include the following information:
      a. Instructions for starting and operating equipment.
      b. Operating limits which, if exceeded, may result in hazardous or unsafe conditions.
      c. Cleaning, preventive maintenance, and lubrication schedule and procedures.
      d. List of special tools, maintenance materials, and replacement parts.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A company manufacturing products specified in this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

B. Installer Qualifications: A company installing products specified in this section and whose installations have performed in a satisfactory manner for a period of 5 years.

C. Regulatory Requirements: Conform to National plumbing code and 1996 BOCA code.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping:
   1. All materials shall be protected from damage by factory packing. Label packing, indicating contents.
   2. Handle all products in a manner to prevent damage. Follow manufacturer's recommendations.
   3. Cap ends of pipes and tubes at the factory. Maintain end caps until pipe or tube is installed.
      a. Exception: End caps are not required for hub-and-spigot pipes.

B. Acceptance at Site:
   1. Reject any damaged materials upon arrival.
   2. Store all materials above grade and in a manner to prevent damage.

1.7 PROJECT CONDITIONS

A. Location and arrangement of plumbing materials are indicated on drawings. Install as indicated. Obtain approval of the architect for any significant deviation from the system design or from the intent of the design, before installation is executed.

1.8 COORDINATION

A. Use manufacturer's instructions and data to determine rough-in requirements and locations of products connected to piping.
   1. Provide coordination drawings for each plumbing piping system.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate work of this section with work of other sections as necessary.

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

A. Do not use plumbing products manufactured from metal alloys containing more than 6 percent lead in potable water piping system.

2.2 HOT WATER SYSTEM

A. Design Pressure: 85 psig

B. Pipe and Fitting Materials - Within Building or Above Grade:
1. Copper tube: Conform to ASTM B 88, Type L.
a. Application: Piping 4-inch and smaller
b. Temper: All tubes; annealed.
c. Joints: Soldered, mechanically coupled, or brazed.
d. Fittings:
1. soldered, or brazed joint, wrought copper fittings: Conform to ANSI B16.22.
2. Threaded cast bronze fittings: Conform to ASME B16.15.

C. Pipe and Fitting Materials - Underground or Below Slab:
1. Copper tube: Conform to ASTM B 88, Type K.
a. Application: Piping 3-inches and smaller.
b. Temper: All tubes; annealed.
c. Joints:
1. Tubes 1-inch and smaller: Soldered.
2. Tubes larger than 1-inch: Soldered or brazed.
d. Fittings:
1. Threaded, soldered, or brazed joint, wrought copper fittings: Conform to ASME B16.22.
2. Threaded cast bronze fittings: Conform to ASME B16.15.

D Isolation and Shut off Valves

1. Contractor shall provide isolation and shut off valves for all plumbing equipment. These include but not limited to Hot water heater. etc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which plumbing piping is to be installed.

B. Verify placement of fixtures and equipment to determine locations of rough-in connections.

C. Correct any unsatisfactory conditions before beginning installing piping products of this section. Commencement of installation indicates acceptance of conditions.

3.2 PREPARATION

A. Pipe and Fittings:
1. Preparation of pipe and tubes: Ream and deburr.
2. Clean all debris from pipe (inside and outside) and fittings (inside and outside) before installation.

3.3 INSTALLATION

A. General Piping Requirements:
   1. Install piping as indicated on the drawings. Avoid interferences with other work.
   2. Install fittings at all branch connections and changes in direction.
   3. Fire stop/smoke stop all pipe penetrations through fire/smoke barriers in accordance with requirements of the fire stopping and smoke stopping section in Division 7.

B. Joints:
   1. Copper tubing:
      a. Bending: Conform to bending procedures and techniques described in the Copper Tube Handbook (CDA 404/O-R).
      b. Brazing: Conform to soldering procedures and techniques described in the Copper Tube Handbook (CDA 404/0-R).
      c. Keep a copy of the Copper Tube Handbook (CDA 404/0-R) on construction site for duration of the work.
      d. Mechanical couplings: Conform to manufacturer's recommended installation procedures and techniques.

3.4 CLEANING

A. Water Distribution System:
   2 Clean and disinfect water distribution system to meet regulatory requirements.

3.5 PROTECTION

A. Plug all piping system openings whenever installation is temporarily interrupted or halted for the day.

END OF SECTION 15410

SECTION 15486

AIR COOLED HEAT PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section specifies the following configurations of electrically operated Heat Pumps"

1. Heat pump.
2, Concealed air cooled heat pumps up to that 21 kW (6 tons).

B. Definitions:

1. Energy Efficiency Ratio (EER): The ratio of net cooling capacity is Btu/h to total rate of electricity input in watts under designated operating conditions.
2. Coefficient of Performance (COP) - Cooling: The ratio of the rate of heat removed to the rate of energy input in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.
3. Coefficient of Performance (COP) - Heating: The ratio of the rate of heat delivered to the rate of energy input is consistent units for a complete heat pump system, including the compressor and, if applicable, auxiliary heat under designated operating conditions.
4. Unitary Heat Pump: One or more factory made assemblies that normally include an indoor conditioning coil, compressor(s) and an outdoor refrigerant-to-air coil or refrigerant-to-water heat exchanger. These units provide both heating and cooling functions.

1.2 RELATED WORK

A. Section 1, GENERAL REQUIREMENTS: For pre-test requirements.
B. Section 15, Basic Mechanical Material and Methods.
D. Section 15, REFRIGERANT PIPING: Requirements for field refrigerant piping.
E. Section 15. HYDRONIC PIPING Requirements for piping for split systems and expansion tanks.
F. Section 15, HVAC DUCTS AND CASINGS: Requirements for sheet metal ductwork.

G. Section 15, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and Thermostats.

H. Section 15.TESTING, ADJUSTING, AND BALANCING FOR HVAC: Requirements for testing, adjusting and balancing of HVAC system.

1.3 QUALITY ASSURANCE:

A. Refer to specification Section 15.Mechanical Materials and Method

B. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.

C. Comply with ASHRAE 90.1-2004.

1.4 SUBMITTALS

A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and AND SAMPLES.

B. Manufacturer's Literature and Data.

1. Heat Pumps:

c. Vertical type.

C. Certification: Submit, simultaneously with shop drawings, a proof of certification that this product has been certified by ARI.

D. Performance Rating: Submit catalog selection data showing equipment ratings and compliance with required cooling and heating capacities EER and COP values as applicable.

1.5 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Federal Specification (Fed. Spec.):

A-A-50502-90	Air-conditioner (UNITARY HEAT PUMP), AIR TO AIR (3000 TO 300,000 BTUH)

C. Air-Conditioning and Refrigeration Institute (ARI) Standards:

ARI-DCPP	Directory of Certified Product Performance - Applied Directory of Certified Products
210/240-06	Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment
270-95	Sound Rating of Outdoor Unitary Equipment
310/380-04	Standard for Packaged Terminal Air-Conditioners and Heat Pumps (CSA-C744-04)

320-98 Heat Pumps

D. Air Movement and Control Association (AMCA):

210-99 Laboratory Methods of Testing Fans for Aerodynamic Performance Rating (ANSI)

410-96 Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans

E. American National Standards Institute (ANSI):

S12.51-02 Acoustics - Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Method for Reverberation Rooms (same as ISO 3741:1999)

F. American Society of Heating, Refrigerating and Air-Conditioning Engineers Inc (ASHRAE):

2004 Handbook HVAC Systems and Equipment

G. American Society of Testing and Materials (ASTM):

B117-03 Standard Practice for Operating Salt Spray (Fog) Apparatus

H. National Electrical Manufacturer's Association (NEMA):

MG 1-06 Motors and Generators (ANSI)

ICS 1-00 (R2005) Industrial Controls and Systems: General Requirements

I. National Fire Protection Association (NFPA):

90A-02 Standard for the Installation of Air-Conditioning and Ventilating Systems

J. Underwriters Laboratory (UL):1995-05 Heating and Cooling Equipment

PART 2- PRODUCTS

2.1 GENERAL REQUIREMENTS FOR WATER SOURCE HEAT PUMPS

A. System Characteristics of a split System heat pumps: The system consists of individual unit connected to exterior Heat pump condensers.

2.2 HEAT PUMP

A. Description: air cooled heat pump with temperature controls; and shall be factory assembled, tested, and rated according to ARI-

ISO-13256-1. Unit shall be console, vertical, horizontal type, with ducted free air delivery. Comply with ARI 320.

B. Cabinet: Manufacturer's standard galvanized steel for ducted models and galvanized steel with baked enamel finish. Unit shall have access panels and flanged duct connections. Cabinet shall be factory insulated with fiber glass duct liner, minimum 13 mm (1/2-inch) thick and complying with UL 181. Units shall have knockouts for electrical, piping, and condensate drain connections.

C. Fan: Direct driven, centrifugal, with permanently lubricated multi-speed motor resiliently mounted in fan inlet

D. Compressor: Hermetic, rotary, scroll, compressor installed on vibration isolators; with a slide-out chassis and housed in an acoustically treated enclosure. Unit shall have factory-installed safeties, anti-recycle timer, high-pressure cutout, low-pressure cutout or loss-of-charge switch, internal thermal-overload protection, and freeze stat to stop compressor if water-loop temperature in refrigerant-to-water heat exchanger falls below 2 deg C (35 deg F). **Condensate overflow switch shall stop compressor with high condensate level in condensate drain pan. Compressor lockout circuit shall be capable of being reset at either remote thermostat or circuit breaker.**

E. Refrigerant Piping Materials: ASTM B 743 copper tube with wrought-copper fittings and brazed joints.

F. Pipe Insulation: Refrigerant minimum 10-mm (3/8-inch) thick, flexible elastomeric insulation on piping exposed to airflow through the unit. Maximum 25/50 flame-spread/smoke-development indexes according to ASTM E 84.

G. Refrigerant Metering Device: Capillary tube, Thermal expansion valve to allow specified operation with entering-water temperatures from minus 25 to 125 deg F.

H. **Condensate Drainage: Plastic or stainless-steel drain pan with condensate drain piping projecting through unit cabinet and complying with ASHRAE 62.1-2004.**

I. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

J. Sound Attenuation Package: Minimum 1-mm (0.06-inch) thick compressor enclosure and front panel. Minimum 2-mm (0.12-inch) thick foam gasket around the compressor and perimeter of end panel, sound attenuating blanket over compressor and hot-gas muffler.

K. General Motor Requirements: Comply with requirements in Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT. Motor shall be multispeed, permanently lubricated, // permanent split capacitor ECM.

L air-to-Refrigerant Heat Exchanger:

. Coaxial heat exchangers with *copper,* water tube with enhanced heat-transfer surfaces inside a steel shell; both shell and tube shall be leak tested to 450 psig on refrigerant side and 400 psig on water side. Heat exchanger shall be factory mounted in unit on resilient rubber vibration isolators.

2. Stainless-Steel, Brazed-Plate Heat Exchanger: Factory mount heat exchanger in unit on resilient rubber vibration isolators and leak tested to 450 psig for refrigerant side and 400 psig for water side.

heater is less than 125 deg F.

M. Motorized Water Valve: Stop water flow through the unit when compressor is off.

N. Refrigerant-to-Air Coils: Copper tubes with aluminum fins, leak tested to 450 psig.

O. Refrigerant Circuit Components: Sealed refrigerant circuit charged with R-410A refrigerant

1. Filter-Dryer: Factory installed to clean and dehydrate the refrigerant circuit.
2. Charging Connections: Service fittings on suction and liquid for charging and testing.
3. Reversing Valve: Pilot-operated sliding-type valve designed to be fail-safe in heating position with replaceable magnetic coil.
4. Refrigerant Metering: Extended temperature range device or a bi-directional thermal expansion valve.

P. Electric Heating Coil: Helix-wound, nickel-chromium wire-heating elements in ceramic insulators mounted on steel supports. Energize on call for heating when entering-water-loop temperature is less than 60 deg F

Q. Hot-Gas Reheat: Reheat valve shall be a pilot-operated, sliding-type valve with replaceable magnetic coil to divert refrigerant hot gas to reheat coil when remote humidistat calls for dehumidification.

R. Hot-Gas Bypass: Include constant pressure expansion valve, solenoid valve, and controls to maintain continuous refrigeration system operation at 10 percent of full load on lead compressor.

S. Filters: Disposable, glass-fiber, flat type, 25 mm (1 inch) thick, treated with adhesive, and having a minimum of 80 percent arrestance according to ASHRAE 52.1 and a MERV rating of 5 according to ASHRAE 52.2. Disposable, pleated type, 1 inch thick and with a minimum of 90 percent arrestance according to ASHRAE 52.1 and a MERV rating of 7 according to ASHRAE 52.2.

T. Comply with requirements in Section 15, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC for control equipment and sequence of operation are specified.

U. Controls:

1. Basic Unit Controls:
   a. Low- and high-voltage protection.
   b. Overcurrent protection for compressor and fan motor.
   c. Random time delay, three to ten seconds, start on power up.
   d. Time delay override for servicing.
   e. Control voltage transformer.
2. **Thermostat: Wall-mounted thermostat heat-cool-off switch, fan on-auto switch, manual automatic changeover, temperature set point, Deg F indication.**
3. Terminal Controller:
   a. Scheduled operation for occupied and unoccupied periods on 7 / 365 -day clock with minimum 4 programmable periods per day, override period Remote control panel to contain programmable timer and LED for fault condition.
   b. Compressor-disable relay shall stop compressor operation for demand limiting or switch to unoccupied operation.

c. Unit shall automatic restart after five minutes if fault clears and lockout after three attempts to restart following fault.

d. Indicate fault for service technician Return-air temperature high-limit (firestat).

e. Stop unit on high temperature.

f. Backup for volatile memory.

g. Differential pressure switch shall indicate fan status.

h. Fan failure alarm.

i. Differential pressure switch shall indicate filter status.

j. Dirty filter alarm.

4. Comply with requirements in Section 15. DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC for BAS interfaces requirements. Interface relay for scheduled operation. Interface relay shall provide indication of fault at central workstation. Interface shall be BAC-net or Lonworks for central BAS workstation for the following functions. Set-point adjustment for set points identified in this Section start/stop and operating status of heat-pump unit Data inquiry shall include supply air, room air temperature and humidity, and entering-water temperature. Occupied and unoccupied schedules

V Electrical Connection: Control box with single electrical connection factory installed and tested with fused disconnect

W. Hangers shall have vibration isolators for horizontal type heat pumps.

Part 3- execution

3.1 INSTALLATION

A. Floor-Mounted Units: Support on neoprene pads with minimum 0.125-inch static deflection. Secure units to anchor bolts installed in concrete bases.

B. Suspended Units: Suspend from structure with threaded steel rods and minimum 0.25-inch static deflection rubber-in-shear vibration isolators and seismic restraints.2 Seismic Bracing:

Where applicable provide Seismic bracing as required under specification Section:

SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

3.3 CONNECTIONS

A. **Connect supply and return hydronic piping to heat pump with unions and shutoff valves.**

B. Connect heat-pump condensate drain pan to indirect waste connection with condensate trap of adequate depth to seal against the pressure of fan. Install cleanouts in piping at changes of direction.

C. Connect supply- and return-air ducts to water-source heat pumps with flexible duct connectors. Comply with requirements in Section 15 METAL DUCT.

D. Install electrical devices furnished by manufacturer but not specified to be factory mounted.

E. Install piping adjacent to machine to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

B. Perform the following field tests and inspections and prepare test reports:

1. After installing water-source heat pumps and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 INSTRUCTIONS

A. Provide services of manufacturer's technical representative for four hours to instruct owner's personnel in operation and maintenance of the heat pumps and related systems

E N D OF SECTION 15486

SECTION 15891
METAL DUCT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal duct.
   2. Balancing Dampers

B. Related Sections:
   1. Paint.
   2. Basic mechanical materials and methods.
   3. Mechanical insulation.
   4. Air terminal units.
   5. Controls.
   6. Electrical wiring and wiring connections: Division 16

1.2 REFERENCES

A. ASTM A 527/A 527M-90 -- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality; 2010

B. ASTM C 916-85 (2010) -- Standard Specification for Adhesives for Duct Thermal Insulation; 1985 (Reapproved 2010).

C. ASTM C 1071-2010 -- Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material); 2010.

D. HVAC Duct Construction Standards, Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA); 2010.

E. NFPA 90A -- Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association; 2010.

F. UL 181 -- Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 1994 (8th edition dated November 29, 1994).

1.3 SUBMITTALS

A. Shop drawings for each product specified in this section that is not a standard product of the manufacturer.

B. Shop drawings for shop-fabricated duct and fittings.
   1. Indicate duct sizes, static pressure ratings, locations, elevations, slopes of horizontal runs, wall and floor penetrations, reinforcing methods, and connection details.
   2. Indicate interface and spatial relationship between duct, proximate equipment, and building elements.
   3. Indicate modifications proposed to conform to local shop practice and to meet project conditions. Show that free area and rigidity are not reduced from that specified.

C. Product data for each product specified in this section.

D. Fabricator qualification statement, for information.

E. Coordination drawings, for information.

1.4 FIELD SAMPLE

A. Furnish sample of lined duct to demonstrate attachment and fastening of liner.

B. Include at least 2 connecting sections.

1.5 QUALITY ASSURANCE

A. Conform to NFPA 90A.

B. Conform to the requirements of the following standards that do not conflict with regulatory requirements or requirements of the contract documents; keep one copy at project site:
1. SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

1.6 QUALIFICATIONS

A. Fabricator Qualifications: A company fabricating products of this section for a period of 5 years.

B. Installer Qualifications: A company installing products of this section and whose installations have performed in a satisfactory manner under comparable conditions for a period of 5 years.

1.7 PROJECT CONDITIONS

A. Review drawings to determine project conditions.
1. Determine working clearance around and between equipment..
2. Determine working clearance around piping and other mechanical work.
3. Determine working clearance required around lighting fixtures, and other electrical work.
4. Determine clearance required to allow proper maintenance of equipement.
5. Determine spaces reserved for electrical connections.

B. Locations of equipment and air terminal units indicated on drawings are approximate unless dimensioned. Determine exact location before roughing in duct and duct connections.

1.8 FIELD MEASUREMENTS

A. Field-measure related work to ensure proper fit and clearance.

B. Field-measure existing work to ensure proper fit and clearance.

1.9 COORDINATION

A. Use manufacturer's instructions and data to determine rough-in requirements and locations of products connected to ducts.

B. Prepare coordination drawings and distribute to affected installers of related work.
1. Use reproducible copy of duct shop drawings.
2. Indicate product locations, project conditions, and field measurements.
3. Indicate proposed infringements into required clearance space of other work.
4. Indicate clearance required around each location of installed products for installation, ventilation, access, operation, and maintenance.
5. Indicate required separation of product from pipes, heat generating sources
6. Indicate requirements for access openings in building finishes.

PART 2 - PRODUCTS

2.1 METAL DUCT MATERIALS

A. Galvanized Sheet Metal: ASTM A 527.
   1. Finish: Provide mill phosphatized finish, suitable for painting.

2.2 METAL DUCT SHOP FABRICATION

A. Fabricate and support duct using tools, techniques, and materials required by SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

B. Install duct liner where indicated on drawings. Duct dimensions shown are clear inside with liner in place.

C. Duct sealing is required for the following duct static pressure classes:
   1. 1/2 inch w.g., Seal Class C.
   2. 1 inch w.g., Seal Class C.
   3. 2 inches w.g., Seal Class C.
   4. 3 inches w.g., Seal Class B.
   5. 4 inches w.g., Seal Class A.
   6. 6 inches w.g., Seal Class A.
   7. 10 inches w.g., Seal Class A.

D. Seal duct in accordance with duct sealing described in SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

2.3 DUCT STATIC PRESSURE CLASS

A. Supply Duct Static Pressure Class:
   1. 3 inch w.g. between supply fan and air terminal units.

B. Supply Duct Pressure Mode: Positive.

C. Return Duct Static Pressure Class:
   1. 1" w.g. for return duct connected to Air Handling Units, and all fan coil units, where applicable.

D. Return Duct Pressure Mode: Negative.

E. Exhaust Duct Static Pressure Class:
   1. 1 inch w.g. for all exhausts fans.

F. Exhaust Duct Pressure Mode:
   1. Negative upstream of exhaust fan.
   2. Positive downstream of exhaust fan.

G. Outside Air Duct Static Pressure Class:
   1. 1 inch w.g. for AHU-1 and all fan coil units.

H. Outside Air Duct Pressure Mode: Negative.

2.4 CONTROL, BALANCING, AND BACKDRAFT DAMPERS

A. Provide control, balancing, and back draft dampers as indicated on drawings.

2.5 CONTROL DAMPERS

A. Description:
   1. Frame material:
      a. Aluminum.
   2. Blade type:
      a. Aluminum airfoil.
   3. Blade edge seal material:
      a. Extruded vinyl.
   4. Opposed blade operation.
   5. Operator type:
      a. Pneumatic.

2.6 MAINTENANCE MATERIALS AND TOOLS

A. Spare filter: one of each type and size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in compliance with manufacturer's instructions.

B. Fabricate duct in field to accommodate changes and to complete system. Use methods of construction and sealing specified for shop fabrication.

C. Install metal duct in accordance with SMACNA "HVAC Duct Construction Standards, Metal and Flexible."

D. Modify size, shape, and routing of duct to meet project conditions.

E. Install accessories specified in this section.

F. Provide manual dampers for balancing system at each branch takeoff.

G. Install duct test holes as required.

H. Temporary Closure: Close ends of duct using suitable materials and methods to minimize collecting construction debris in installed duct.

3.2 COMMISSIONING

A. Verify tightness of mechanical joints.

B. Remove baffles and temporary closures.

C. Verify proper operation of control actuators.

D. Verify that moving parts are properly lubricated.

3.3 FIELD QUALITY CONTROL

A. Inspect installed products to observe damage.

B. Test and demonstration as required by the governing authority.

C. Visually inspect duct which is not leakage tested, to verify duct construction requirements.

D. Testing, Adjusting, and Balancing:
   1. Secure all manual dampers at full open position.
   2. Set splitters straight with main duct.
   3. Complete and clean the duct systems to prepare for testing, adjusting, and balancing work.

3.4 CLEANING

A. Clean using materials and methods recommended by product manufacturer.

B. Remove dust and debris from inside ducts and fittings.

C. Clean finishes to remove dust and dirt.

D. Touch up scratches in unfinished surfaces to restore corrosion resistance.

E. Touch up scratches in finished surfaces to restore finish.

3.5 INSTRUCTION OF OWNER'S PERSONNEL

A. Provide instruction to the owner's designated personnel.

B. Conduct walking tour of the project. Briefly identify location and describe function, operation, and maintenance of each product.

C. Demonstrate each distinct adjustment, troubleshooting, servicing, and maintenance procedure.

3.6 PROTECTION

A. Do not use duct provided under this section for temporary heating and ventilating during construction.

END OF SECTION 15891

SECTION 15940
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Air diffusers and accessories.
2. Grilles and accessories.
3. Registers and accessories.

B. Related Sections:
1. Metal Duct.
2. Hydronic piping systems.
3. Mechanical insulation
4. Temperature controls.
5. Basic mechanical materials and methods.
6. Testing, adjusting, and balancing

1.2 REFERENCES

A. ARI Standard 880-89 -- Standard for Air Terminals; Air-Conditioning and Refrigeration Institute; 1989.

B. NFPA 90A -- Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association; 1993.

1.3 SUBMITTALS

A. Product Data - Air Outlets and Inlets:
1. Performance data for each distinct type and size.
2. Installation instructions.

B. Contract Closeout Submittals:
1. Operation and maintenance data:
a. Parts list.
b. "Troubleshooting" guide.
2. Warranty: Manufacturer's standard warranty information.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: A company manufacturing products of this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

B. Installers' Qualifications: A company installing products of this section whose installations have performed in a satisfactory manner under comparable conditions for a period of 5 years.

C. Regulatory Requirements:
1. Conform to NFPA 90A.

D. Certifications and Tests:
1. ARI compliance:
a. Test air terminal units in accordance with ARI Standard 880, Appendix A.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Protect air inlets and outlets with factory packing designed to prevent damage and contamination. Label exterior of the factory packaging identifying air inlet and outlet types.

B. Acceptance at Site: Reject any damaged materials upon arrival.

C. Storage and Protection:
1. Store air inlets and outlets in factory packaging in an area (indoors) protected from weather and construction traffic.
2. If indoor storage is unavailable and outdoor storage is necessary, store air terminals above grade and protect with waterproof cover or wrap.

PART 2 - PRODUCTS

2.1 AIR OUTLET AND AIR INLET MANUFACTURERS

A. Provide product complying with requirements of the contract documents and made by one of the following:
1. Krueger Division/Philips Industries, Inc.
2. Air Devices Division/Hart & Cooley.
3. Titus, Inc.
4. Hart and Cooley, Inc. Division/Eagle Industries.
5. Tuttle and Bailey

2.2 AIR INLETS AND OUTLETS

A. Description:
1. Material: Steel or aluminum.
2. Type, capacity, and size of air inlets and outlets are indicated on the drawings.
3. Provide the required accessories manufactured by the air inlet or outlet manufacturer.

2.3 DIFFUSER - D

A. Manufacturer and Model Number: Tuttle and Bailey,

B. Other manufacturers' products will be considered.

2.4 GRILLE - GR

A. Manufacturer and Model Number: Tuttel and Bailey

B. Other manufacturers' products will be considered.

2.5 REGISTER - R

A. Manufacturer and Model Number: Tuttle and Bailey.

B. Other manufacturers' products will be considered.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Examine conditions and areas where air outlets and air inlets will be installed. Correct any unsatisfactory conditions before installing air inlets and outlets.

3.2 INSTALLATION

A. Locate all diffusers, registers, and grilles in accordance with duct shop drawings.

B. Install air inlets and outlets in compliance with manufacturer's recommendations.

3.3 ADJUSTING

A. Provide the owner with 5 operating keys for each type of air inlet or outlet device which requires them.

3.4 PAINTING

A. Paint the interior of ducts matte black behind grilles and registers where it is visible.

3.5 CLEANING

A. Clean the faces of all air inlets and outlets. Replace or repair any damaged faces.

END OF SECTION 15940

SECTION 15975
CONTROL SYSTEMS EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes control equipment for Air Cooled Heat Pumps HVAC systems and components, including control components for terminal heating and cooling units that are not supplied with factory-wired controls.

1.3 SYSTEM DESCRIPTION

A. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories connected to controllers to operate mechanical systems according to sequences of operation indicated or specified.

1.4 SEQUENCE OF OPERATION

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.

D. Shop Drawings containing the following information for each control system:
1. Schematic flow diagram showing fans, pumps, coils, dampers, valves, and control devices.
2. Each control device labeled with setting or adjustable range of control.
3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

E. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

F. Samples of each type of furnished thermostat cover according to requirements of Division 1.

G. Maintenance data for control systems equipment to include in the operation and maintenance

manual specified in Division 1. Include the following:

1. Interconnection wiring diagrams with identified and numbered system components and devices.
2. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
3. Calibration records and list of set points.

H. Field Test Reports: Procedure and certification of pneumatic control piping system.

I. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain Heating/Air conditioning control from single source if possible.

B. Installer Qualifications: Engage an experienced Installer specializing in control system installations.

C. Manufacturer Qualifications: Engage a firm experienced in manufacturing control systems similar to those indicated for this Project and that have a record of successful in-service performance.

D. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of manufacturer of primary temperature control system.

E. Comply with NFPA 90A.

F. Comply with NFPA 70.

G. Coordinate equipment selection with Division 16 Section "Fire Alarm Systems" to achieve compatibility with equipment that interfaces with that system.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store equipment and materials inside and protected from weather.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Carrier
2. Trane
3. Bryant

B. APARTMENT THERMOSTAT
1. T2000 ZONE THERMOSTAT Provide a T2000 Auto Change Over thermostat or equal to control Heet pump through heating and cooling cycles. The T2000 thermostat shall send heating or cooling calls to the System Controller. Each thermostat shall send heating or cooling calls to the System Controller. There shall be a three degree dead band between the heating and cooling set points. Each thermostat shall be provided with two on/off switches. One switch will control heating calls to the System Controller. The other switch will control cooling calls to the System Controller. The switches may be manually set for auto operation,

cooling only, heating only or zone off. Red heating and green cooling signal lights shall be integral parts of the thermostat. The thermostat is to be compatible with auto change over Controllers. The T2000 thermostat shall have remote sensor capability.

2.3 THERMOSTATS

A. Combination Thermostat and Fan Switches: Line-voltage thermostat with 2-, 3-, or 4-position, push-button or lever-operated, fan switch.
   1. Label switches "FAN ON-OFF," "FAN HIGH-LOW-OFF," "FAN HIGH-MED-LOW-OFF." Provide unit for mounting on 2-gang switch box.

B. Low-Voltage, ON-OFF Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater.

C. Line-Voltage, ON-OFF Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual ON-OFF-AUTO selector switch; UL listed for electrical rating.

   1. Equip thermostats, which control electric, heating loads directly, with OFF position on dial wired to break ungrounded conductors.
   2. Dead Band: Maximum 2 deg F (1 deg C).

D. Fire-Protection Thermostats: UL listed with fixed or adjustable settings to operate at not less than 75 deg F (24 deg C) above normal maximum operating temperature, with the following:
   1. Reset: Manual.
   Reset: Automatic with control circuit arranged to require manual reset at central control panel, with pilot light and reset switch on panel labeled to indicate operation.

E. Room Thermostat Construction: Manufacturer's standard locking covers.

F. Room Thermostat Accessories: As follows:
   1. Insulating Bases: For thermostats located on exterior wall
   2. Thermostat Guards: Locking transparent-plastic mounted on separate base.
   3. Adjusting Key: As required for device.
   4. Aspirating Boxes: Where indicated for thermostats requiring flush installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation. Verify that field end devices, wiring, and pneumatic tubing are installed before proceeding with installation.

3.2 INSTALLATION

A. Install equipment as indicated to comply with manufacturer's written instructions.
B. Verify location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Locate 60 inches (1524 mm) above floor.
   1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

C. Install labels and nameplates to identify control components according to Division 15 Sections specifying mechanical identification.

D. Install refrigerant instrument wells, valves, and other accessories according to Division 15 Section "Refrigerant Piping."

E. Install duct volume-control dampers according to Division 15 Sections specifying air ducts.

F. Install optical-fiber cable according to Division 16 Section "Control/Signal Transmission Media."

3.3 ELECTRICAL WIRING AND CONNECTIONS

A. Install raceways, boxes, and cabinets according to Division 16 Section "Raceways, Boxes, and Cabinets."

B. Install building wire and cable according to Division 16 Section "Wires and Cables."

C. Install signal and communication cable according to Division 16 Section "Control/Signal Transmission Media."
   1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
   2. Install exposed cable in raceway.
   3. Install concealed cable in raceway.
   4. Bundle and harness multiconductor instrument cable in place of single cables where a number of cables follow a common path.
   5. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.
   6. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.

D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

F. Connect HAND-OFF-AUTO selector switches to override automatic interlock controls when switch is in HAND position.

3.4 COMMISSIONING

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to start control systems.

B. Test and adjust controls and safeties.

C. Replace damaged or malfunctioning controls and equipment.

D. Start, test, and adjust control systems.

E. Demonstrate compliance with requirements.

F. Adjust, calibrate, and fine tune circuits and equipment to achieve proper operation.

3.5 DEMONSTRATION

A. Manufacturer's Field Services: Provide the services of a factory-authorized service representative to demonstrate and train Owner's maintenance personnel as specified below.
   1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
   2. Schedule training with Owner with at least 7 days' notice.

END OF SECTION 15975

SECTION 15990 - TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Testing, adjusting, and balancing (TAB) requirements for:
   1. Supply air systems.
   2. Return air systems.
   3. Potable water systems.

B. Related Sections:
   1. Temperature control.
   2. Basic mechanical materials and methods.
   3. Duct.
   4. Hydronic piping systems.

1.2 REFERENCES

A. National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems; Associated Air Balance Council; 2009.

1.3 SUBMITTALS

A. Name of the TAB Agency.

B. Detailed Procedures.

C. Agenda.

1.4 QUALITY ASSURANCE

A. Conform to AABC National Standards for Total Systems.

B. Agency Employer: The Contractor shall purchase the services of an independent TAB agency.

C. Agency Qualifications: A company which has performed a test and balance under comparable conditions at a similar facility with satisfactory results within the last 5 years.

D. Provide the owner with an AABC "National Project Performance Guarantee."
   1. Submit copies to the contractor and the architect.

1.5 PROJECT CONDITIONS

A. Review drawings to determine project conditions.

B. Determine access requirements.

C. Locations of equipment on the drawings are approximate unless dimensioned.

PART 2 - PRODUCTS

2.1 PROGRESS REPORTS

A. Report progress of the job: Inspect all mechanical systems and list:
   1. Deficiencies.
   2. Items not installed.

3. Items installed, but not operable.

B. Report Description:
1. Typed or legibly hand written.
2. Bound.
3. List initial readings.
4. List final readings when available.

C. Number of Copies: Three for the contractor; one for the architect.

2.2 FINAL REPORTS

A. Verify and report performance of automatic controls system with cooperation from the control installer.

B. Inspect all mechanical systems and report:
1. Deficiencies.
2. Items not installed.
3. Items installed, but not operable.

C. Report Description:
1. Typed.
2. Bound.
3. List initial readings.
4. List final readings.
5. List excesses and deficiencies.
6. List dates and times of all tests.
7. List the name plate data of installed equipment. Include:
   a. Manufacturer.
   b. Size.
   c. Model number.
   d. Serial number.
   e. Motor horsepower.
   f. Revolutions per minute.
   g. Voltage.
   h. Full load amperes.
   i. Sheave sizes.
   j. Belt sizes.
   k. Starter heater sizes.
   l. Starter rating.
   m. Starter fuse sizes.
8. Air measurements during heating mode and during cooling mode:
   a. Air flow and air velocities for:
      1. Supply air systems.
      2. Return air systems.
      3. Exhaust air systems.
      4. Outside air systems.
   b. Static pressures, velocity pressures, and total pressures for all branches and mains.
   c. Pressure drops across all filters and all coils.
   d. Dry bulb temperatures entering and leaving coils.
   e. Humidities entering and leaving coils.
9. Water measurements:
   a. Flow rates at domestic water heaters.
   b. Total flow rates for the following systems:
      1. Heating water system.
   c. Head pressures.
   d. Head pressure drops across equipment.
   e. Heat transfer rates in Btu per hour.

1. Predict performance of equipment at design conditions based on measured heat transfer rates.

D. Number of Copies: Four delivered to the contractor; one delivered to the architect; two delivered to the owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that all systems are fully operational.
   1. Report any unsatisfactory conditions to the contractor and the architect in writing.
   2. Begin testing, adjusting, and balancing work after all systems are fully operational.

3.2 SYSTEM OPERATION

A. Contractor Responsibilities: Operate the systems at all times during testing, adjusting, and balancing work.
   1. Perform start-up, adjustment, and commissioning of all mechanical systems, including but not limited to the following:
      a. Assembly of all parts.
      b. Alignment of drives.
      c. Tightening sheaves on shafts.
      d. Checking motors for proper rotation.
         1. Correction of incorrect rotation.
      e. Providing properly sized starter overload heaters.
      f. Removal of dirt and blockage.
      g. Adjust automatic controls.
      h. Commission systems.

3.3 TESTING, ADUSTING, AND BALANCING

A. Marking of Adjustable Devices:
   1. Permanently mark all adjustable device settings. Include:
      a. Valves.
   2. Set, lock, and mark balancing devices with memory stops.

B. HP and Hot Water Elecctric
   1. Check and record full load amperes.
   2. Report any motors which are overloaded, defective, or operating within their service safety factor.

C.. Air Flow Measurements:
   1. Main ducts:
      a. Use Pitot tube and a calibrated inclined manometer to measure pressures.
      b. Calculate air flow based on measured pressures.
   2. Ducts with velocities below 700 feet per minute:
      a. Use Pitot tube and a standard hook gage to measure pressures.
      b. Calculate air flow based on measured pressures.

D. Diffusers, Registers, and Grilles:
   1. Measure and record initial and final device air flow.
   2. Measure and record initial and final device air velocity.
   3. Adjust all diffusers, registers and grilles to minimize drafts.
   4. Set slot diffusers as follows:
      a. Interior spaces: Horizontal throw; 180 degrees apart.
      b. Perimeter spaces:

1. 2-slot diffusers:
    a. Set one slot with horizontal throw toward perimeter.
    b. Set one slot with horizontal throw toward interior.
2. 3-slot diffusers:
    a.
    b.
3. 4-slot diffusers:
    a. Set one slot with horizontal throw toward perimeter.
    b. Set one slot with vertical throw.
    c. Set two slots with horizontal throw toward interior.

5. Adjust the air flow within the tolerances listed below and to minimize drafts:
    a. Individual space tolerance: 5 to 10 percent of specified air flow.
    b. Individual device tolerance:
        1. One device in space: Minus 5 to plus 10 percent of specified air flow.
        2. Two devices in space: Plus or minus 10 percent of the specified air flow.
        3. Three devices or more in space: Plus or minus 15 percent of the specified air flow.

6. Identify each device by listing its:
    a. Location and area.
    b. Size.
    c. Type.
    d. Manufacturer.
7. Use manufacturer's ratings to complete required calculations.

END OF SECTION 15990

TABLE OF CONTENTS

ELECTRICAL SPECIFICATION

DIVISION 16

SECTION 16000- ELECTRICAL GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 BASIC ELECTRICAL REQUIREMENTS

A. Specifically applicable to Division 16 sections, in addition to Division 1- General Requirements. In case of overlap between Division 1 and Division 16 the more stringent specification or requirements shall apply.

1.2 PROJECT INCLUDES

A. Disconnecting existing electric Hot Water Heaters and Heat Pumps remove and scrap as per schedule. Disconnect existing wires back to power panels.
B. Connect new hot water Heater and Heat Pumps per plans. Identify in panel the appropriate breaker location.
C. Provide new ceiling mounted light fixture per plans and schedule.
D. Arc fault breakers and outlets for bedroom (code compliant- Not in Contract)
E. Electrical Systems for the Following Applications: Refer to individual specification sections following for detailed requirements.
   1. Primary connections.
   2. Power connections for HVAC-ELECTRIC HEAT PUMP, and HOT WATER ELECTRICAL HEATER.

1.3 SCOPE OF WORK

A. New Work
   1. Provide new power requirements to feed the new HVAC –Heat Pumps equipment.
   2. Connect new hot water heaters.
   3. Provide new light per schedule in each mechanical room

END OF SECTION 16000

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:
1. Grounding and bonding
2. Supports
3. Identification

B. Related Sections:
1. Cutting and patching: Division 1.
2. Painting. Division 9

1.2 REFERENCES

A. A NFPA 70-96- National Electrical Code; National Fire Protection Association; 1996.

B. Standard of Installation; National Electrical Contractors Association (NECA); 1990.

1.3 QUALITY ASSURANCE

A. Conform to NFPA 70

B. Conform to requirements of NECA 'Standard of Installation' that do not conflict with regulatory requirements or requirements of contract documents. Keep one copy at project site.

C. Furnish products listed by Underwriters Laboratories Inc and classified as suitable for installed use and environmental conditions.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Description: Engraved plastic.

B. Nameplate Color: Black letters on white background.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces intended to support products.

B. Verify that each product conforms to regulatory requirements and to specification requirements.

C. Examine existing grounding and bonding systems to verify adequacy.

3.2 PREPARATION

A. Clean surfaces to receive work.

B. Protect surrounding elements from work of this section.

3.3 GROUNDING AND BONDING

A. Make grounding and bonding connections to meet regulatory requirements.

B. Equipment Grounding Conductor. Provide separate grounding conductor in each raceway and cable.

3.4 ANCHORS AND SUPPORTS

A. Select fasteners and anchors that are suitable for surfaces to which they attach.

B. Select fasteners and anchors with suitable load rating to support installed products.

C. Do not use nails for permanent supports.

D. Fasten supports to sheet metal framing channels using sheet metal screws.

E. Does not use spring steel clips and clamps to fasten supports.

3.5 IDENTIFICATION

A. Secure nameplates to equipment and enclosures using noncorrosive screws or rivets, or appropriate adhesive.

3.6 FIELD QUALITY CONTROL

A. Correction of Defective Work:
1. Replace defective products.

3.7 CLEANING

A. Restore damaged corrosion-resistant coatings.

END OF SECTION 16050

SECTION 16120
WIRE AND CABLE

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wire.

B. Related Sections:
   1. Cutting and patching:
   2. Fire-stopping.
   3. Painting:

C. Owner- Furnished Products: Refer to Division 1 for description of owner-furnished products affecting work of this section.

D. Alternates: Refer to Division 1 for description of alternates affecting work of this section.

1.2 REFERENCES

A. NFPA 70-96 – National Electrical Code; National Fire Protection Association; 1996.

B. Standard of Installation; National Electrical Contractors Association (NECA); 1990.

1.3 SUBMITTALS

A. Manufacturer's qualification statement, for information.

B. Coordination drawings, for information.

C. Field test report for each inspection and test specified in this section, for information. Describe inspections and tests, list observations, indicate corrective action taken, and state conclusions and recommendations for future action.

1.4 QUALITY ASSURANCE

A. Conform to NFA 70.

B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents. Keep one copy at project site.

C. Furnish products listed by Underwriters Laboratories Inc. and classified as suitable for installed use and environmental conditions.

1.5 QUALIFICATIONS

A. Manufacturer Qualifications: A company manufacturing products of this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years.

1.6 PROJECT CONDITIONS

A. Review drawings to determine project conditions.

B. Determine working clearance around and between construction elements such as beams, columns, walls, and ceilings.

C. Determine access requirements around other work, including working clearances to mechanical equipment, controls, and electrical equipment.

1.7 COORDINATION

A. Prepare coordination drawings and distribute to affected installers of related work.
   1. Indicate cable routing and elevation.
   2. Indicate required separation of cable from piping and heat generating sources
   3. Indicate requirements for access openings in building finished.

PART 2 – PRODUCTS

2.1 INSULATED WIRE AND CABLE

A. Conductor: Copper.

2.2 METAL-CLAD CABLE

A. Armor Type: Interlocked tape.

B. Armor Material: Steel.

C. Conductor: Copper

D. Covering: PVC jacket.

PART 3 – EXECUTION

3.1 CONDUCTORS – 600 VOLT & UNDER

A. GENERAL
   1. Sizes of conductors and thickness of metals are American Wire Gauge (AWG).
   2. Wire sizes #10 and smaller shall be solid. Wire sizes #8 and larger shall be stranded.
   3. Wire and cable shall be insulated single conductor, 98 percent conductivity copper.
   4. Minimum size conductors for power and lighting circuits shall be #12 AWG and signaling systems #14 AWG.

B. CONDUCTORS SELECTION
   1. In areas subject to temperatures not exceeding 75 degrees C. (165 degrees F.), type THW shall be used for feeders and THWN for tenant branch circuits.
   2. In areas subject to temperatures not exceeding 90 degrees C. 194 degrees F.), type THHN shall be used.
   3. Wire and cable shall be Anaconda, General Electric, Phelps Dodge, Prelli or approved equal.

3.2 EXAMINATION

A. Examine elements and surfaces intended to support products.

B. Verify that each product conforms to regulatory requirements and to specification requirements.

3.3 PREPARATION

A. Clean surfaces to receive work.

B. Protect surrounding elements from work of this section.

C. Clean raceways thoroughly before installing wires.

3.4 WIRING METHODS

A. Use specified wiring methods.

B. Underground locations:
1. Underground service entrance cable
2. Underground feeder and branch circuit cable.

C. In or Under Slab-on-Grade:

D. Wet interior Locations:
1. Metal-clad cable with jacket.

E. Concealed Dry Interior Locations:
1. Metal-clad cable.

F. Exposed Dry Interior Locations:
1. Metal-clad cable.

3.5 INSTALLATION

A. Install products in compliance with manufacturer's instructions.

B. Install accessories specified in this section.

C. Maintain required headroom.

D. Conceal cable in finished spaces.

E. Install exposed cable perpendicular and parallel to building surfaces.

F. Identification:
1. Use wire markers at each box and enclosure to identify conductors.
2. Identify each feeder number with its designation shown on drawings.
3. Identify each branch circuit conductor with panelboard and circuit number
4. Identify each control circuit conductor with wire number shown on drawings.

3.6 FIELD QUALITY CONTROL

A. Inspect wires and cables for physical damage.

B. Insulation Resistance:
1. Test each service and feeder circuit.
2. Test each conductor with respect to ground and to its adjacent conductors.
3. Apply 1000 volts dc test potential for 1 minute.
4. Minimum insulation resistance; 2 megohms.

C. Correction of Defective Work:
1. Replace wire and cable damaged during installation.
2. Replace defective products.

END OF SECTION 16120

SECTION 16121
MEDIUM-VOLTAGE CABLE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section is to coordinate with and be complementary to the General Conditions and Supplementary General Conditions of the Work, wherever applicable to Electrical Work.

B. Section 16000 - Electrical Requirements.

C. Section 16050 - Basic electrical materials and methods shall apply.

1.2 DESCRIPTION OF WORK

A. The work includes the providing of cable complete with all accessories, in accordance with Drawings and Specifications and as required for a complete system

1.3 QUALITY ASSURANCE

A. Manufacturers - Firms regularly engaged in the manufacture of cable of specified types and ratings whose products have been in satisfactory use in similar service for not less than 5 years

B. Comply with the National Electrical Code (NFPA No. 70) and with local electrical codes, which apply. Where discrepancies arise between codes, the most restrictive regulation shall apply

C. Workman Competency Submit high voltage Splicer/ Terminator certification of competency and experience 30 days before splices or terminations are made in high voltage cables Splicer/Terminator experience during the immediate past 3 years shall include performance in splicing and terminating cables of the type and classification being provided under this Specification

D. Listing Agency. Cable types for which Underwriter ' s Laboratories, Inc provide listing service shall be listed and bear the listing mark

1.4 SUBMITTALS

A. Preliminary Acceptance Submittals:
1. Complete manufacturer' s construction details and specifications for the cable including physical and electrical characteristics of insulation, shields, and jacket
2. Overall dimension and ampacity of cable.
3. Cable handling and installation recommendations

B. Final Acceptance Submittals:
1. Cable manufacturer's certified test reports
2. Written statement from cable manufacturer indicating acceptable pulling lubricants
3. Manufacturer's catalog sheets for all products supplied.

1.5 GUARANTEE

A. Refer to Section 16000, Special Requirements for Electrical Work.

1.6 APPLICABLE INDUSTRY STANDARDS

A. Cable system shall comply with or exceed applicable provisions and recommendations of the following except where otherwise shown or specified
1. National Electrical Code (NEC).
2. ASTM B 8, Specification for Copper Conductors, Concentric-Laid- Standard, Hard, Medium-Hard, or Soft.
3. ASTM B 3, Specification for Copper wire, Soft or Annealed
4. UL 1072, Specification for Medium Voltage Cable (Type MV-90)
5. ICEA S-68-516, Ethylene-Propylene-Rubber-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
6. AEIC CS6-87, Specifications for Ethylene Propylene Rubber insulated Shielded Power Cables Rated 5 through 69 KV

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Cables shall be single conductor

B. Keep ends of cables sealed at all times, except when making splices or terminations Use heat shrinkable plastic end caps, or other methods approved by cable manufacturer.

C. Mark and tag cables for delivery to the site the same as required for sample labels

D. Cables shall be manufactured and tested under a quality assurance program which meets the requirements of ISO 9001 or Section 10 CFR50, appendix B, of Federal Register as defined in ANSI 45.2.

2.2 SPECIFIC REQUIREMENTS

A. All conductors shall be annealed uncoated copper with concentric -1a Class B compressed or compact stranding to accordance with the current ASTM Standards

At the option of the purchaser, the conductor interstices of the stranded conductor shall be filled with a semi- conducting material to prevent water propagation through the insulated conductor and to alleviate water (electrochemical) freeing of the insulation The compound used shall be flexible and stable under the conditions imposed by cable operation, and compatible with the conductor, strand shield (conductor shield), and insulation. The compound shall be capable of withstanding a water penetration test of 5 psi for qualification and 10 psi for production testing

B. The conductor shield shall consist of an extruded semi-conducting thermosetting compound applied over the conductor This material shall be compatible with the conductor metal, free stripping from the stranded conductor, and shall be uniformly and firmly bonded to the overlaying insulation The thermal characteristics shall be equal to or better than those of the insulation The thickness of the extruded conductor shield shall be in accordance with the following table:

CONDUCTOR SHIELD THICKNESS (MILS)

CONDUCTOR SIZE (AWG or kcmil)	Minimum Average	Minimum Point
2 - 4/0	15	12

250 - 500	20	16
600 - 1000	25	20

The volume resistivity of the extruded conductor shield shall not exceed 1000 ohm-meters at 90°C and 130°C when tested in accordance with ICEA.

C. The primary insulation shall be high quality, heat, moisture, ozone and corona-resistant thermosetting ethylene propylene rubber based compound (such as Pirell's EpRotenaxTM) meeting the requirements of UL, ICEA and AEIC It shall be contrasting in color from the extruded semi-conducting shields, and it shall meet the requirements of Paragraph 3 .6.1 of ICEA 5 68 516.

The minimum average thickness of the insulation shall be 220 mils and the minimum thickness at any point shall not be less than 90% of the specified minimum average thickness (or 198 mils).

The manufacturer must be able to demonstrate and document to the satisfaction of the purchaser sufficient capability and experience in the manufacturer and field application of high quality, high voltage power cable with EPR insulation. The insulation shall have an established service record of twenty (20) years or more in industrial and utility installations.

D. All 15 KV cable shall have an extruded semi-conducting thermosetting compound extruded directly over the insulation the thermosetting material shall be compatible with the insulation and the overlying metallic shield. The thermal characteristics of the compound shall be equal to or better than those of the insulation The thickness of the extruded insulation shield shall be in accordance with the following table:

OD Over Insulation (Inches)	INSULATION SHIELD THICKNESS (MILS) Minimum Point	Maximum Point
0.000-1.000	30	70
1.001-1.500	40	85
1.501-2.000	55	100
2.001 & larger	55	115

The DC volume resistivity of the extruded insulation shield shall not exceed 500 ohm-meters at 90°C and 130°C when tested in accordance with ICEA.

The insulation shield shall be free stripping from the insulation (Without the use of a release agent), and the tension necessary to remove the extruded insulation shall be 4 to 18 pounds when tested in accordance with Paragraph C.3.1 of AEIC the shield shall strip cleanly from the insulation, leaving it free of any significant residue of semiconducting or other material, which would have to be removed before splicing or terminating

E. The metallic shielding shall consist of a non-magnetic copper tape meeting the requirements of Section 4.112 of ICEA S-68-516, helically applied with a minimum overlap of 125%.

F. A polyvinyl chloride (PVC) jacket shall be tightly extruded directly over the copper shielding tape. Unless otherwise specified at time of purchase, the jacket color shall be black The jacket thickness shall be in accordance with UL 1072, Table 24.14 for shielded single conductor cables

G. The cable shall meet or exceed the testing requirements as outlined in AEIC, ICEA and UL 1072

PART 3 - EXECUTION

3.1 GENERAL

A. Install wire and cable in accordance with the requirements of the National Electrical Code (NEC) , the manufacturer's written instructions, and in accordance with recognized industry practices to ensure that products serve the intended functions

3.2 CABLE INSTALLATION

A. Pull all cables with a dynamometer or strain gauge incorporated into the pulling equipment Do not pull cables unless the Owner's Representative is present to observe readings on the dynamometer or strain gauge during the time of actual pulling Total strain on cables shall not exceed manufacturer's recommended pulling tensions

3.3 WARRANTY

A. The manufacturer shall provide a written product warranty effective from date of installation Warranty shall cover replacement of product if defects are discovered during the warranty period

END OF SECTION 16121

SECTION 16130 - WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Boxes.
2. Service fittings.
3. Wiring devices.
4. Equipment connections

B. Related Sections:
1. Cutting and patching.
2. Fire-stopping:
3. Painting.

C. Owner-Furnished Products. Refer to Division 1 for description of owner- furnished products affecting work of this section

D. Alternates: Refer to Division 1 for description of alternates affecting work of this section

1.2 REFERENCES

A. NEMA OS 1-1989 -- Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 1989.

B. NEMA WD 1-1983(R 1989) -- General Requirements for Wiring Devices; National Electrical Manufacturers Association; 1983 (Reaffirmed 1989)

C. NEMA WD 6-1988 -- Wiring Devices--Dimensional Requirements; National Electrical Manufacturers Association; 1988

D. NFPA 70-93 -- National Electrical Code; National Fire Protection Association; 1993

E. Standard of Installation; National Electrical Contractors Association (NECA) ; 1990

1.3 SUBMITTALS

A. Product data for each wiring device specified in this section

B. Product data for each service fitting specified in this section

C. Manufacturer l s qualification statement, for information

D. Coordination drawings, for information

1.4 QUALITY ASSURANCE

A. Conform to NFPA 70

B. Conform to requirements of NECA "Standard of Installation" that do not conflict with regulatory requirements or requirements of contract documents. Keep one copy at project site.

C. Furnish products listed by Underwriters Laboratories Inc and classified as suitable for installed use and environmental conditions

1.5 QUALIFICATIONS

A. Manufacturer Qualifications: A company manufacturing products of this section which have performed in a satisfactory manner under comparable conditions for a period of 5 years

1.6 PROJECT CONDITIONS

A. Review drawings to determine project conditions.

B. Determine working clearance around and between construction elements such as beams, columns, walls, and ceilings.

C. Determine access requirements around other work, including working clearances to mechanical equipment, controls, and electrical equipment.

D. Locations of outlets indicated on drawings are approximate unless dimensioned. Determine exact locations before roughing in raceway.

1.7 COORDINATION

A. Use manufacturer's instructions and data to determine rough- in requirements and locations of products connected to electrical wiring.

B. Prepare coordination drawings and distribute to affected installers of related work
1. Indicate requirements for access openings in building finishes.

PART 2 - PRODUCTS

2.1 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel

2.2 JUNCTION AND PULL BOXES

A. Sheet Metal Boxes: Screw covers type.

2.3 WALL SWITCHES

A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of the contract documents, will be among those considered acceptable:
1. Arrow Hart Division/Cooper Industries.
2. Bryant Electric Inc
3. GE Wiring Devices
4. Hubbe1l Incorporated/Wiring Device Division.
5. Leviton Manufacturing Company, Inc.

B. Wall Switch:
1. Comparable products of specified manufacturers are acceptable
2. Description: NEMA WD 1, heavy duty snap switch.
3. Voltage: 120 volts, ac only
4. Rating. 20 amperes
5. Handle type: Toggle.
6. Handle color Ivory
7. Wall plate: Plastic with color to match switch handle

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces intended to support products.

B. Verify that each product conforms to regulatory requirements and to specification requirements.

C. Verify locations of outlets before roughing in.

3.2 PREPARATION

A. Clean surfaces to receive work.

B. Protect surrounding elements from work of this section.

3.3 INSTALLATION

A. Install products in compliance with manufacturer's instructions.

B. Install accessories specified in this section.

C. Maintain required headroom.

3.4 WIRING CONNECTIONS

A. Make wiring connections in locations that ensure access, or provide access panel using materials and methods specified in Division 8.

B. Fasten conduit to boxes in wet locations using conduit hubs.

C. Use splice and tap devices compatible with conductor material.

D. Provide closures on unused openings in boxes.

E. Outlet and Device Boxes:
1. Install at heights indicated on drawings.
2. position recessed outlets carefully to allow for surface finish thickness
3. Separate outlets on both sides of walls by at least 6 inches.

F. Equipment Connections:

G. Examine electrical outlets to verify proper location

H. Examine branch circuit wiring to verify suitability.
1. Install disconnect switches where indicated
2. Make wiring connections to equipment using devices and methods recommended by equipment manufacturer
3. Use conductor insulation with suitable rating for equipment connection.

3.5 COMMISSIONING

A. Verify that products connected to wiring system are properly bonded to ground.

B. Verify size of overcurrent protection devices.

C. Verify that wiring connections conform to manufacturer's instructions.

D. Operate electrical system to allow placing connected equipment into operation.

3.6 FIELD QUALITY CONTROL

A. Receptacle Connections: Test each receptacle for proper connection.

B. Correction of Defective Work:
1. Replace defective products.

3.7 CLEANING

A. Restore damaged corrosion-resistant coatings.

END OF SECTION 16130

SECTION 16140
WIRING DEVICES

1.1 PROJECT INCLUDES

A. Wiring devices for electrical service.

1.2 QUALITY ASSURANCE

A. Compliance; National Electrical Code, NEMA WD 1, UL.

1.3 PRODUCTS

A. Wiring Devices and Components:
   1. Heat Pumps and HP Condensers.
   2. Hot Water Heaters
   3. Thermostats

END OF SECTION 16140

SECTION 16170
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Electrical equipment grounding and bonding.

1.2 SYSTEM DESCRIPTION

A. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables receptacles ground connectors, and plumbing systems

1.3 INSTALLATION

A. Provide a separate, insulated equipment grounding conductor in feeder and branch circuits terminate each end of a grounding lug, bus, or grounding bushing.

B. Ground electrical systems and provide equipment grounding as required by the National Electrical Code and the National Safety Code, including secondary neutrals

C. The following list is representative of the parts which shall be solidly grounded
1. Conduit systems
2. Motor frames
3. Pull boxes and junction boxes

D. All raceways and cable connections entering panel boards shall be provided with plastic insulating bushings and properly fastened to assure grounding continuity.

1.4 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connection for tightness and proper installation

END OF SECTION 16170

SECTION 16181
CIRCUIT AND MOTOR DISCONNECTS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of circuit and motor disconnect witch work is indicated by drawings- Heat Pump and Heat Pump Condensers.

1.2 QUALITY ASSURANCE

A. NEC Compliance: Comply with requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.

B. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead-Front Switches". Provide Circuit and motor disconnect switches which have been UL-listed and labeled.

C. NEMA Compliance: Comply with applicable requirements of NEMA Stds. Pub. No. KS 1, "Enclosed Switches" and 250, "Enclosures for Electrical Equipment (1000Volts Maximum).

1.3 SUBMITTALS

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work included, but are not limited to, the following:

Crouse-Hinds Co.
Cutler-Hammer Inc.
Federal Pacific Electric Co.
Furnas Electric Co.
General Electric Co.
General Switch Corp.
GTE Sylvania Inc.
Square D Company
Westinghouse Electric Corp.

2.2 FABRICATE SWITCHES

A. Safety Switches: Provide surface-mounted, heavy-duty type, sheet-steel enclosed safety switches, of types, sizes, ratings and electrical characteristics as indicated on drawings; fusible type, solid neutral; incorporating quick-make, quick-break type switches; so constructed that switch blades are visible in off position with door open. Equip with operating handle which is integral part of enclosure base and whose position is easily recognized, and is padlockable in off position; construct current carrying parts of high – conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA 1 type enclosure unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES

A. The Contractor for Electrical Work shall review the General, Plumbing, Heating, Air conditioning and Ventilation Specifications and Drawings for equipment furnished and installed under each of these contracts, as the Contractor for Electrical work shall provide all electrical facilities and make all electrical installation.

B. Electrical Contractor shall provide overcurrent protection and disconnecting means as required by the National Electrical Code for all motors Therefore, it is necessary to check equipment provided under these Divisions so as to avoid duplication of protective and disconnecting.

C. Contractor shall connect, ready for operation, motors and starting apparatus specified under other trades.

D. Each motor, except where disconnecting means is combined with motor branch circuit overcurrent protection in a panel or motor control center, shall be provided with a NEMA Type "H" enclosed safety switch, having quick-make and quick-break contracts. The disconnecting switch shall open all underground conductors simultaneously and shall have rating equal to, or in excess of, the motor control. Where manual control is called for in addition to automatic control, a switch in parallel with the automatic control device is acceptable. Each motor protective device shall be calibrated or selected for its rated capacity. Provide quick-make, quick-break, non-fusible disconnect switches at all motors where circuit breaker type is not required.

E. Note that the various Contractors will furnish F.O.B. to the premises, all magnetic starters for installation and connection by the Electrical Contractor. Where more than one motor is wired to a single circuit, each motor shall be provided with a thermal protective switch.

3.3 ROTATION

A. This Contractor shall be responsible for correct rotation of all motors.

3.4 AUTOMATIC CONTROL

A. In general, automatic control for Heating, Ventilation, and Air Conditioning Equipment will be wired, including the installation of conduits, panels, fittings, etc., by a Temperature Control Contractor; hired as a subcontractor , however, an Electrical Contractor shall install controls and control wiring for a specific unit or apparatus is specifically indicated to be furnished by Electrical Contractor on the electrical drawings.

3.5 AUTOMATIC TEMPERATURE CONTROL

A. Power wiring and connections for temperature control panels and air compressors shall be installed by the Electrical Contractors. Electrical wiring and connections, freeze protection thermostats, fire protection thermostats, solenoid air valves and pressure electric switches shall be furnished and installed by the Temperature Control Contractor.

3.6 GROUNDING

A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches where indicated.

3.7 FIELD QUALITY CONTROL

A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.

END OF SECTION – 16181

SECTION 16195
METHODS IDENTIFICATION

PART 1 GENERAL

1.1 DESCRIPTION

A. The work under this Section shall include all labor, material, and all else necessary for full compliance with applicable drawings, specifications and other contract requirements, or as directed by the Project Manager for furnishing and installing equipment, Related works see Basic Electrical Material & Methods requirements, Section 16050; General Electrical Requirements, Section 16000.

1.2 SECTION INCLUDES

A. Related Work

B. Submittals

C. Materials

D. Installation

E. Wire Identification

F. Nameplate engraving schedule

G. Typical Plastic Cable Tags

1.3 SUBMITTALS

A. Submit shop drawings under provisions of Section 01300.

B. Include schedule for nameplates and tape labels.

PART 2 PRODUCTS

1.4 MATERIALS

A. Nameplates: Engraved three-layer laminated plastic, white letters on a black background.

B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

PART 3 EXECUTION

3.1 INSTALLATION

A. Degrease and clean surfaces to receive nameplates.

B. Install nameplates parallel to equipment lines.

C. Secure nameplates to equipment fronts using screws or rivets. Secure nameplate to inside face of recessed panel board doors in finished locations.

D. Embossed tape will not be permitted for any application.

3.2 WIRE IDENTIFICATION

A. Provide wire markers at entrance and egress point on each conductor in panel board gutters, pull boxes, and at load connection, Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

A. Provide nameplates to identify all equipment and control panels.

B. Disconnect Switches Letter Height: ½ inch for individual switches, 3/8 inch for loads served.

C. Panel boards and Boxes: ½ inch; identifying equipment designation. 3/8 inch; identifying voltage rating and source.

D. Control Panels: First line, ½ inch control panel designation, 3/8 inch identifying function, title, 3/8 inch identifying power source.

E. Other Equipment: 1/2inch indicate designation.

END OF SECTION

SECTION 16470
PANELBOARDS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Disconnecting existing hot water heaters and heat pumps.
B. Connect new hot water heat pumps and hot water..

1.2 REFERENCES

A. Fs w-c375 – Circuit Breakers, Molded Case, Branch Circuit and Service.

B. FS-W-P-115 – Power Distribution Panel.

C. NEMA AB 1 – Molded Case Circuit Breakers.

D. NEMA PB 1.1 – Instructions for Safe Installations, Operation and Maintenance of Panelboards Rated 600 Volts or less.

1.3 SUBMITTALS

A. Submit shop drawings for equipment and component.

B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.4 SPARE PARTS.

A. Keys: Furnish 2 each to Owner.

Part 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – PANELBOARDS

A. Square D. or approved equal.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1: circuit breaker type.

B. Enclosure: NEMA PB 1: Type 1.

C. Provide flush cabinet front with concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

D. Provide panelboards with copper bus, ratings as scheduled on drawings. Provide copper ground bus in all panelboards.

E. Minimum Integrated short circuit rating: 10,000 amperes rms symmetrical for 240 volt panelboards.

F. Molded Case Circuit Breakers: NEMA AB 1 bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type

SWD for lighting circuits. Provide UL Class A ground fault interrupt circuit breakers where scheduled.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb and flush with wall finishes in conformance with NEMA PB 1.1.

B. Provide filler plates for unused spaces in panelboards.

C. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 16470

SECTION 16476
INDIVIDUAL CIRCUIT BREAKERS

PART 1 – GENERAL

1.1 STIPULATIONS

A. The specifications section "General Conditions" and "Special Requirements" from a part of this section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 DESCRIPTION OF WORK

A. Furnish and install enclosed molded case circuit breakers sized as shown on drawings and as specified herein.

1.3 SUBMITTALS

A. Submit manufacturer's product data review.

1.4 CODES AND STANDARDS

A. National Electrical Code (NFPA-70) – latest edition (NEC)

B. Underwriters Laboratories Inc. (UL)

C. National Electrical Manufacturer's Association (NEMA AB-1)

PART 2 – PRODUCTS

2.1 FUNCTIONAL REQUIREMENTS

A. Circuit breakers shall be molded case, thermal magnetic type and shall have a minimum interrupting capacity as shown on drawings.

B. Each pole shall provide inverse time delay and instantaneous circuit protection and shall be trip free.

C. Circuit breakers shall be ambient compensated to allow the breaker to carry rated current between 25°C and 50°C with the same tripping characteristics.

D. Circuit breakers shall be enclosed in a NEMA 1 housing for indoor use and NEMA 4 housing for outdoor use.

E. Multiple circuit breakers shall have common handle.

F. Circuit breakers shall have lockable handle in the off position.

2.2 ACCEPTABLE MANUFACTURERS

A. Circuit breakers shall be as manufactured by Westinghouse, General Electric C. or Square "D" Co.

B. Wherever CL breakers are called for on drawings, they shall be fuse-less current limiting type FCL and LCL by Westinghouse, or THLC by General Electric or IK, ID and IL by Square "D".

PART 3 – EXECUTION

3.1 Contractor shall install individual circuit breakers where shown on the drawings and shall provide all necessary mounting hardware including steel framing where required.

END OF SECTION 16476

CONSTRUCTION DOCUMENTS

MECHANICAL RENOVATIONS

PROJECT MANAGER:

Mr. Steve G. Gherke, Construction P.M.
Delaware State Housing Authority
18 The Green
Dover, DE 19901

BURTON VILLAGE APARTMENTS

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Consultant:

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Wilmington, DE 19802 Wilmington, DE 19809 Fax: 302-421-9140
Contact:
Desmond A. Baker, P.E, FACEC, Principal
dabaker01@comcast.net

SCOPE OF WORK

A. FURNISH AND INSTALL A COMPLETE MECHANICAL, AND ELECTRICAL SYSTEMS AS INDICATED ON THE DRAWINGS AND SPECIFIED HEREIN. THE CONTRACTOR SHALL PROVIDE ALL SUPERVISION, LABOR, MATERIALS, EQUIPMENT, MACHINERY, AND ANY AND ALL ITEMS NECESSARY TO COMPLETE THE SYSTEMS. THE CONTRACTOR SHALL PROVIDE AND INSTALL THE NUMBER OF ITEMS OR EQUIPMENT AS INDICATED ON THE DRAWINGS AND/OR AS REQUIRED FOR A COMPLETE SYSTEM AS FOLLOWS:

1. INSTALL HVAC SYSTEM, ELECTRICAL SYSTEM AND ALL ASSOCIATED WORK AS ILLUSTRATED BY THE DESIGN AND SPECIFICATION DOCUMENTS.
2. PRIOR TO THE START OF INSTALLATION CONTRACTOR SHALL VISIT THE SITE AND BECOME FAMILIAR WITH ALL CONDITIONS OF THE BUILDING AND WORK LOCATION
3. EXISTING CONCRETE PADS TO BE VERIFIED AND RE-USED FOR NEW CONDENSING UNITS.
4. CLEAN EXISTING R22 REFRIGERANT PIPING, ENSURE GOOD CONDITION AND SUITABILITY FOR RE-USE, RE-USE EXISTING REFRIGERANT PIPING FOR NEW SYSTEMS.
5. PROVIDE REQUIRED CONDENSATE DRAIN FROM EACH HEAT PUMPS TO EXTERIOR DRAIN AS SHOWN.
6. INSTALL THERMOSTATS AS SHOWN
7. INSTALL NEW ELECTRIC HOT WATER HEATER AS SHOWN. PROVIDE SHUT-OFF VALVES AS SHOWN AND ENSURE PROPER ACCESS TO MAIN SHUT-OFF VALVE.
8. CONTRACTOR SHALL TEST AND DEBUG SYSTEM
8. PROVIDE FOUR (4) SETS OF OPERATION AND MAINTENANCE MANUALS FOR OWNERS USE.

LIST OF DRAWINGS

CODES:

APPLICABLE CITY OF WILMINGTON BUILDING, MECHANICAL, ELECTRICAL AND PLUMBING CODES,

IBC 2012

IMC 2012

IPC 2012

FOR CONSTRUCTION

COVER SHEET

DATE: JANUARY 2, 2014

SCALE: AS NOTED

DRAWING NO. CS-1

ELECTRICAL GENERAL NOTES:

1. PROVIDE ALL MATERIAL REQUIRED INCLUDING SUPPORTS AND ALL OTHER APPURTENANCES FOR A COMPLETE AND FULLY OPERATING INSTALLATION EXCEPT AS OTHERWISE NOTED. ALL MATERIALS SHALL BE NEW AND AND SHALL BE FURNISHED, INSTALLED AND WIRED AS PART OF THIS CONTRACT. CONFIRM ALL LOCATIONS WITH THE ARCHITECT.

2. PRIOR TO BID, VISIT THE SITE TO BE FAMILIAR WITH EXISTING CONDITIONS.

3. ALL MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED FOR A MINIMUM OF ONE YEAR FOLLOWING THE DATE OF OWNER ACCEPTANCE.

4. THE WORK SHALL CONFORM TO THE NATIONAL ELECTRICAL CODE (NEC).

5. CONTRACTOR SHALL SECURE ALL PERMITS, PAY ALL FEES, AND ARRANGE FOR ALL INSPECTIONS.

6. KEEP PREMISES FREE FROM RUBBISH. REMOVE RUBBISH FROM SITE DAILY.

7. PROVIDE TEMPORARY AND CONSTRUCTION SERVICES AS REQUIRED. REMOVE WHEN NOT NEEDED.

8. PROVIDE ALL CUTTING AND PATCHING REQUIRED FOR THE WORK.

9. WIRING SHALL BE TYPE THWN COPPER IN RIGID RACEWAY. (INTERIOR WIRING SHALL BE TYPE MC (NM) CABLE EXCEPT WHERE NOT ALLOWED BY CODE, IN WHICH CASE, USE TYPE THWN COPPER IN RIGID RACEWAY.) ALL WIRING TO BE CONCEALED IN CONSTRUCTION. THE MINIMUM WIRE SIZE SHALL BE SIZE 12 AWG.

10. ALL WIRING SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. CONFIRM EQUIPMENT WIRING WITH MANUFACTURER.

11. NOT USED.

12. PROVIDE A COMPLETE LUMINAIRE INSTALLATION INCLUDING LUMINAIRES, LAMPS, BALLASTS, ENCLOSURES, MOUNTING APPURTENANCES, ETC., AS REQUIRED. LAMPS AND BALLASTS TO BE OF THE ENERGY EFFICIENT TYPE.

13. DRAWINGS ARE DIAGRAMMATIC AND CERTAIN SPECIALTIES ARE NOT SHOWN, HOWEVER, THEY SHALL BE PROVIDED AS REQUIRED. ALL MEASUREMENTS SHALL BE DONE IN THE FIELD.

14. AFTER ALL WORK HAS BEEN COMPLETED, CLEAN, WASH, VACUUM, ETC., ALL PART OF THE INSTALLATION. CLEAN LIGHTING FIXTURE LENS AND REFLECTORS.

15. PREPARE ONE SET OF OPERATING AND MAINTENANCE MANUALS FOR EACH SYSTEM AND EQUIPMENT.

16. PROVIDE ACCESS PANELS FOR DEVICES WHICH ARE CONCEALED.

17. PREPARE A RECORD SET OF PRINTS RECORDING ALL DEVIATIONS OF LOCATIONS AND EQUIPMENT.

18. IDENTIFY ELECTRICAL EQUIPMENT, WITH BLACK PLASTIC SHEETS WITH WHITE LETTERS. (EMBOSSED PRESSURE SENSITIVE ADHESIVE PLASTIC TAPE). STENCIL EMERGENCY RACEWAY.

19. PANEL BOARDS SHALL BE PROVIDED WITH NEW TYPEWRITTEN DIRECTORIES.

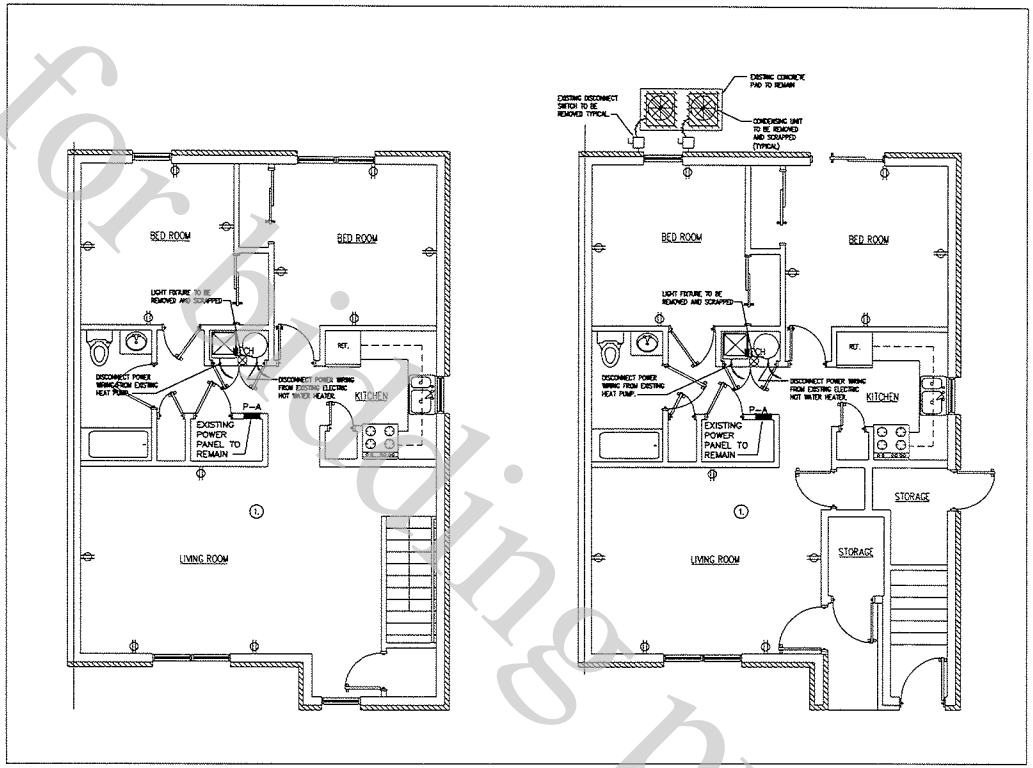
20. EQUIPMENT IS SPECIFIED TO ESTABLISH STANDARDS. IF CONTRACTOR SUBMITS OTHER TYPES OTHER THAN SPECIFIED, AND THEY ALTER THE DESIGN, THE CONTRACTOR SHALL PAY FOR ALL COSTS INVOLVED. PROVIDE SHOP DRAWINGS FOR APPROVAL OF ALL MATERIALS AND EQUIPMENT.

21. UNLESS OTHERWISE NOTED, OR REQUIRED FOR CONTINUITY OF EXISTING SYSTEMS, ALL EXISTING WIRING AND EQUIPMENT IN RENOVATED AREAS SHALL BE REMOVED.

22. ALL PENETRATIONS THROUGH FIRE RATED WALLS SHALL BE FIRE SEALED WITH HILTI FIRE CAULKING OR APPROVED EQUAL.

23. ALL ELECTRICAL MATERIALS, DEVICES, APPLIANCES AND EQUIPMENT SHALL BE LABELED AND LISTED BY A CERTIFIED TESTING LABORATORY OR AGENCY.

24. PROVIDE MINIMUM 3 FT. WORKING CLEARANCE IN FRONT OF ELECTRICAL EQUIPMENT, EXCEPT AS OTHERWISE REQUIRED BY NEC.



1 FIRST FLOOR PLAN
SCALE: 1/4"=1'-0"

2 SECOND FLOOR PLAN
SCALE: 1/4"=1'-0"

SHEET NOTE:

1. REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR APPLICABLE WORK FOR RESPECTIVE UNIT.
2. REFER TO LEGEND ON SHEET E-2.

GENERAL NOTES:

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Fax: 302-658-1392
Contact:
Desmond A. Baker, P.E. FACEC, Principal
dabaker01@comcast.net

- ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:
BURTON VILLAGE APPARTMENTS
37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

DWG TITLE:
2 - BEDROOM UNIT DEMOLITION

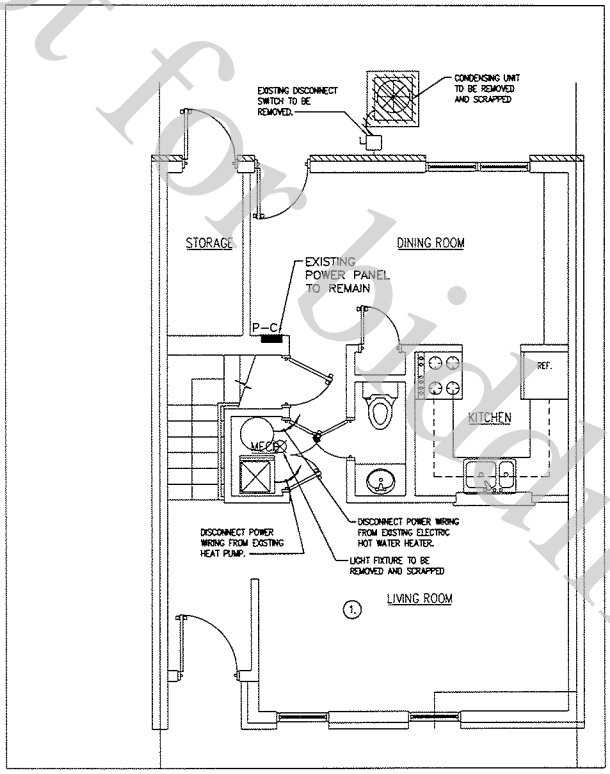
ISSUED FOR:
FOR CONSTRUCTION

DATE: 01/02/2014
SCALE: AS NOTED
CHECKED BY: DAB
DRAWN BY: RD

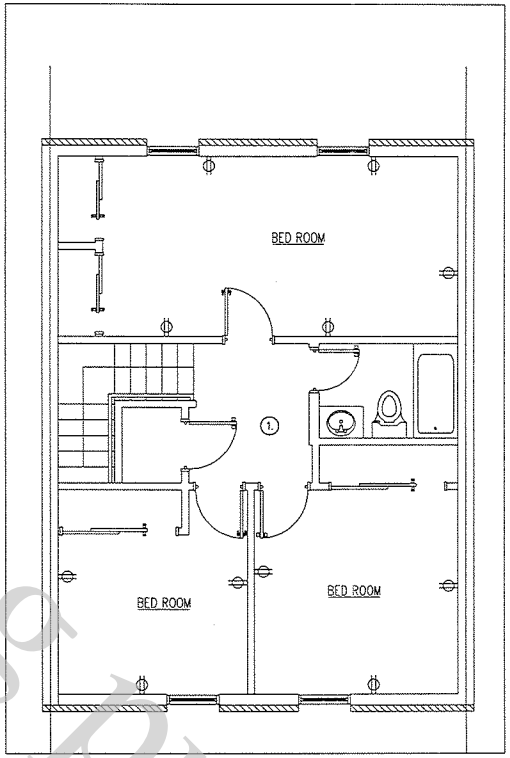
SHEET #
E-1
-

LEGEND

- DUPLEX ELECTRICAL OUTLET MOUNTED 18" AFF TO CENTERLINE (UNLESS OTHERWISE NOTED)
- QUAD ELECTRICAL OUTLET MOUNTED 18" AFF TO CENTERLINE (UNLESS OTHERWISE NOTED)
- (GFI) DEDICATED GFI ELECTRICAL OUTLET MOUNTED 3'-6" AFF TO CENTERLINE (UNLESS OTHERWISE NOTED)
- 240 VOLTS APPLIANCE RECEPTACLE
- RECESSED DOWN LIGHTS (SELECTED BY OWNER)
- CEILING MOUNTED LIGHT FIXTURE (SELECTED BY OWNER)
- JUNCTION BOX – WALL MOUNTED
- NOM – FUSED DISCONNECT SWITCH
- NOM – FUSED DISCONNECT SWITCH
- S_o SINGLE POLE SWITCH – 48" AFF "o" INDICATES DEVICE CONTROLLED.
- S_{3o} 3-WAY SWITCH – 48" AFF. "o" INDICATES DEVICE CONTROLLED.
- S_{MO} SWITCH WITH MOTION SENSOR
- HOME RUN – PP-1 PANEL AND 1 INDICATES THE CIRCUIT NUMBER.



1 FIRST FLOOR PLAN



2 SECOND FLOOR PLAN

SHEET NOTE:

1. REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR APPLICABLE WORK FOR RESPECTIVE UNIT.

GENERAL NOTES:

PRIME CONSULTANT:

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- ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:

BURTON VILLAGE APPARTMENTS

37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

DWG TITLE:

3 & 4 - BEDROOM UNIT DEMOLITION

ISSUED FOR:

FOR CONSTRUCTION

DATE: 01/02/2014	SHEET #
SCALE: AS NOTED	E-2
CHECKED BY: DAB	
DRAWN BY: RD	-

SHEET NOTES:

1. CONTRACTOR SHALL TRACE ALL ELECTRICAL RECEPTACLE CIRCUITS FROM BEDROOMS BACK TO ELECTRICAL POWER PANEL. REPLACE ALL CIRCUIT BREAKERS SERVING BEDROOMS WITH ARC FAULT INTERRUPTER TYPE BREAKERS. THE CONTRACTOR SHALL VERIFY THE WIRE GAGE AND INSTALL THE PROPER BREAKER PER WIRE GAGE. TEST AND VERIFY PROPER WORKING CONDITION OF ARC FAULT BREAKERS.

   PROVIDE 15 AMPS OR 20 AMPS COMBINATION ARC FAULT CIRCUIT BREAKERS AS REQUIRED. UNIT SHALL BE SINGLE PHASE, 120/240 VOLTS, 10,000.0 AIC RATED. UNIT SHALL BE UL CLASSIFIED FOR MITIGATING THE EFFECT OF ARC FAULTS.

2. REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR APPLICABLE WORK FOR RESPECTIVE UNIT.

3. REMOVE EXISTING LIGHTING FIXTURE FROM ALL EXISTING MECHANICAL CLOSET. PROVIDE NEW LIGHTING FIXTURE IN EACH CLOSET, EQUAL TO DESIGN HOUSE 519264 SINGLE LIGHT CEILING MOUNT LIGHT WITH PULL CHAIN WITH OPAL GLASS OIL RUBBED BRONZE. CONNECT TO EXISTING SWITCH.

PANEL DESIGNATION: P-1 (EXISTING PANEL TO REMAIN) — VOLTAGE: 120/240 V, 1 PH, 3W — ☐ SURFACE MTD. ☒ FLUSH MTD.

LOCATION: 2 BEDROOM UNITS — MAIN 100A MCB

*	CIR NO.	LOAD V.A	BRANCH CIRCUIT DESCRIP. & LOCATION	C/B SIZE	WIRE SIZE	WIRE SIZE	C/B SIZE	BRANCH CIRCUIT DESCRIP. & LOCATION	LOAD V.A	CIR NO.	*
	1	--	EXISTING	-- / 2	--	--	-- / 2	EXISTING	--	2	
	3				--	--			--	4	
	5	--	EXISTING	-- / 2	--	--	-- / --	EXISTING	--	6	
	7				--	--		EXISTING	--	8	
	9	--	EXISTING	-- / --	--	--	-- / --	EXISTING	--	10	
	11		NEW AFCI BREAKER	-- / --	--	--	-- / --	EXISTING	--	12	
	13		NEW AFCI BREAKER	-- / --	--	--	-- / --	EXISTING	--	14	
	15	--	EXISTING	-- / --	--	--	-- / --	EXISTING	--	16	
	17	--	SPACE	-- / --	--	--	-- / --	SPACE	--	18	
	19	--	SPACE	-- / --	--	--	-- / --	SPACE	--	20	
	21	--	SPACE	-- / --	--	--	-- / --	SPACE	--	22	
	23	--	SPACE	-- / --	--	--	-- / --	SPACE	--	24	
	25	--	SPACE	-- / --	--	--	-- / --	SPACE	--	26	
	27	--	SPACE	-- / --	--	--	-- / --	SPACE	--	28	
	29	--	SPACE	-- / --	--	--	-- / --	--	--	30	

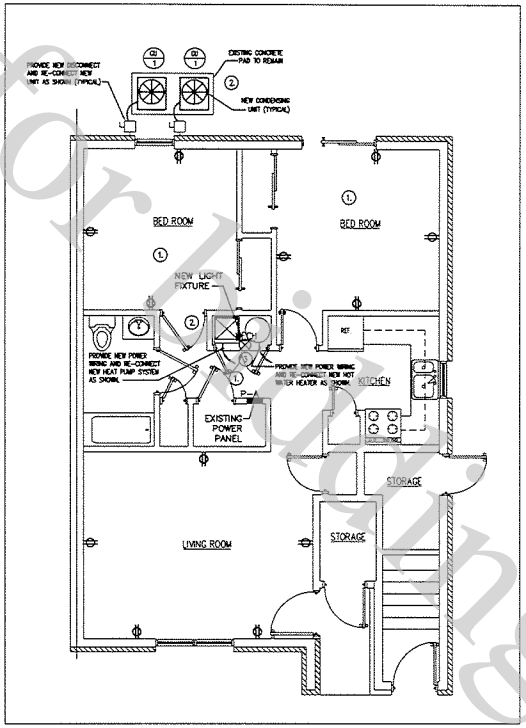
CONNECTED LOAD ---- KVA

CONN. + SPARE ---- KVA (20% SPARE CAPACITY)

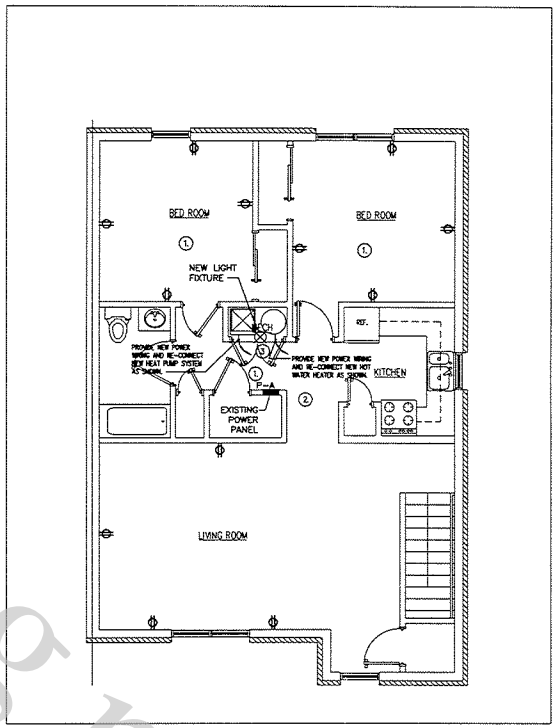
DEMAND ---- KVA

DEMAND ---- AMPS AT 240 VOLTS — MIN. A.I.C. RATING 10,000

PANEL SCHEDULE IS SHOWN FOR REFERENCE ONLY. THE CONTRACTOR SHALL VERIFY CIRCUIT CONDITION AND ARRANGEMENT OF ALL CIRCUITING IN THE FIELD. PROVIDE NEW CIRCUIT BREAKERS AND WIRING WHERE REQUIRED TO SUIT NEW EQUIPMENT.



1 FIRST FLOOR PLAN



1 SECOND FLOOR PLAN

LIGHTING FIXTURE SCHEDULE

SYMBOL	TYPE	DESCRIPTION	MANUFACTURER	CATALOG No.	LAMP QTY	LAMP TYPE	MAX. WATTS	VOLTS	HEIGHT	REMARKS
⊠"A"	SURFACE CEILING MTD.	ROUND SURFACE MOUNTED FIXTURE WITH PROTECTIVE LENSE	DESIGN HOUSE	519264 12OW	1	15W ENERGY MISER COMPACT COIL FLUORESCENT	14	120	8 1/4"	

GENERAL NOTES:

PRIME CONSULTANT:

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- ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:

BURTON VILLAGE APPARTMENTS

37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

DWG TITLE:

2 - BEDROOM UNIT NEW WORK

ISSUED FOR:

FOR CONSTRUCTION

DATE: 01/02/2014 — SHEET #

SCALE: AS NOTED — **E-3**

CHECKED BY: DAB

DRAWN BY: RD — -

SHEET NOTES:

1. CONTRACTOR SHALL TRACE ALL ELECTRICAL RECEPTACLE CIRCUITS FROM BEDROOMS BACK TO ELECTRICAL POWER PANEL. REPLACE ALL CIRCUIT BREAKERS SERVING BEDROOMS WITH ARC FAULT INTERRUPTER TYPE BREAKERS. THE CONTRACTOR SHALL VERIFY THE WIRE GAGE AND INSTALL THE PROPER BREAKER PER WIRE GAGE. TEST AND VERIFY PROPER WORKING CONDITION OF ARC FAULT BREAKERS.

   PROVIDE 15 AMPS OR 20 AMPS COMBINATION ARC FAULT CIRCUIT BREAKERS AS REQUIRED. UNIT SHALL BE SINGLE PHASE, 120/240 VOLTS, 10,000.0 AIC RATED. UNIT SHALL BE UL CLASSIFIED FOR MITIGATING THE EFFECT OF ARC FAULTS.

2. REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR APPLICABLE WORK FOR RESPECTIVE UNIT.

3. REMOVE EXISTING LIGHTING FIXTURE FROM ALL EXISTING MECHANICAL CLOSET. PROVIDE NEW LIGHTING FIXTURE IN EACH CLOSET, EQUAL TO DESIGN HOUSE 519264 SINGLE LIGHT CEILING MOUNT LIGHT WITH PULL CHAIN WITH OPAL GLASS OIL RUBBED BRONZE. CONNECT TO EXISTING SWITCH.

PANEL DESIGNATION: P-2, P-3 (EXISTING PANEL TO REMAIN) — VOLTAGE: 120/240 V, 1 PH, 3W — ☐ SURFACE MTD. ☒ FLUSH MTD.

LOCATION: 3 & 4 BEDROOM UNITS — MAIN: 100A MCB

*	CIR NO.	LOAD V.A.	BRANCH CIRCUIT– DESCRIP. & LOCATION	C/B SIZE	WIRE SIZE	WIRE SIZE	C/B SIZE	BRANCH CIRCUIT– DESCRIP. & LOCATION	LOAD V.A.	CIR NO.	*
	1	–	EXISTING	– / 2	–	–	–	EXISTING	–	2	
	3				–	–	2		–	4	
	5	–	EXISTING	– / 2	–	–	–	EXISTING	–	6	
	7				–	–	–	EXISTING	–	8	
	9	–	EXISTING	– / –	–	–	–	EXISTING	–	10	
	11	–	NEW AFCI BREAKER	– / –	–	–	–	NEW AFCI BREAKER	–	12	
	13	–	NEW AFCI BREAKER	– / –	–	–	–	NEW AFCI BREAKER	–	14	
	15	–	EXISTING	– / –	–	–	–	EXISTING	–	16	
	17	–	EXISTING	– / –	–	–	–	SPACE	–	18	
	19	–	EXISTING	– / –	–	–	–	SPACE	–	20	
	21	–	SPACE	– / –	–	–	–	SPACE	–	22	
	23	–	SPACE	– / –	–	–	–	SPACE	–	24	
	25	–	SPACE	– / –	–	–	–	SPACE	–	26	
	27	–	SPACE	– / –	–	–	–	SPACE	–	28	
	29	–	SPACE	– / –	–	–	–	–	–	30	

CONNECTED LOAD — KVA

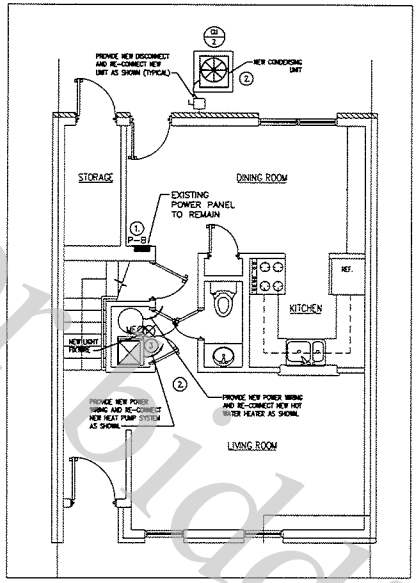
CONN. + SPARE — KVA (20% SPARE CAPACITY)

DEMAND — KVA

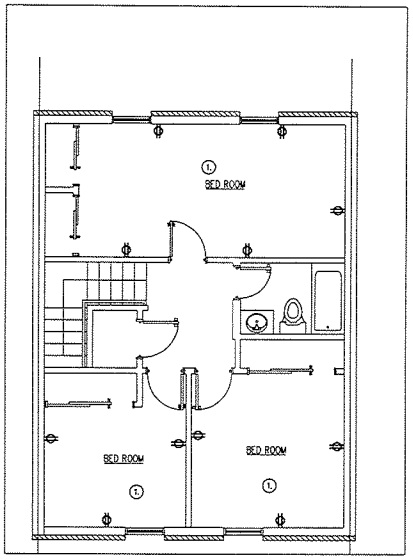
DEMAND — AMPS AT 240 VOLTS

MIN. A.I.C. RATING 10,000

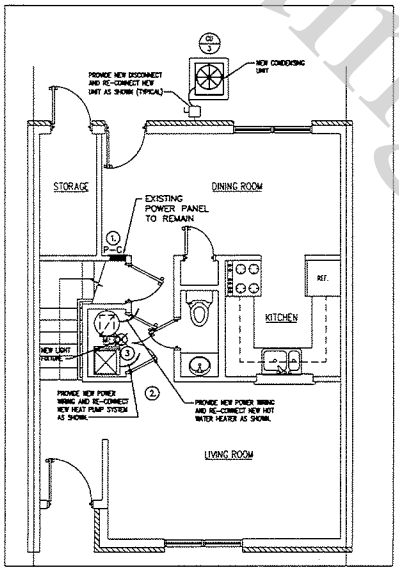
PANEL SCHEDULE IS SHOWN FOR REFERENCE ONLY. THE CONTRACTOR SHALL VERIFY CIRCUIT CONDITION AND ARRANGEMENT OF ALL CIRCUITING IN THE FIELD. PROVIDE NEW CIRCUIT BREAKERS AND WIRING WHERE REQUIRED TO SUIT NEW EQUIPMENT.



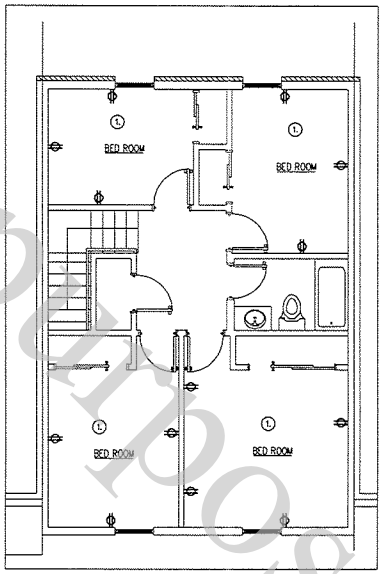
1 E4 FIRST FLOOR PLAN



2 E4 SECOND FLOOR PLAN



2 E4 FIRST FLOOR PLAN



1 E4 SECOND FLOOR PLAN

GENERAL NOTES:

PRIME CONSULTANT:

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– ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:

BURTON VILLAGE APPARTMENTS

37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

DWG TITLE:

3 & 4 BEDROOM UNIT NEW WORK

ISSUED FOR: FOR CONSTRUCTION

DATE: 01/02/2014 — SHEET #: E-4

SCALE: AS NOTED

CHECKED BY: DAB

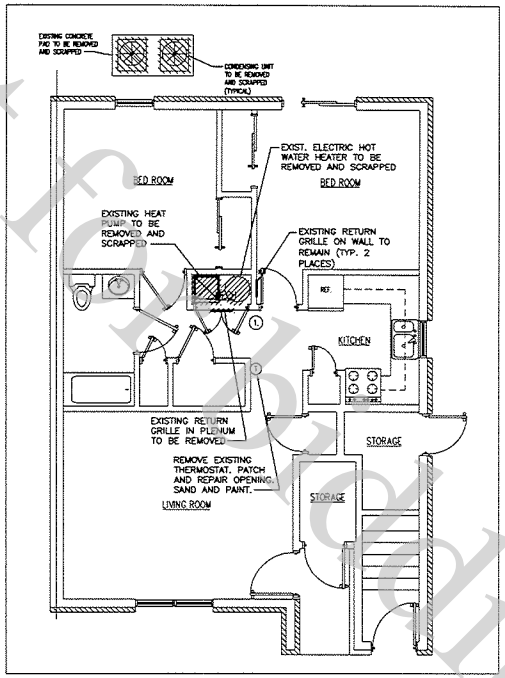
DRAWN BY: RD

GENERAL NOTES

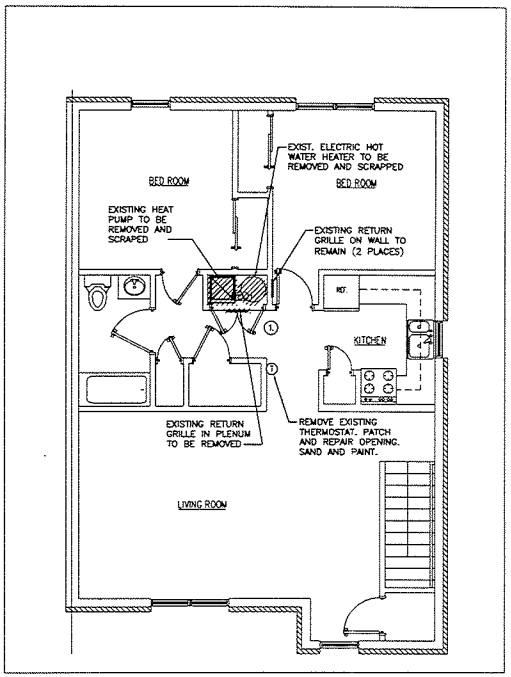
1. CONTRACTOR SHALL FURNISH ALL LABOR AND MATERIALS TO PROVIDE A COMPLETE AND OPERATIONAL SYSTEM AS INDICATED ON THE PLANS.
2. EACH CONTRACTOR SHALL COORDINATE ALL OF HIS WORK WITH THE OTHER CONTRACTORS AND TRADES PRIOR TO INSTALLATION OF ANY WORK. REPORT ALL CONFLICTS IMMEDIATELY TO OWNER / ENGINEER.
3. EACH CONTRACTOR SHALL OBTAIN APPROVALS FROM AUTHORITIES AND PAY FOR ALL PERMITS. ALL OTHER FEES AND TAXES SHALL NOT BE INCLUDED IN CONTRACT.
4. ALL EQUIPMENT, MATERIALS, AND WORKMANSHIP SHALL BE GUARANTEED FOR A MINIMUM OF ONE YEAR AFTER ACCEPTANCE BY OWNER, UNLESS OTHERWISE SPECIFIED. ALL MAJOR EQUIPMENT EQUIPMENT WARRANTY SHALL BE BY THE EQUIPMENT MANUFACTURER.
5. DRAWINGS ARE DIAGRAMMATIC, INDICATING THE GENERAL ARRANGEMENT OF ALL SYSTEMS AND WORK TO BE PERFORMED. MINOR DETAILS NOT SHOWN ON PLANS OR SPECIFIED, BUT NECESSARY FOR PROPER INSTALLATION AND OPERATION OF ALL SYSTEMS SHALL BE PROVIDED BY THE CONTRACTOR WITH NO ADDITIONAL CHARGES TO THE OWNER.
6. CONTRACTOR SHALL CHECK AND VERIFY ALL MEASUREMENTS AND CONDITIONS SHOWN ON DRAWINGS PRIOR TO PROCEEDING WITH ANY WORK. ANY CONFLICT OR DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE CONTRACTING OFFICER.
7. ALL EQUIPMENT COMPONENTS SHALL BE MOUNTED AND CONNECTED IN STRICT ACCORDANCE OF THE MANUFACTURE'S RECOMMENDATIONS.
8. CONTRACTOR SHALL PROVIDE DIELECTRIC UNION WHERE DISSIMILAR PIPING MATERIALS ARE CONNECTED.
9. CONTRACTOR SHALL VERIFY ELECTRIC SERVICE CHARACTERISTICS (VOLTS/PHASE/HERTZ)BEFORE PURCHASING ANY EQUIPMENT. COORDINATE FINAL ELECTRICAL CHARACTERISTICS OF ALL EQUIPMENT WITH THE ELECTRICAL CONTRACTOR.
10. CONTRACTOR SHALL PROVIDE ALL PIPE SUPPORTS; ALL DUCT SUPPORTS; ALL EQUIPMENT SUPPORTS; INSTRUMENT SUPPORTS; AND ALL HARDWARE NECESSARY FOR THE PROPER INSTALLATION AND OPERATION OF ALL SYSTEMS.
11. ALL MECHANICAL WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID ANY INTERFERENCE.
12. ALL ELECTRICAL WORK AND NECESSARY REWIRING SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST EDITION OF THE "NATIONAL ELECTRIC CODE".
13. DUCT MATERIAL SHALL BE GALVANIZED STEEL. DUCT GAGE SHALL BE IN ACCORDANCE WITH SMACNA'S GUIDELINES.
14. ALL SUPPLY, RETURN AND OUTSIDE AIR DUCTWORK SHALL BE INSULATED WITH 1" INSULATION.
15. PROVIDE VOLUME DAMPERS AT EACH BRANCH TAKE-OFF FROM MAIN DUCT FOR AIR SUPPLY. PROVIDE VOLUME DAMPER AT ALL SUPPLY AIR REGISTER AND DIFFUSER TAKE-OFF.
16. ALL CEILING DIFFUSERS SHALL HAVE INTEGRAL VOLUME DAMPER FOR EACH DIFFUSER. DUCT DROPS SHALL BE CLOSELY COORDINATED WITH OTHER TRADES TO AVOID CONFLICT WITH LIGHTING FIXTURES, CEILING GRID, ETC.
17. PROVIDE TURNING VANES WHERE DUCTWORK RISES OR WHERE 90 DEGREE TURNS ARE SHOWN.
18. ALL HVAC WORK MUST COMPLY WITH THE LOCAL BUILDING CODE, ASHRAE'S, SMACNA'S, NFPA'S AND THE STATE AND LOCAL RULES, REGULATIONS AND RECOMMENDATIONS.
19. ALL EQUIPMENT SHALL HAVE ITS MANUFACTURER'S NAMEPLATE SECURELY ATTACHED GIVING DESIGN AND OPERATING CHARACTERISTICS. NAMEPLATES SHALL NOT BE COVERED OR OBSTRUCTED FROM VIEW. ELECTRICAL PANEL SCHEDULES SHALL BE PROVIDED AND/OR WHERE EXISTING THEY SHALL BE AMENDED TO REFLECT THE NEW WORK. PIPING AND CONDUIT SYSTEMS SHALL BE LABELED, AND VALVES SHALL BE TAGGED.
20. ALL DUCT PENETRATIONS THROUGH FIRE RATED WALLS SHALL BE EQUIPPED WITH A FIRE DAMPER.
21. ALL PIPE PENETRATIONS THROUGH FIRE RATED WALLS SHALL BE FIRE STOPPED.
22. THE CONTRACTOR SHALL NOTE THE CONDITION OF THE GROUNDS PRIOR TO START OF WORK. ALL DAMAGES TO THE GROUNDS SHALL BE RESTORED TO THE ORIGINAL CONDITION AT THE CONCLUSION OF THE CONTRACT WORK.

SHEET NOTE:

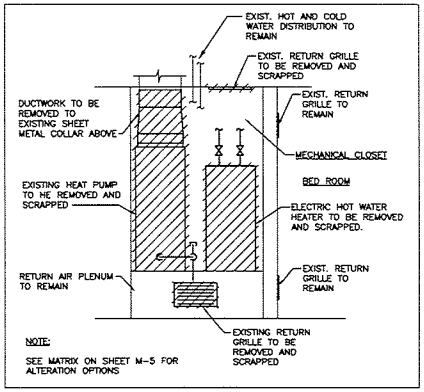
① REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR APPLICABLE WORK FOR RESPECTIVE UNIT.



1 MI FIRST FLOOR PLAN
SCALE: 1/4"=1'-0"



2 MI SECOND FLOOR PLAN
SCALE: 1/4"=1'-0"



3 MI MECHCAL CLOSET ELEVATION
SCALE: 1/4"=1'-0"

GENERAL NOTES:

PRIME CONSULTANT:

Desmond A. Baker & Associates, LLC
CONSULTING ENGINEERS * PLANNERS
2102 Baynard Boulevard P.O. Box 9543 Tel: 302-584-1383
Wilmington, DE 19802 Wilmington, DE 19809 Office: 302-658-1390
Fax: 302-658-1392
Contact:
Desmond A. Baker, P.E. FACEC, Principal
dabaker01@comcast.net

- ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:

BURTON VILLAGE APPARTMENTS

37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

DWG TITLE:

2 - BEDROOM UNIT DEMOLITION

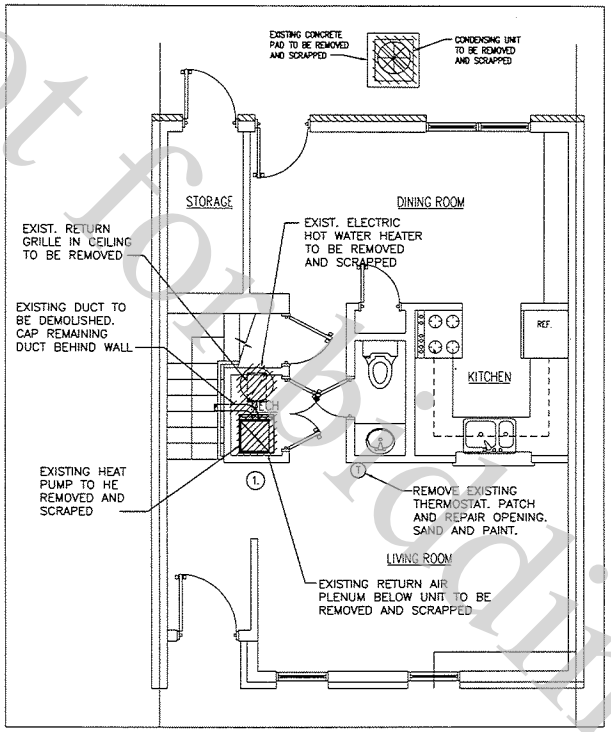
ISSUED FOR:

FOR CONSTRUCTION

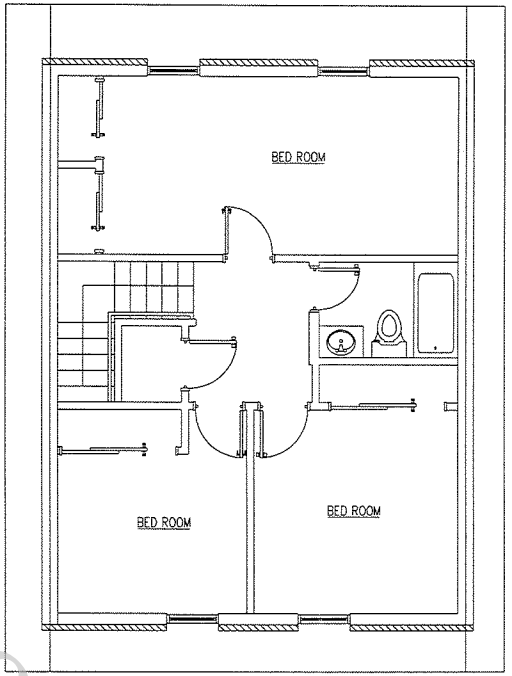
DATE: 01/02/2014	SHEET #
SCALE: AS NOTED	M-1
CHECKED BY: DAB	
DRAWN BY: RD	-

LEGEND

- FLEXIBLE CONNECTION TO EQUIPMENT
- DUCT SPLIT BRANCHES
- RL — REFRIGERANT LIQUID
- RS — REFRIGERANT SUCTION
- THERMOSTAT
- HUMIDISTAT
- MOTOR OPERATED DAMPER
- DAMPER -DIAGRAMMATIC
- FD/AP — FIRE DAMPER W/ACCESS PANEL
- SD/AP — SMOKE DAMPER W/ACCESS PANEL
- VOLUME DAMPER
- AIR RETURN GRILL
- SUPPLY DIFFUSER
- UNDERCUT DOOR
- SUPPLY AIR ARROW
- DUCTWORK WITH TURNING VANES
- DUCT CAP



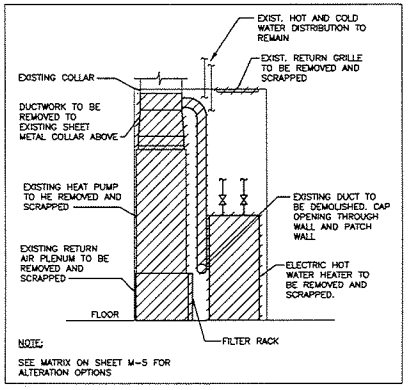
1/M2 FIRST FLOOR PLAN
SCALE: 1/4"=1'-0"



2/M2 SECOND FLOOR PLAN
SCALE: 1/4"=1'-0"

SHEET NOTE:

1. REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR APPLICABLE WORK FOR RESPECTIVE UNIT.



2/M2 MECHANICAL CLOSET ELEVATION
SCALE: 1/2"=1'-0"

GENERAL NOTES:

PRIME CONSULTANT:
Desmond A. Baker & Associates, LLC
CONSULTING ENGINEERS + PLANNERS
2102 Baynard Boulevard P.O. Box 9543 Tel: 302-654-1383
Wilmington, DE 19802 Wilmington, DE 19809 Office: 302-658-1380
Fax: 302-658-1392
Contact:
Desmond A. Baker, P.E. FACEC, Principal
dabaker01@comcast.net

ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:
BURTON VILLAGE APPARTMENTS
37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

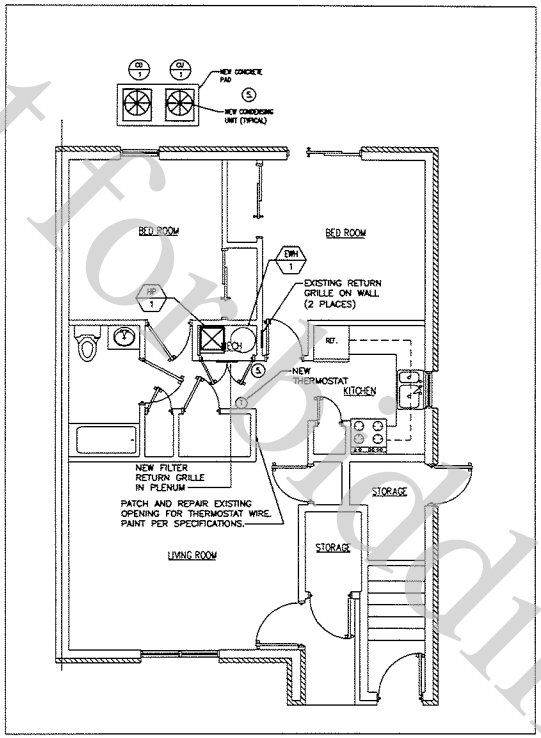
DWG TITLE:
3 & 4 - BEDROOM UNIT DEMOLITION

ISSUED FOR:
FOR CONSTRUCTION

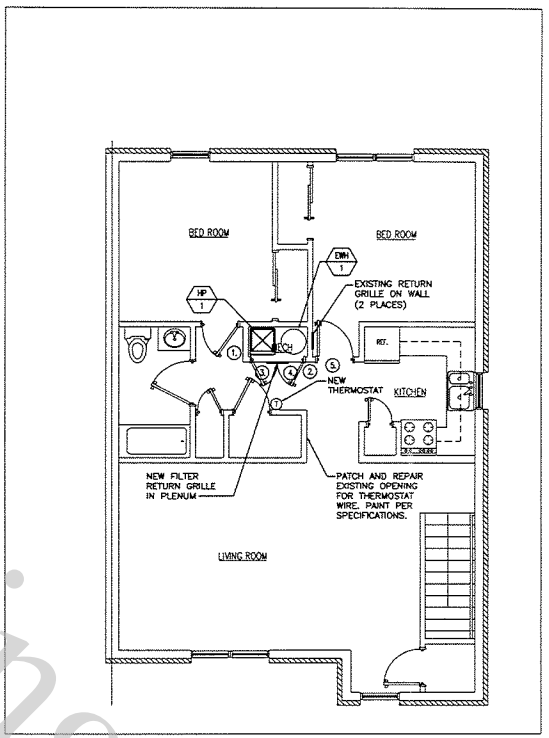
DATE: 01/02/2014	SHEET #
SCALE: AS NOTED	M-2
CHECKED BY: DAB	
DRAWN BY: RD	-

SHEET NOTES

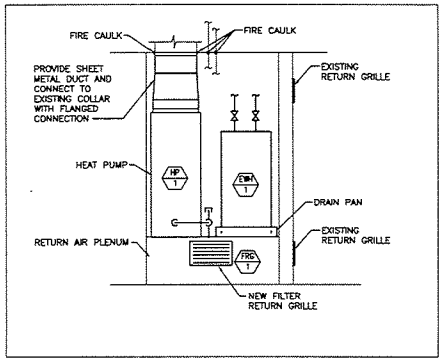
1. CONTRACTOR SHALL REPAIR ALL DRYWALL DAMAGES IN MECHANICAL CLOSET WALL WITH 5/8" DRY WALL AND DRYWALL COMPOUND. SEAL AND CAULK ALL DUCT AND PIPE PENETRATIONS. CAULK AND SEAL ALL OPENINGS IN ALL MECHANICAL ROOM WALLS WITH PLASTER COMPOUND, AND 3M FIRE RATED FIRE CAULK, SAND , PRIME AND REPAINT PER D.S.H.A. REQUIREMENTS AS OUTLINED IN PAINTING SPECIFICATION SECTION 09900.
2. AFTER MODIFICATIONS, ALL DOORS SHALL BE SANDED AND REPAINTED PER D.S.H.A. STANDARD PAINT COLOR AND SPECIFICATIONS, COORDINATE WITH THE PROJECT MANAGER.
3. ALL MECHANICAL ROOM FLOORING TO BE REPLACED WITH VINYL TILES. TILES TO BE FURNISHED BY D.S.H.A. GLUE TO BE FURNISHED BY THE CONTRACTOR.
4. ALL CONDENSATE DRAINS TO BE INDIRECTLY DISCHARGED INTO DRAIN PIPE DUMPING AT THE REAR OF EACH BUILDING, REFER TO DETAIL ON DRAWINGS.
5. REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR ALTERATION OPTIONS.
6. CONTRACTOR SHALL VISIT THE SITE TO VERIFY EXISTING HOSE BIBBS. REMOVE ALL EXISTING HOSE BIBB, CAP REMAINING PIPING NOT BEING REUSED BEHIND WALL INTERIOR OF BUILDING INSULATION. PROVIDE NEW SHUT OFF VALVE INSIDE BUILDING AND REPLACE 16 UNITS WITH NEW HOSE BIBBS AS SHOWN. PROVIDE ONE NEW HOSE BIBB AT FRONT AND ONE AT REAR OF EACH BUILDING. COORDINATE FINAL LOCATIONS WITH THE OWNER. THE NEW HOSE BIBBS SHALL BE EQUAL TO JAY S. SMITH MODEL 5509QT-R, QUARTER TURN - NON FREEZE WALL HYDRANT WITH VACUUM BREAKER, STAINLESS STEEL BOX, AND KEY OPERATOR. REPAIR SURFACES WHERE HOSE BIBBS HAVE BEEN REMOVED TO MATCH EXISTING.



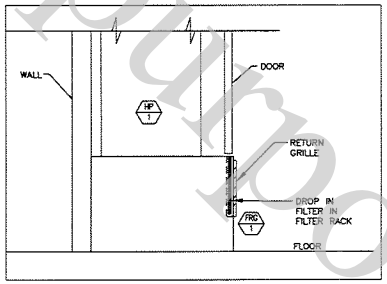
1 M-3 FIRST FLOOR PLAN
SCALE: 1/4"=1'-0"



2 M-3 SECOND FLOOR PLAN
SCALE: 1/4"=1'-0"



3 M-3 MECHANICAL CLOSET ELEVATION
SCALE: 1/4"=1'-0"



4 M-3 RETURN FILTER DETAIL
SCALE: 1"=1'-0"

GENERAL NOTES:

PRIME CONSULTANT:
Desmond A. Baker & Associates, LLC
CONSULTING ENGINEERS - PLANNERS
2102 Baynard Boulevard P.O. Box 9543 Tel: 302-684-1382
Wilmington, DE 19802 Wilmington, DE 19809 Office: 302-656-1340
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Desmond A. Baker, P.E. FACEC, Principal
debaker01@comcast.net

- ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:
BURTON VILLAGE APPARTMENTS
37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

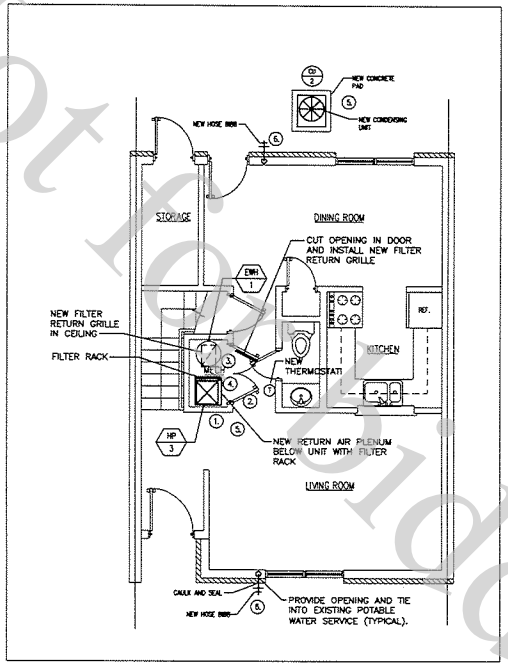
DWG TITLE:
2 - BEDROOM UNIT NEW WORK

ISSUED FOR:
FOR CONSTRUCTION

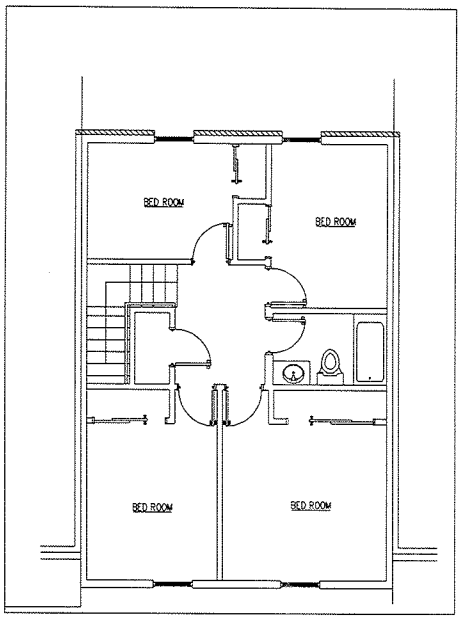
DATE: 01/02/2014	SHEET #
SCALE: AS NOTED	M-3
CHECKED BY: DAB	
DRAWN BY: RD	-

SHEET NOTES

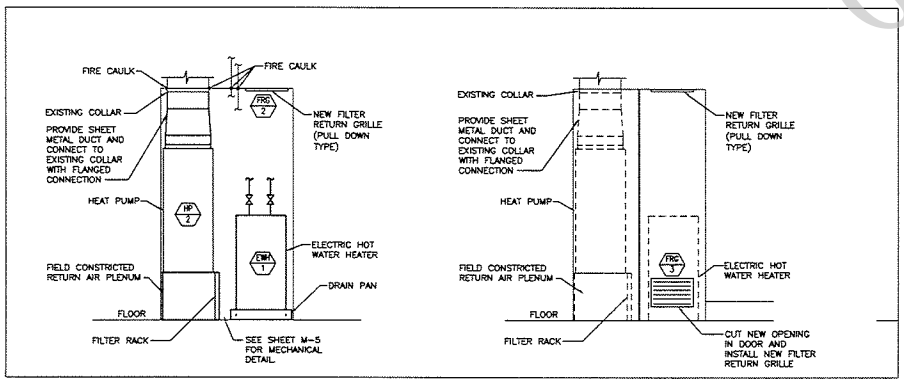
1. CONTRACTOR SHALL REPAIR ALL DRYWALL DAMAGES IN MECHANICAL CLOSET WALLS WITH 5/8" DRY WALL AND DRYWALL COMPOUND, SEAL AND CAULK ALL DUCT AND PIPE PENETRATIONS. CAULK AND SEAL ALL OPENINGS IN ALL MECHANICAL ROOM WALLS WITH PLASTER COMPOUND, AND 3M FIRE RATED FIRE CAULK, SAND , PRIME AND REPAINT PER D.S.H.A. REQUIREMENTS AS OUTLINED IN PAINTING SPECIFICATION SECTION 09900.
2. AFTER MODIFICATIONS, ALL DOORS SHALL BE SANDED AND REPAINTED PER D.S.H.A. STANDARD PAINT COLOR AND SPECIFICATIONS, COORDINATE WITH THE PROJECT MANAGER.
3. ALL MECHANICAL ROOM FLOORING TO BE REPLACED WITH VINYL TILES, TILES TO BE FURNISHED BY D.S.H.A. GLUE TO BE FURNISHED BY THE CONTRACTOR.
4. ALL CONDENSATE DRAINS TO BE INDIRECTLY DISCHARGED INTO DRAIN PIPE DUMPING AT THE REAR OF EACH BUILDING. REFER TO DETAIL ON DRAWINGS.
5. REFER TO REPLACEMENT MATRIX ON SHEET M-5 FOR ALTERATION OPTIONS.
6. CONTRACTOR SHALL VISIT THE SITE TO VERIFY EXISTING HOSE BIBBS, REMOVE ALL EXISTING HOSE BIBB, CAP REMAINING PIPING NOT BEING REUSED BEHIND WALL, INTERIOR OF BUILDING INSULATION. PROVIDE NEW SHUT OFF VALVE INSIDE BUILDING AND REPLACE 18 UNITS WITH NEW HOSE BIBBS AS SHOWN, PROVIDE ONE NEW HOSE BIBB AT FRONT AND ONE AT REAR OF EACH BUILDING. COORDINATE FINAL LOCATIONS WITH THE OWNER. THE NEW HOSE BIBBS SHALL BE EQUAL TO JAY R. SMITH MODEL 5509CTAR, QUARTER TURN - NON FREEZE WALL HYDRANT WITH VACUUM BREAKER, STAINLESS STEEL BOX, AND KEY OPERATOR. REPAIR SURFACES WHERE HOSE BIBBS HAVE BEEN REMOVED TO MATCH EXISTING.



1 M4 FIRST FLOOR PLAN
SCALE: 1/4" = 1'-0"



2 M4 SECOND FLOOR PLAN
SCALE: 1/4" = 1'-0"



3 M4 MECHANICAL CLOSET INTERIOR ELEVATION
SCALE: 1/2" = 1'-0"

4 M4 MECHANICAL CLOSET EXTERIOR ELEVATION
SCALE: 1/2" = 1'-0"

GENERAL NOTES:

PRIME CONSULTANT:
Desmond A. Baker & Associates, LLC
CONSULTING ENGINEERS + PLANNERS
2102 Baynard Boulevard P.O. Box 3543 Tel: 302-654-1382
Wilmington, DE 19802 Wilmington, DE 19807 Office: 302-658-1396
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Contact:
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dabaker21@comcast.net

ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:
BURTON VILLAGE APPARTMENTS
37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

DWG TITLE:
3 & 4 BEDROOM UNIT NEW WORK

ISSUED FOR:
FOR CONSTRUCTION

DATE: 01/02/2014
SCALE: AS NOTED
CHECKED BY: DAB
DRAWN BY: RD

SHEET #
M-4

DIFFUSER AND REGISTER SCHEDULE

BASIS OF DESIGN: TITUS OR APPROVED EQUAL

REF. NO.	CFM RANGE	NECK SIZE (IN)	NECK VEL.(FPM)	PRESS. DROP (IN W.G.)	NC @ MAX CFM	PATTERN	THROW @ 75 FPM	REMARKS
FRG-1	SEE PLANS	SEE PLANS	250	.02	20	22" FIXED DEFLECTION	–	TITUS FILTER RETURN AIR GRILLE, MOD. 350
FRG-2	SEE PLANS	SEE PLANS	250	.02	20	22" FIXED DEFLECTION	–	TITUS FILTER RETURN AIR GRILLE, MOD. 350
FRG-3	SEE PLANS	SEE PLANS	250	.04	24	22" FIXED DEFLECTION	–	TITUS FILTER RETURN AIR GRILLE, MOD. 350

① ALL SUPPLY REGISTERS SHALL BE EQUIPPED WITH INTEGRAL OPPOSED BLADE BALANCING DAMPER

HEAT PUMP INDOOR UNIT SCHEDULE

DESIGN BASED ON: TRANE (HP/1)

REF. No.	AREA SERVED	FAN SECTION						ELECTRIC BACKUP HEAT HEATING			UNIT MOCP AMPS	DIRECT EXPANSION COIL				OUTSIDE AIR		TYPE	REMARKS
		CFM	STATIC PRESS. IN. WG.	MOTORS				TEMPERATURE RISE RANGE °F	INPUT KW	VOLTS/PHASE/HERTZ		ENT. AIR TEMP. °F		MODEL NUMBER	NOMINAL CAPACITY TON	MIN. CFM	MAX. CFM		
				HP	VOLTS	PHASE	Hz					D.B.	W.B.						
HP-1	2 BEDROOM UNITS	800	0.5	1/2	230	1	60	37.9	9.6	240V/1PH/60HZ	60	80.0	67.0	–	2	0	0	VERTICAL UP FLOW	MODEL: GAM5B0A24M21SA ①
HP-2	3 BEDROOM UNITS	1000	0.5	1/2	230	1	60	30.3	9.6	240V/1PH/60HZ	60	80.0	67.0	–	2.5	0	0	VERTICAL UP FLOW	MODEL: GAM5B0A30M21SA ①
HP-3	4 BEDROOM UNITS	1000	0.5	1/2	230	1	60	30.3	9.6	240V/1PH/60HZ	60	80.0	67.0	–	2.5	0	0	VERTICAL UP FLOW	MODEL: GAM5B0A30M21SA ①

① FLOOR MOUNTED, UP-FLOW, WITH NEW 7-DAY PROGRAMMABLE THERMOSTAT EQUAL TO HONEYWELL MODEL NO. TH8110U.

CONDENSING UNIT SCHEDULE

DESIGN BASED ON: TRANE OR EQUAL (DU/1)

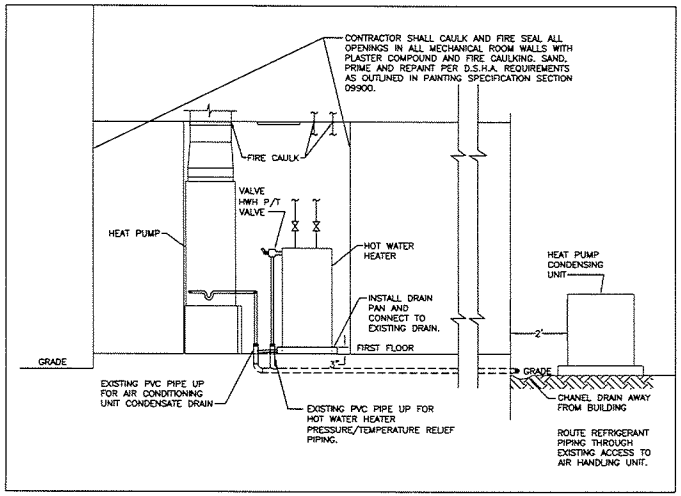
REF. NO.	NOMINAL TONS	AMBIENT TEMP. °F	REFRG.	ELEC. CHARACTERISTICS						SEER RATING	REMARKS
				MCA	MIN AMPS	MOCP	VOLTS	PHASE	Hz		
CU-1	2	95	R410	11	15	15	208/230	1	60	15	HEAT PUMP, MODEL: 4TWR5024G1 ①
CU-2	2.5	95	R410	15	25	25	208/230	1	60	15	HEAT PUMP, MODEL: 4TWR5030G1 ①
CU-3	2.5	95	R410	15	25	25	208/230	1	60	15	HEAT PUMP, MODEL: 4TWR5030G1 ①

① EXISTING R22 REFRIGERANT PIPING TO BE THOROUGHLY CLEANED AND REUSED FOR NEW SYSTEM. INSTALL REFRIGERANT PIPING IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

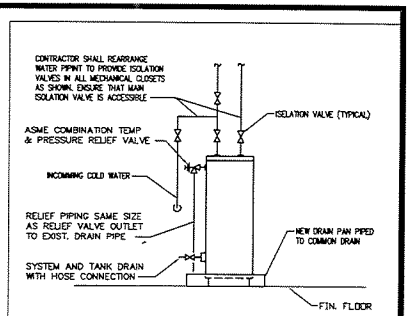
ELECTRIC WATER HEATER

DESIGN BASED ON: BRADFORD WHITE OR EQUAL

REF. No.	RECOVERY GPM @ 90°F RISE	CAPACITY GAL.	FUEL			ELECTRICAL SERVICE			LOCATION	REMARKS
			TYPE	INPUT	UNIT	VOLTS	PHASE	HERTZ		
EWH-1	21	40	ELECTRIC	4.5	KW	208/240	1	60	MECHANICAL CLOSET	MODEL NO. M-2-40S6DS



1 MECHANICAL DETAIL
M-5 SCALE: 1/2"=1'-0"



WATER HEATER DETAIL – EWH-1
N.T.S.

WORK SCHEDULE

UNIT NO.	DEMO EXISTING HP AND CONDENSER	DEMO EXISTING HOT WATER HEATER	NEW HEAT PUMP AND CONDENSER	NEW HOT WATER HEATER	NEW RETURN AIR GRILLS	FIRE CAULK OPENINGS, PAINT MECHANICAL ROOM AND DOOR	CLEAN DUCTWORK	NEW THERMOSTAT	NEW ARC FAULT CIRCUIT BREAKER (BY D.S.H.A.)
101	o	o	o	o	o	o	o	o	o
103	o	o	o	o	o	o	o	o	o
105	o	o	o	o	o	o	o	o	o
107	o	o	o	o	o	o	o	o	o
109	o	o	o	o	o	o	o	o	o
111	X	o	X	o	o	o	o	o	o
200	o	o	o	o	o	o	o	o	o
202	o	o	o	o	o	o	o	o	o
204	X	o	X	o	o	o	o	o	o
206	o	o	o	o	o	o	o	o	o
208	o	o	o	o	o	o	o	o	o
210	o	o	o	o	o	o	o	o	o
201	o	o	o	o	o	o	o	o	o
203	o	o	o	o	o	o	o	o	o
205	o	o	o	o	o	o	o	o	o
207	o	o	o	o	o	o	o	o	o
209	o	o	o	o	o	o	o	o	o
211	o	o	o	o	o	o	o	o	o
300	o	o	o	o	o	o	o	o	o
302	o	o	o	o	o	o	o	o	o
304	o	o	o	o	o	o	o	o	o
306	o	o	o	o	o	o	o	o	o
308	o	o	o	o	o	o	o	o	o
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303	o	o	o	o	o	o	o	o	o
305	o	o	o	o	o	o	o	o	o
307	X	o	X	o	o	o	o	o	o
309	o	o	o	o	o	o	o	o	o
311	o	o	o	o	o	o	o	o	o
400	o	X	o	X	o	o	o	o	o
402	o	o	o	o	o	o	o	o	o
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607	o	o	o	o	o	o	o	o	o
609	o	o	o	o	o	o	o	o	o
611	o	o	o	o	o	o	o	o	o

LEGEND
o YES
X NO

GENERAL NOTES:

PRIME CONSULTANT:
Desmond A. Baker & Associates, LLC
CONSULTING ENGINEERS • PLANNERS
2102 Baynard Boulevard P.O. Box 9543 Tel: 302-564-1382
Wilmington, DE 19802 Wilmington, DE 19809 Office: 302-658-1382
Fax: 302-658-1382
Contact:
Desmond A. Baker, P.E. FACSC, Principal
dabaker01@comcast.net

-ENGINEERS:

NO.	REVISION / ISSUE	DATE

PROJECT TITLE:
BURTON VILLAGE APPARTMENTS
37511 BURTON VILLAGE AVENUE,
ROHOBOTH BEECH, DE 19971

DWG TITLE:
SCHEDULES AND DETAILS

ISSUED FOR:
FOR CONSTRUCTION

DATE: 01/02/2014
SCALE: AS NOTED
CHECKED BY: DAB
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SHEET #
M-5
-