



**AERIAL IMAGE**  
SCALE: NO SCALE



# St. James Episcopal Church

ST. JAMES EPISCOPAL CHURCH  
355 W MAPLE RD.  
BIRMINGHAM, MI 48009

## HVAC EQUIPMENT UPGRADES

DECEMBER 2019



Process Results, Inc.  
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### PROJECT DIRECTORY

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355 W MAPLE RD  
BIRMINGHAM, MI 48009

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### SCOPE OF WORK

THIS PROJECT INVOLVES MODIFICATIONS TO THE HEATING HOT WATER (HHW) AND CHILLED WATER (CHW) SYSTEMS SERVING THE ST. JAMES EPISCOPAL CHURCH. THESE MODIFICATIONS ARE BEING MADE TO REPLACE EXISTING AGING EQUIPMENT.

#### MECHANICAL/PIPING

##### CHILLER

- ISOLATE AND DISCONNECT CHILLED WATER (CHW) PIPING TO EXISTING CHILLER
- REMOVE EXISTING CHILLER AND DISPOSE OF PROPERLY.
- PURCHASE AND INSTALL NEW CHILLER IN SAME LOCATION AS EXISTING.
- RECONNECT CHW PIPING TO NEW CHILLER.
- INSULATE NEW CHW PIPING AFTER HEAT TRACING HAS BEEN REINSTALLED.

##### BOILERS

- ISOLATE AND DISCONNECT HEATING HOT WATER (HHW) AND NATURAL GAS (NG) PIPING AND TO EXISTING HHW BOILERS.
- REMOVE EXISTING FLUE DUCTS FROM BOILERS TO MAIN FLUE DUCT.
- REMOVE EXISTING HHW BOILERS AND DISPOSE OF PROPERLY.
- PURCHASE AND INSTALL NEW HHW BOILERS.
- RECONNECT HHW AND NG PIPING TO BOILERS AS SHOWN ON DRAWINGS.
- INSULATE NEW HHW PIPING.

##### ELECTRICAL

##### CHILLER

- DISCONNECT POWER TO EXISTING CHILLER.
- DISCONNECT POWER TO EXISTING HEAT TRACE ON EXTERIOR CHW PIPING AND TEMPORARILY REMOVE.
- REINSTALL HEAT TRACE ON NEW CHW PIPING AND RE-ENERGIZE SYSTEM.
- RECONNECT POWER TO NEW CHILLER.

##### BOILERS

- DISCONNECT POWER TO EXISTING HHW BOILERS AND PUMPS.
- RECONNECT POWER TO NEW HHW BOILERS AND PUMPS.

##### ARCHITECTURAL

- POUR NEW EQUIPMENT PADS IN BOILER ROOM #129.
- CONSTRUCT NEW ENCLOSURE AROUND BOILER FLUE PIPES IN COURTYARD AREA.

##### WATER BALANCE

- BALANCE WATER FLOWS (CHW AND HHW) TO VALUES INDICATED ON DRAWINGS.

##### TEMPERATURE CONTROLS

- DEMOLISH EXISTING TEMPERATURE CONTROL SYSTEM AS SHOWN ON DRAWINGS.
- PURCHASE AND INSTALL NEW TEMPERATURE CONTROL SYSTEM.
- PROVIDE CHECKOUT AND START-UP SERVICES ALONG WITH TRAINING FOR ST. JAMES STAFF.

### SHOP DRAWING FOR REVIEW

CONTRACTOR SHALL SUBMIT THE FOLLOWING SHOP DRAWINGS FOR REVIEW AND APPROVAL FROM ENGINEER PRIOR TO PURCHASING:

- BOILERS
- CHILLER
- PUMPS
- HHW COMPONENTS
- BAS CONTROLS (TEMP)

### APPLICABLE CODES

**BUILDING CODE:** MICHIGAN BUILDING CODE/2015  
**MECHANICAL CODE:** MICHIGAN MECHANICAL CODE/2015  
**PLUMBING CODE:** MICHIGAN PLUMBING CODE/2015  
**ELECTRICAL CODE:** MICHIGAN ELECTRICAL CODE/2017  
**FIRE PREVENTION CODE:** NFPA FIRE CODE/2015

APPLICABLE CITY OF BIRMINGHAM RULES AND REGULATIONS

### SHUT DOWNS

- CONTRACTORS ARE ALSO ADVISED THAT ST. JAMES EPISCOPAL CHURCH WILL REMAIN OPERATIONAL DURING CONSTRUCTION HOURS.
- COORDINATE AND SCHEDULE ANY SHUTDOWNS AND HEAVY NOISE GENERATING ACTIVITIES WITH ST. JAMES EPISCOPAL CHURCH PERSONNEL AT LEAST 24 HOURS PRIOR TO IMPLEMENTING TO ALLOW TIME FOR COORDINATION.
- LIFE SAFETY SYSTEM SHUTDOWNS (AND STARTUPS) SHALL BE COORDINATED WITH ST. JAMES EPISCOPAL CHURCH PERSONNEL, AND LOCAL FIRE AUTHORITIES AND CENTRAL STATION MONITORING SERVICES (IF APPLICABLE).
- LIFE SAFETY SYSTEMS SHALL BE IN OPERATION DURING OCCUPIED AND UNOCCUPIED (I.E. NIGHT, WEEKEND, AND HOLIDAY) TIMES. PROVIDE FIRE WATCH DURING ALL TIMES THAT THE FIRE SUPPRESSION SYSTEM AND/OR FIRE ALARM CONTROL PANEL (FACP) IS DEACTIVATED.

### HAZARDOUS MATERIALS NOTE

THIS PROJECT AREA MAY CONTAIN HAZARDOUS MATERIALS. IF THE CONTRACTOR SHOULD ENCOUNTER ANY ITEMS SUSPECTED TO CONTAIN ASBESTOS, LEAD, OR MERCURY, CONTACT THE PROJECT CONSTRUCTION MANAGER IMMEDIATELY FOR DIRECTION. DO NOT DISTURB THE MATERIAL IN ITS LOCATION. PROJECT CONSTRUCTION MANAGER SHALL COORDINATE REMOVAL OF ANY ITEMS SUSPECTED OF CONTAINING HAZARDOUS MATERIALS. REMOVAL OF HAZARDOUS MATERIALS SHALL BE IN ACCORDANCE WITH EPA REQUIREMENTS AS WELL AS REQUIREMENTS OF ANY OTHER AGENCIES WITH JURISDICTION OVER SUCH WORK.

### PROJECT CLOSE OUT DOCUMENTS

CONTRACTOR SHALL PROVIDE A COPY OF THE FOLLOWING CLOSE OUT DOCUMENTS:

- APPROVED ELECTRICAL, MECHANICAL AND FIRE ALARM CERTIFICATES
- AS-BUILTS FOR RECORD DRAWINGS NOTING DEVIATIONS FROM CONSTRUCTION DOCUMENTS
- ALL O&M MANUALS (ELECTRONIC AND PAPER COPY)
- UPDATED, TYPED PANELBOARD DIRECTORY IN ALL AFFECTED ELECTRICAL PANELS
- DOCUMENTATION OF FACTORY START UP AND OWNER TRAINING FOR ALL MEP EQUIPMENT
- WARRANTIES/WARRANTY CONTACT LIST WITHIN O&M MANUAL
- DOCUMENTATION THAT ALL PUNCH LIST ITEMS HAVE BEEN COMPLETED AND SIGNED OFF BY OWNER
- WATER BALANCE REPORT WITH APPROVAL WITHIN O&M MANUAL

### GENERAL NOTES

- ALL WORK MUST COMPLY WITH THE REQUIREMENTS OF LOCAL CODES AND ORDINANCES. WHERE INSPECTIONS ARE REQUIRED BY AUTHORITIES HAVING JURISDICTION, WORK WILL NOT BE CONSIDERED COMPLETE UNTIL TESTED, INSPECTED, AND ACCEPTED.
- DRAWINGS ARE BASED ON AVAILABLE DOCUMENTS, SITE INSPECTION AND DESIGN EXPERIENCE. DRAWINGS MAY NOT REFLECT A COMPLETE AS BUILT CONDITION. CONTRACTOR TO FIELD VERIFY.
- DRAWINGS DIAGRAMMATICALLY INDICATE THE GENERAL WORK SCOPE BUT DO NOT PROVIDE EXACT SCALE OR LOCATIONS. PROPER INSTALLATION OF ALL SYSTEMS, AFTER COORDINATION WITH OTHER TRADES, IS THE CONTRACTOR'S RESPONSIBILITY.
- CONTRACTOR SHALL USE BID WALK-THROUGH AND FIELD OBSERVATIONS TO ENHANCE PROJECT UNDERSTANDING BEFORE BIDDING ON PROJECT.
- ALL CONTRACTORS TO REVIEW DRAWINGS AND SPECIFICATIONS TO UNDERSTAND THE SCOPE OF WORK FOR THEIR DISCIPLINE.
- NO DEMOLITION SHALL TAKE PLACE WITHOUT APPROVAL FROM THE OWNER'S REPRESENTATIVE.
- ALL UTILITY SHUTDOWNS ARE TO BE SCHEDULED WITH OWNER'S REPRESENTATIVE MINIMUM 24 HOURS IN ADVANCE.
- TEMPORARY REMOVAL OF ANY AND ALL EXISTING MISCELLANEOUS ITEMS (I.E. CONDUIT, PIPING, LIGHTING, ETC.) FOR THE PURPOSE OF PERFORMING THIS WORK SHALL BE REINSTALLED BACK TO PRE-CONSTRUCTION LEVEL AS PART OF THIS PROJECT. NO ADDITIONAL FEES WILL BE AWARDED.
- CONTRACTOR TO TEMPORARILY SUPPORT ALL DUCTWORK, PIPING, CONDUIT, ETC. DURING THE DEMOLITION AND CONSTRUCTION PHASES.
- CONTRACTOR TO PROTECT ALL PIPING, PIPE INSULATION, CONDUITS, FIRE SPRINKLERS, AND OTHER MISCELLANEOUS ITEMS DURING THE DEMOLITION PHASE. ANY DAMAGE RESULTING FROM THE CONTRACTOR'S OPERATIONS MUST BE REPAIRED OR REPLACED WITH EQUAL AND TO THE OWNER'S SATISFACTION AND AT NO ADDITIONAL COST.
- EQUIPMENT INDICATED ON THE CONSTRUCTION DOCUMENTS, TOGETHER WITH ITS BASE AND/OR SUPPORT, DUCTWORK, ROOF OPENINGS, ELECTRICAL SERVICE, REFRIGERANT PIPING, AND HEATING HOT WATER ARE BASED ON THE MAKE AND MODEL INDICATED IN THE EQUIPMENT SCHEDULE. SHOULD AN EQUIVALENT ALTERNATE MAKE OF EQUIPMENT BE SELECTED, EVEN IF APPROVED BY THE OWNER AS EQUAL, COORDINATE AND MAKE THE MODIFICATIONS IN THE WORK WITH NO CHANGE IN THE CONTRACT AMOUNT.
- UNLESS OTHERWISE SHOWN ON CONSTRUCTION DOCUMENTS OR SPECIFIED HEREIN, PRODUCTS USED IN THE WORK SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS. ANY CHANGES OR MODIFICATIONS PROPOSED WHICH ARE BELIEVED TO IMPROVE THE INSTALLATION SHALL BE APPROVED BY THE OWNER AND/OR ITS REPRESENTATIVE.
- MAINTAIN SECURITY, LIFE SAFETY, FIRE AND SMOKE CONSTRUCTION INTEGRITY, FIRE ESCAPES AND EGRESS PATHS AT ALL TIMES.
- REFER TO CONTRACT DOCUMENTS AND PROJECT SPECIFICATIONS FOR ADDITIONAL SCOPE AND INFORMATION.
- SAFETY STANDARDS DICTATE THAT LIFTING OF EQUIPMENT ON THE ROOF OR IN THE SPACE MUST BE DONE WHEN THERE ARE NO PERSONNEL PRESENT IN THE SPACE.
- CONTRACTOR WILL BE RESPONSIBLE FOR REPAIRING ANY AND ALL DAMAGE CAUSED BY CRANE AND/OR EQUIPMENT USED DURING LIFTING PROCESS AND/OR CAUSED DURING CONSTRUCTION PROCESS.
- CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING A COMPLETE AND WORKING SYSTEM.
- CONTRACTOR IS RESPONSIBLE FOR FINAL CLEANING OF PROJECT AREA(S).
- PROVIDE ALL REQUIRED ACCESSORIES, INCLUDING MISCELLANEOUS SUPPORT STEEL, REQUIRED FOR PROPER INSTALLATION.
- CONTRACTOR SHALL PROVIDE SUBMITTALS ON ALL EQUIPMENT FOR APPROVAL BEFORE PURCHASING.
- PROTECT BUILDING FROM DUST MIGRATION USING APPROPRIATE SEALED BARRIERS TO SEPARATE AND SEGREGATE CONSTRUCTION AREAS FROM ACTIVE TENANT AREAS INCLUDING SHARED CEILING PLENUMS AND MECHANICAL SYSTEMS.
- ALL MATERIAL COMING IN CONTACT WITH POTABLE WATER SHALL MEET NSF STANDARD 61.
- THE WATER TREATMENT FACILITIES SHALL BE DISINFECTED ACCORDING TO AWWA STANDARDS C653-13.

### GENERAL NOTES (CONTINUED)

- ALL PIPING TO BE SUPPORTED IN ACCORDANCE WITH ANS/MSS SP-58 (2015 MICHIGAN MECHANICAL CODE, SECTION 305).
- GRAY INDICATES EXISTING EQUIPMENT AND BLACK INDICATES NEW EQUIPMENT.
- HATCHING ON DRAWINGS DENOTES DEMOLITION.
- NEW WORK SHOWN IN BOLD ON DRAWINGS.

- CURRENT ISSUE
- PREVIOUS ISSUE
- NOT ISSUED

### DRAWING INDEX

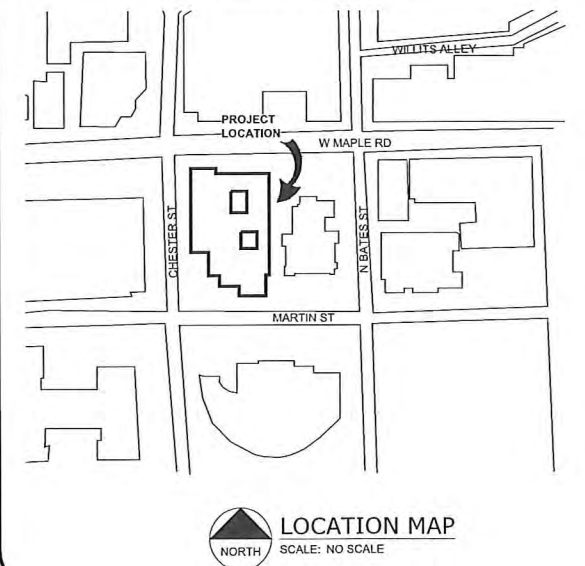
#### GENERAL INFORMATION

NO.	ISSUE	DESCRIPTION
T1.0	●	TITLE SHEET & GENERAL INFORMATION
SP1.0	●	MEP PLUMBING SPECIFICATIONS
SP1.1	●	MEP SPECIFICATIONS
SP1.2	●	MEP SPECIFICATIONS
SP1.3	●	MEP SPECIFICATIONS

#### MECHANICAL/ELECTRICAL/PLUMBING

MEP1.0	●	MEP PARTIAL SITE PLAN
MEP1.1	●	MEP LOWER LEVEL PLAN DEMOLITION
MEP1.2	●	MEP LOWER LEVEL PLAN NEW WORK
MEP1.3	●	MEP LOWER LEVEL PLAN ENLARGED
MEP2.0	●	MECHANICAL - SCHEDULES
MEP2.1	●	MECHANICAL DETAILS
MEP3.0	●	HHW SYSTEM SCHEMATIC
MEP4.0	●	HVAC CONTROLS SCHEMATICS

### PROJECT LOCATION



PRELIMINARY 12/17/2019  
REVISION DATE

TITLE SHEET  
&  
GENERAL INFO

PROJ. NO.: 13063.01

T1.0  
SHEET NO.



**PRELIMINARY**

DATE: 12/17/19



**PROJECT REQUIREMENTS**

ALL WORK SHALL CONFORM TO ALL FEDERAL, STATE, AND LOCAL CODES AND REGULATIONS.

FAMILIARITY WITH CONDITIONS: CONTRACTOR SHALL BE HELD TO HAVE EXAMINED PROJECT SITE PRIOR TO SUBMITTING BIDS, TO HAVE FAMILIARIZED THEMSELVES WITH THE DOCUMENTS AND WITH CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED, AND TO HAVE VERIFIED THE AVAILABILITY OF REQUIRED MATERIALS AND TRADES PERSONS.

LEGAL CONFORMANCE: THE DOCUMENTS INTEND THAT ALL WORK SHALL BE PERFORMED IN COMPLETE LEGAL CONFORMANCE WITH ALL PERTINENT CODES AND LAWS. THE CONTRACTOR SHALL ADVISE THE PROJECT MANAGER OF ANY ADDITIONAL DOCUMENTATION REQUIRED BY CODE OFFICIALS TO OBTAIN BUILDING PERMITS.

FIELD VERIFY ALL DIMENSIONS. NOTIFY ENGINEER IF DISCREPANCIES OCCUR.

CONSTRUCTION SHALL MEET THE BARRIER-FREE REQUIREMENTS STATED IN THE MICHIGAN DEPARTMENT OF LABOR CONSTRUCTION CODE GENERAL RULES LATEST EDITION, AND ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES OF THE LATEST PUBLISHED EDITION OF THE AMERICANS WITH DISABILITIES ACT (ADA) INCLUDING MOUNTING HEIGHTS, CLEARANCES, ETC.

ALL MATERIALS SHALL BE INSTALLED PER MANUFACTURERS SPECIFICATIONS

CONTRACTOR SHALL WORK FROM "ISSUED FOR CONSTRUCTION" DOCUMENTS OR LATER REVISIONS ONLY. CONTRACTOR SHALL NOT WORK FROM ANY DOCUMENTS "ISSUED FOR REVIEW, BIDS, PERMITS" OR FROM ANY DOCUMENTS WITH A LETTERED REVISION (A, B, C, ETC)

CONTRACTOR SHALL RECORD ON AS-BUILT DRAWINGS ALL SIZES, MATERIALS, ELEVATIONS AND LOCATIONS OF ALL EQUIPMENT, DUCTWORK AND PIPING THAT DEVIATE FROM THE DESIGN CONTRACT DRAWINGS.

**DEMOLITION AND DISPOSAL**

ALL DEMOLITION WORK SHALL BE COORDINATED WITH NEW WORK FOR DEFINITION OF LIMITS AND REQUIREMENTS OF THE NEW WORK. CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH ALL OTHER DISCIPLINES FOR LIMITS OF WORK. DEMOLITION LIMITS SHALL BE CONFIRMED WITH THE OWNER, PROJECT MANAGER OR DESIGNER PRIOR TO START OF ALL WORK.

DEMOLITION WORK SHALL INCLUDE THE PROPER DISPOSAL OF ALL MATERIALS. IN GENERAL, ALL EQUIPMENT, CONCRETE, PLUMBING, PIPING, DUCTWORK, CONDUIT, WIRING, SUPPORTS, INSULATION, ETC. SHALL BE DISCARDED BY THIS CONTRACTOR.

**STRUCTURAL REQUIREMENTS**

SHOULD ANY STRUCTURAL DIFFICULTIES PREVENT THE INSTALLATION OF THE DUCTWORK OR PIPING AT THE POINTS SHOWN ON THE DRAWINGS, THE NECESSARY DEVIATION THEREFROM, AS DETERMINED BY THE PROJECT ENGINEER, WILL BE PERMITTED AND SHALL BE MADE WITHOUT ADDITIONAL COST TO THE OWNER.

DO NOT CUT AND PATCH STRUCTURAL ELEMENTS IN A MANNER THAT WOULD REDUCE THE LOAD-CARRYING CAPACITY OR LOAD DEFLECTION RATIO. OBTAIN APPROVAL OF THE CUTTING AND PATCHING PROPOSAL BEFORE CUTTING AND PATCHING STRUCTURAL ELEMENTS.

**CLEARANCES**

INSTALL DUCTWORK AND/OR PIPING SYSTEMS AS REQUIRED TO PROVIDE ADEQUATE CLEARANCES AROUND ALL EQUIPMENT FOR SERVICE AND MAINTENANCE.

**PENETRATIONS**

CONTRACTOR SHALL CUT FLOOR AND WALL PENETRATIONS NEATLY AND TO THE MINIMUM SIZE REQUIRED FOR INSTALLATION OF THE EQUIPMENT AND COMPONENTS.

ALL INTERIOR AND EXTERIOR FLOOR AND WALL PENETRATIONS SHALL BE SEALED AIR AND WATER TIGHT WITH THE FIRE RATING OF THE WALL OR FLOOR MAINTAINED.

ROOF PENETRATIONS SHALL BE FLASHED AND COUNTER-FLASHED AS REQUIRED TO PREVENT AIR AND WATER LEAKS AT ALL DEVICES PROJECTING THROUGH THE ROOF. ALL PENETRATIONS AND SEALING DETAILS SHALL BE REVIEWED AND APPROVED BY THE OWNER PRIOR TO CUTTING ANY OPENINGS.

CONTRACTOR SHALL SEAL PENETRATIONS IN NON-RATED WALLS USING MATERIALS THAT MATCH THE WALL CONSTRUCTION UNLESS OTHERWISE NOTED.

**INTENT OF DOCUMENTS**

IT IS THE INTENT OF THE DOCUMENTS TO INCLUDE THE FOLLOWING IN THE SCOPE OF WORK AND BID PROPOSAL.

FURNISHING AND INSTALLATION OF ALL ITEMS INDICATED, EXCEPT THOSE ITEMS CLEARLY INDICATED AS EXISTING OR NOT IN CONTRACT (N.I.C.). PROVIDE SHALL MEAN "FURNISH" AND "INSTALL" UNLESS OTHERWISE INDICATED.

BID TO INCLUDE ALL TAXES AND PERMITS REQUIRED BY ALL GOVERNMENT AGENCIES. THE WORK WILL NOT BE DEEMED COMPLETE UNTIL A VALID PERMANENT CERTIFICATE OF OCCUPANCY IS OBTAINED.

ALL FASTENERS, HARDWARE, ACCESSORIES, TRIM, AND OTHER ITEMS REASONABLY INFERRABLE FROM THE DOCUMENTS NECESSARY TO PROVIDE A COMPLETE, FUNCTIONAL AND FINISHED INSTALLATION.

**MECHANICAL SUBMITTALS**

**SHOP DRAWINGS**

SUBMIT THE FOLLOWING PROJECT SPECIFIC ITEMS FOR APPROVAL:

- (1) PRODUCT DATA INCLUDE CATALOG ILLUSTRATIONS, MODEL, RATED CAPACITIES, PERFORMANCE, WEIGHTS, DIMENSIONS, COMPONENT SIZES, ROUGH-IN REQUIREMENTS, PIPING AND WIRING DIAGRAMS AND DETAILS, MATERIALS OF CONSTRUCTION, ACCESSORIES, OPERATING AND MAINTENANCE CLEARANCE REQUIREMENTS, WIRING DIAGRAMS SHALL BE PROJECT SPECIFIC, AND DIFFERENTIATE BETWEEN FACTORY WIRING AND FIELD WIRING. INCLUDE SHOP DRAWINGS AND FABRICATION DRAWINGS FOR EQUIPMENT INDICATING DUCT AND PIPING CONNECTIONS, POWER AND UTILITY REQUIREMENTS, RIGGING, INSTALLATION AND SUPPORT DETAILS AND INSTRUCTIONS. INCLUDE WRITTEN SEQUENCE OF OPERATIONS FOR ALL CONTROLS.
- (2) QUALITY ASSURANCE SUBMITTALS: INCLUDE FACTORY TESTING CERTIFICATES AND REPORTS, STANDARDS COMPLIANCE CERTIFICATES, FIELD START-UP AND TESTING REPORTS, CALCULATIONS (STRUCTURAL, HYDRAULIC), TRAINING PLAN AND REPORT AND OTHER ITEMS AS DESCRIBED IN PARAGRAPHS BELOW
- (3) SUBMIT ALL SUBMITTALS FOR A GIVEN SYSTEM OR COMPONENT AT THE SAME TIME.

**OPERATION AND MAINTENANCE MANUALS**

SUBMIT PROJECT SPECIFIC OPERATION AND MAINTENANCE MANUALS FOR APPROVAL:

- (1) FOR ALL EQUIPMENT AND COMPONENTS, INCLUDE INSTALLATION INSTRUCTIONS, OPERATION, MAINTENANCE AND INSPECTION DATA, SPARE AND REPLACEMENT PARTS LISTS, EXPLODED ASSEMBLY VIEWS.
- (2) FOR EQUIPMENT AND COMPONENTS, INCLUDE SUBMITTED AND APPROVED PRODUCT DATA, NAMEPLATE DATA. EXCLUDE ITEMS FOR WHICH PRODUCT DATA IS NOT REQUIRED FOR MAINTENANCE AND OPERATION OF THE SYSTEM

- (3) INCLUDE EQUIPMENT AND SYSTEM START-UP REPORTS, PERFORMANCE TESTING REPORTS.

**CONTRACT CLOSE-OUT**

SUBMIT THE FOLLOWING CONTRACT CLOSE-OUT DOCUMENTS FOR APPROVAL:

- (1) RECORD DRAWINGS, INCLUDING ALL CONCEALED PIPING AND DUCTWORK, AND DEVIATIONS TO ORIGINAL CONTRACT DOCUMENTS
- (2) WARRANTIES FOR ALL MECHANICAL EQUIPMENT, INCLUDING WARRANTY PERIODS, CONTACT PERSON AND PHONE NUMBER.

**SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION**

**GENERAL**

**SUMMARY**

THIS SECTION INCLUDES THE FOLLOWING:

- (1) DEMOLITION AND REMOVAL OF SELECTED PORTIONS OF BUILDING OR STRUCTURE.

- (2) SALVAGE OF EXISTING ITEMS TO BE REUSED OR RECYCLED. DEFINITIONS

REMOVE: DETACH ITEMS FROM EXISTING CONSTRUCTION AND LEGALLY DISPOSE OF THEM OFF-SITE, UNLESS INDICATED TO BE REMOVED AND SALVAGED OR REMOVED AND REINSTALLED.

REMOVE AND SALVAGE: WHERE INDICATED, DETACH ITEMS FROM EXISTING CONSTRUCTION AND DELIVER THEM TO OWNER.

REMOVE AND REINSTALL: DETACH ITEMS FROM EXISTING CONSTRUCTION, PREPARE THEM FOR REUSE, AND REINSTALL THEM WHERE INDICATED.

EXISTING TO REMAIN: EXISTING ITEMS OF CONSTRUCTION THAT ARE NOT TO BE REMOVED AND THAT ARE NOT OTHERWISE INDICATED TO BE REMOVED, REMOVED AND SALVAGED, OR REMOVED AND REINSTALLED.

**SUBMITTALS**

SCHEDULE OF SELECTIVE DEMOLITION ACTIVITIES: INDICATE DETAILED SEQUENCE OF SELECTIVE DEMOLITION AND REMOVAL WORK, WITH STARTING AND ENDING DATES FOR EACH ACTIVITY, INTERRUPTION OF UTILITY SERVICES, USE OF ELEVATOR AND STAIRS, AND LOCATIONS OF TEMPORARY PARTITIONS AND MEANS OF EGRESS.

PREDEMOLITION PHOTOGRAPHS OR VIDEOTAPES: SHOW EXISTING CONDITIONS OF ADJOINING CONSTRUCTION AND SITE IMPROVEMENTS, INCLUDING FINISH SURFACES, THAT MIGHT BE MISCONSTRUED AS DAMAGE CAUSED BY SELECTIVE DEMOLITION OPERATIONS. SUBMIT BEFORE WORK BEGINS.

**QUALITY ASSURANCE**

DEMOLITION FIRM QUALIFICATIONS: AN EXPERIENCED FIRM THAT HAS SPECIALIZED IN DEMOLITION WORK SIMILAR IN MATERIAL AND EXTENT TO THAT INDICATED FOR THIS PROJECT.

REFRIGERANT RECOVERY TECHNICIAN QUALIFICATIONS: CERTIFIED BY AN EPA-APPROVED CERTIFICATION PROGRAM.

REGULATORY REQUIREMENTS: COMPLY WITH GOVERNING EPA NOTIFICATION REGULATIONS BEFORE BEGINNING SELECTIVE DEMOLITION. COMPLY WITH HAULING AND DISPOSAL REGULATIONS OF AUTHORITIES HAVING JURISDICTION.

STANDARDS: COMPLY WITH ANSI A10.6 AND NFPA 241.

**PROJECT CONDITIONS**

OWNER WILL OCCUPY PORTIONS OF BUILDING IMMEDIATELY ADJACENT TO SELECTIVE DEMOLITION AREA. CONDUCT SELECTIVE DEMOLITION SO OWNER'S OPERATIONS WILL NOT BE DISRUPTED.

CONDITIONS EXISTING AT TIME OF INSPECTION FOR BIDDING PURPOSE WILL BE MAINTAINED BY OWNER AS FAR AS PRACTICAL.

NOTIFY ARCHITECT/ENGINEER/PROJECT MANAGER OF DISCREPANCIES BETWEEN EXISTING CONDITIONS AND DRAWINGS BEFORE PROCEEDING WITH SELECTIVE DEMOLITION.

HAZARDOUS MATERIALS: IT IS NOT EXPECTED THAT HAZARDOUS MATERIALS WILL BE ENCOUNTERED IN THE WORK.

- (1) IF MATERIALS SUSPECTED OF CONTAINING HAZARDOUS MATERIALS ARE ENCOUNTERED, DO NOT DISTURB; IMMEDIATELY NOTIFY ARCHITECT/ENGINEER/PROJECT MANAGER AND OWNER.

STORAGE OR SALE OF REMOVED ITEMS OR MATERIALS ON-SITE IS NOT PERMITTED.

UTILITY SERVICE: MAINTAIN EXISTING UTILITIES INDICATED TO REMAIN IN SERVICE AND PROTECT THEM AGAINST DAMAGE DURING SELECTIVE DEMOLITION OPERATIONS.

- (1) MAINTAIN FIRE-PROTECTION FACILITIES IN SERVICE DURING SELECTIVE DEMOLITION OPERATIONS.

**WARRANTY**

EXISTING WARRANTIES: REMOVE, REPLACE, PATCH, AND REPAIR MATERIALS AND SURFACES CUT OR DAMAGED DURING SELECTIVE DEMOLITION, BY METHODS AND WITH MATERIALS SO AS NOT TO VOID EXISTING WARRANTIES.

**PRODUCTS (NOT USED)**

**EXECUTION**

**EXAMINATION**

VERIFY THAT UTILITIES HAVE BEEN DISCONNECTED AND CAPPED.

SURVEY EXISTING CONDITIONS AND CORRELATE WITH REQUIREMENTS INDICATED TO DETERMINE EXTENT OF SELECTIVE DEMOLITION REQUIRED.

INVENTORY AND RECORD THE CONDITION OF ITEMS TO BE REMOVED AND REINSTALLED AND ITEMS TO BE REMOVED AND SALVAGED.

WHEN UNANTICIPATED MECHANICAL, ELECTRICAL, OR STRUCTURAL ELEMENTS THAT CONFLICT WITH INTENDED FUNCTION OR DESIGN ARE ENCOUNTERED, INVESTIGATE AND MEASURE THE NATURE AND EXTENT OF CONFLICT. PROMPTLY SUBMIT A WRITTEN REPORT TO ARCHITECT/ENGINEER/PROJECT MANAGER.

ENGAGE A PROFESSIONAL ENGINEER TO SURVEY CONDITION OF BUILDING TO DETERMINE WHETHER REMOVING ANY ELEMENT MIGHT RESULT IN STRUCTURAL DEFICIENCY OR UNPLANNED COLLAPSE OF ANY PORTION OF STRUCTURE OR ADJACENT STRUCTURES DURING SELECTIVE DEMOLITION OPERATIONS.

PERFORM SURVEYS AS THE WORK PROGRESSES TO DETECT HAZARDS RESULTING FROM SELECTIVE DEMOLITION ACTIVITIES.

**UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

EXISTING SERVICES/SYSTEMS: MAINTAIN SERVICES/SYSTEMS INDICATED TO REMAIN AND PROTECT THEM AGAINST DAMAGE DURING SELECTIVE DEMOLITION OPERATIONS.

SERVICES/SYSTEM REQUIREMENTS: LOCATE, IDENTIFY, DISCONNECT, AND SEAL OR CAP OFF INDICATED UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS SERVING AREAS TO BE SELECTIVELY DEMOLISHED.

- (1) ARRANGE TO SHUT OFF INDICATED UTILITIES WITH UTILITY COMPANIES.

- (2) IF SERVICES/SYSTEMS ARE REQUIRED TO BE REMOVED, RELOCATED, OR ABANDONED, BEFORE PROCEEDING WITH SELECTIVE DEMOLITION PROVIDE TEMPORARY SERVICES/SYSTEMS THAT BYPASS AREA OF SELECTIVE DEMOLITION AND THAT MAINTAIN CONTINUITY OF SERVICES/SYSTEMS TO OTHER PARTS OF BUILDING.

- (3) CUT OFF PIPE OR CONDUIT IN WALLS OR PARTITIONS TO BE REMOVED. CAP, VALVE, OR PLUG AND SEAL REMAINING PORTION OF PIPE OR CONDUIT AFTER BYPASSING.

**PREPARATION**

SITE ACCESS AND TEMPORARY CONTROLS: CONDUCT SELECTIVE DEMOLITION AND DEBRIS-REMOVAL OPERATIONS TO ENSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, WALKS, WALKWAYS, AND OTHER ADJACENT OCCUPIED AND USED FACILITIES.

TEMPORARY FACILITIES: PROVIDE TEMPORARY BARRICADES AND OTHER PROTECTION REQUIRED TO PREVENT INJURY TO PEOPLE AND DAMAGE TO ADJACENT BUILDINGS AND FACILITIES TO REMAIN.

TEMPORARY SHORING: PROVIDE AND MAINTAIN SHORING, BRACING, AND STRUCTURAL SUPPORTS AS REQUIRED TO PRESERVE STABILITY AND PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF CONSTRUCTION AND FINISHES TO REMAIN, AND TO PREVENT UNEXPECTED OR UNCONTROLLED MOVEMENT OR COLLAPSE OF CONSTRUCTION BEING DEMOLISHED.

**SELECTIVE DEMOLITION**

GENERAL: DEMOLISH AND REMOVE EXISTING CONSTRUCTION ONLY TO THE EXTENT REQUIRED BY NEW CONSTRUCTION AND AS INDICATED. USE METHODS REQUIRED TO COMPLETE THE WORK WITHIN LIMITATIONS OF GOVERNING REGULATIONS AND AS FOLLOWS:

- (1) NEATLY CUT OPENINGS AND HOLES PLUMB, SQUARE, AND TRUE TO DIMENSIONS REQUIRED. USE CUTTING METHODS LEAST LIKELY TO DAMAGE CONSTRUCTION TO REMAIN OR ADJOINING CONSTRUCTION. USE HAND TOOLS OR SMALL POWER TOOLS DESIGNED FOR SAWING OR GRINDING, NOT HAMMERING AND CHOPPING, TO MINIMIZE DISTURBANCE OF ADJACENT SURFACES. TEMPORARILY COVER OPENINGS TO REMAIN.

- (2) CUT OR DRILL FROM THE EXPOSED OR FINISHED SIDE INTO CONCEALED SURFACES TO AVOID MARRING EXISTING FINISHED SURFACES.

- (3) DO NOT USE CUTTING TORCHES UNTIL WORK AREA IS CLEARED OF FLAMMABLE MATERIALS. AT CONCEALED SPACES, SUCH AS DUCT AND PIPE INTERIORS, VERIFY CONDITION AND CONTENTS OF HIDDEN SPACE BEFORE STARTING FLAME-CUTTING OPERATIONS. MAINTAIN FIRE WATCH AND PORTABLE FIRE-SUPPRESSION DEVICES DURING FLAME-CUTTING OPERATIONS.

- (4) LOCATE SELECTIVE DEMOLITION EQUIPMENT AND REMOVE DEBRIS AND MATERIALS, FLOORS, OR FRAMING.

- (5) DISPOSE OF DEMOLISHED ITEMS AND MATERIALS PROMPTLY.

REMOVED AND SALVAGED ITEMS (IF AND WHERE INDICATED):

- (1) CLEAN SALVAGED ITEMS.
- (2) PACK OR CRATE ITEMS AFTER CLEANING. IDENTIFY CONTENTS OF CONTAINERS.
- (3) STORE ITEMS IN A SECURE AREA UNTIL DELIVERY TO OWNER.
- (4) TRANSPORT ITEMS TO OWNER'S STORAGE AREA ON-SITE.
- (5) PROTECT ITEMS FROM DAMAGE DURING TRANSPORT AND STORAGE.

REMOVED AND REINSTALLED ITEMS (IF AND WHERE INDICATED):

- (1) CLEAN AND REPAIR ITEMS TO FUNCTIONAL CONDITION ADEQUATE FOR INTENDED REUSE. PAINT EQUIPMENT TO MATCH NEW EQUIPMENT.
- (2) PACK OR CRATE ITEMS AFTER CLEANING AND REPAIRING. IDENTIFY CONTENTS OF CONTAINERS.
- (3) PROTECT ITEMS FROM DAMAGE DURING TRANSPORT AND STORAGE.

- (4) REINSTALL ITEMS IN LOCATIONS INDICATED. COMPLY WITH INSTALLATION REQUIREMENTS FOR NEW MATERIALS AND EQUIPMENT. PROVIDE CONNECTIONS, SUPPORTS, AND MISCELLANEOUS MATERIALS NECESSARY TO MAKE ITEM FUNCTIONAL FOR USE INDICATED.

EXISTING ITEMS TO REMAIN: PROTECT CONSTRUCTION INDICATED TO REMAIN AGAINST DAMAGE AND SOILING DURING SELECTIVE DEMOLITION. WHEN PERMITTED BY ARCHITECT/ENGINEER/PROJECT MANAGER, ITEMS MAY BE REMOVED TO A SUITABLE, PROTECTED STORAGE LOCATION DURING SELECTIVE DEMOLITION AND CLEANED AND REINSTALLED IN THEIR ORIGINAL LOCATIONS AFTER SELECTIVE DEMOLITION OPERATIONS ARE COMPLETE.

**DISPOSAL OF DEMOLISHED MATERIALS**

GENERAL: EXCEPT FOR ITEMS OR MATERIALS INDICATED TO BE REUSED, SALVAGED, REINSTALLED, OR OTHERWISE INDICATED TO REMAIN OWNER'S PROPERTY, REMOVE DEMOLISHED MATERIALS FROM PROJECT SITE AND LEGALLY DISPOSE OF THEM IN AN EPA-APPROVED LANDFILL.

BURNING: DO NOT BURN DEMOLISHED MATERIALS.

DISPOSAL: TRANSPORT DEMOLISHED MATERIALS OFF OWNER'S PROPERTY AND LEGALLY DISPOSE OF THEM.

**CLEANING**

CLEAN ADJACENT STRUCTURES AND IMPROVEMENTS OF DUST, DIRT, AND DEBRIS CAUSED BY SELECTIVE DEMOLITION OPERATIONS. RETURN ADJACENT AREAS TO CONDITION EXISTING BEFORE SELECTIVE DEMOLITION OPERATIONS BEGAN.

END OF SECTION 024119

**SECTION 03 30 00 - CAST-IN-PLACE CONCRETE**

**GENERAL**

**SUMMARY**

THIS SECTION SPECIFIES CAST-IN PLACE CONCRETE, INCLUDING FORMWORK, REINFORCEMENT, CONCRETE MATERIALS, MIXTURE DESIGN, PLACEMENT PROCEDURES, AND FINISHES.

**SUBMITTALS**

PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

DESIGN MIXTURES: FOR EACH CONCRETE MIXTURE.

SHOP DRAWINGS: FOR STEEL REINFORCEMENT FORMWORK.

**QUALITY ASSURANCE**

MANUFACTURER QUALIFICATIONS: A FIRM EXPERIENCED IN MANUFACTURING READY-MIXED CONCRETE PRODUCTS AND THAT COMPLIES WITH ASTM C 94/C 94M REQUIREMENTS FOR PRODUCTION FACILITIES AND EQUIPMENT.

- (1) MANUFACTURER CERTIFIED ACCORDING TO NRMCA'S "CERTIFICATION OF READY MIXED CONCRETE PRODUCTION FACILITIES."

ACI PUBLICATIONS: COMPLY WITH THE FOLLOWING UNLESS MODIFIED BY REQUIREMENTS IN THE CONTRACT DOCUMENTS:

- (1) ACI 301, "SPECIFICATION FOR STRUCTURAL CONCRETE," SECTIONS 1 THROUGH 5 AND SECTION 7, "LIGHTWEIGHT CONCRETE."

- (2) ACI 117, "SPECIFICATIONS FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS."

PREINSTALLATION CONFERENCE: CONDUCT CONFERENCE AT PROJECT SITE.

**FORM-FACING MATERIALS**

SMOOTH-FORMED FINISHED CONCRETE: FORM-FACING PANELS THAT WILL PROVIDE CONTINUOUS, TRUE, AND SMOOTH CONCRETE SURFACES. FURNISH IN LARGEST PRACTICABLE SIZES TO MINIMIZE NUMBER OF JOINTS.

**STEEL REINFORCEMENT**

REINFORCING BARS: ASTM A 615/A 615M, GRADE 60, DEFORMED.

- (1) GALVANIZED REINFORCING BARS: ASTM A 787/A 787M, CLASS I ZINC COATED AFTER FABRICATION AND BENDING.

GALVANIZED-STEEL WELDED WIRE REINFORCEMENT: ASTM A 185, PLAIN, FABRICATED FROM GALVANIZED STEEL WIRE INTO FLAT SHEETS.

BAR SUPPORTS: BOLSTERS, CHAIRS, SPACERS, AND OTHER DEVICES FOR SPACING, SUPPORTING, AND FASTENING REINFORCING BARS AND WELDED WIRE REINFORCEMENT IN PLACE. MANUFACTURE BAR SUPPORTS FROM STEEL WIRE, PLASTIC, OR PRECAST CONCRETE ACCORDING TO CRSI'S "MANUAL OF STANDARD PRACTICE."

**CONCRETE MATERIALS**

CEMENTITIOUS MATERIAL: USE THE FOLLOWING CEMENTITIOUS MATERIALS, OF THE SAME TYPE, BRAND, AND SOURCE, THROUGHOUT PROJECT:

- (1) PORTLAND CEMENT: ASTM C 150, TYPE I OR III, SUPPLEMENT WITH THE FOLLOWING:

- a. FLY ASH: ASTM C 618, CLASS C OR F.

- (1) LIGHTWEIGHT AGGREGATE: ASTM C 330, 1/2-INCH NOMINAL MAXIMUM AGGREGATE SIZE.

WATER: ASTM C 94/C 94M AND POTABLE.

AIR-ENTRAINING ADMIXTURE: ASTM C 260.

CHEMICAL ADMIXTURES: PROVIDE ADMIXTURES CERTIFIED BY MANUFACTURER TO BE COMPATIBLE WITH OTHER ADMIXTURES AND THAT WILL NOT CONTRIBUTE WATER-SOLUBLE CHLORIDE IONS EXCEEDING THOSE PERMITTED IN HARDENED CONCRETE. DO NOT USE CALCIUM CHLORIDE OR ADMIXTURES CONTAINING CALCIUM CHLORIDE.

- (1) WATER-REDUCING ADMIXTURE: ASTM C 494/C 494M, TYPE A.
- (2) RETARDING ADMIXTURE: ASTM C 494/C 494M, TYPE B.

- (3) WATER-REDUCING AND RETARDING ADMIXTURE: ASTM C 494/C 494M, TYPE D.

- (4) HIGH-RANGE, WATER-REDUCING ADMIXTURE: ASTM C 494/C 494M, TYPE F.

- (5) HIGH-RANGE, WATER-REDUCING AND RETARDING ADMIXTURE: ASTM C 494/C 494M, TYPE G.

- (6) PLASTICIZING AND RETARDING ADMIXTURE: ASTM C 1017/C 1017M, TYPE II.

**CURING MATERIALS**

EVAPORATION RETARDER: WATERBORNE, MONOMOLECULAR FILM FORMING, MANUFACTURED FOR APPLICATION TO FRESH CONCRETE.

ABSORPTIVE COVER: AASHTO M 182, CLASS 2, BURLAP CLOTH MADE FROM JUTE OR KENAF, WEIGHING APPROXIMATELY 9 OZ./SQ. YD. WHEN DRY.

MOISTURE-RETAINING COVER: ASTM C 171, POLYETHYLENE FILM OR WHITE BURLAP-POLYETHYLENE SHEET.

WATER: POTABLE.

**RELATED MATERIALS**

EXPANSION-AND ISOLATION-JOINT-FILLERSTRIPS: ASTM D 1751.

ASPHALT-SATURATED CELLULOSIC FIBER.

**CONCRETE MIXTURES**

PREPARE DESIGN MIXTURES FOR EACH TYPE AND STRENGTH OF CONCRETE, PROPORTIONED ON THE BASIS OF LABORATORY TRIAL MIXTURE OR FIELD TEST DATA, OR BOTH, ACCORDING TO ACI 301.

PROPORTION NORMAL-WEIGHT CONCRETE MIXTURE AS FOLLOWS:

- (1) MINIMUM COMPRESSIVE STRENGTH: 3500 PSI AT 28 DAYS.

- (2) SLUMP LIMIT: 4 INCHES

**FABRICATING REINFORCEMENT**

FABRICATE STEEL REINFORCEMENT ACCORDING TO CRSI'S "MANUAL OF STANDARD PRACTICE."

**CONCRETE MIXING**

READY-MIXED CONCRETE: MEASURE, BATCH, MIX, AND DELIVER CONCRETE ACCORDING TO ASTM C 94/C 94M, AND FURNISH BATCH TICKET INFORMATION.

- (1) WHEN AIR TEMPERATURE IS BETWEEN 85 AND 90 DEG F, REDUCE MIXING AND DELIVERY TIME FROM 1-1/2 HOURS TO 75 MINUTES; WHEN AIR TEMPERATURE IS ABOVE 90 DEG F, REDUCE MIXING AND DELIVERY TIME TO 60 MINUTES.

**FORMWORK**

DESIGN, ERECT, SHORE, BRACE, AND MAINTAIN FORMWORK ACCORDING TO ACI 301 TO SUPPORT VERTICAL, LATERAL, STATIC, AND DYNAMIC LOADS, AND CONSTRUCTION LOADS THAT MIGHT BE APPLIED, UNTIL STRUCTURE CAN SUPPORT SUCH LOADS.

CONSTRUCT FORMWORK SO CONCRETE MEMBERS AND STRUCTURES ARE OF SIZE, SHAPE, ALIGNMENT, ELEVATION, AND POSITION INDICATED, WITHIN TOLERANCE LIMITS OF ACI 117.

RADIUS EXTERIOR CORNERS AND EDGES OF PERMANENTLY EXPOSED CONCRETE.

**EMBEDDED ITEMS**

PLACE AND SECURE ANCHORAGE DEVICES AND OTHER EMBEDDED ITEMS REQUIRED FOR ADJOINING WORK THAT IS ATTACHED TO OR SUPPORTED BY CAST-IN-PLACE CONCRETE. USE SETTING DRAWINGS, TEMPLATES, DIAGRAMS, INSTRUCTIONS, AND DIRECTIONS FURNISHED WITH ITEMS TO BE EMBEDDED.

**STEEL REINFORCEMENT**

GENERAL: COMPLY WITH CRSI'S "MANUAL OF STANDARD PRACTICE" FOR PLACING REINFORCEMENT.

**JOINTS**

GENERAL: CONSTRUCT JOINTS TRUE TO LINE WITH FACES PERPENDICULAR TO SURFACE PLANE OF CONCRETE.

CONSTRUCTION AND CONTRACTION JOINTS: INSTALL SO STRENGTH AND APPEARANCE OF CONCRETE ARE NOT IMPAIRED, AT LOCATIONS INDICATED OR AS APPROVED BY ARCHITECT.

CONTRACTION JOINTS: FORM WEAKENED-PLANE CONTRACTION JOINTS, SECTIONING CONCRETE INTO AREAS AS INDICATED OR AS APPROVED BY ARCHITECT. CONSTRUCT CONTRACTION JOINTS FOR A DEPTH EQUAL TO AT LEAST ONE-FOURTH OF CONCRETE THICKNESS AS FOLLOWS:

- (1) GROOVED JOINTS: FORM CONTRACTION JOINTS AFTER INITIAL FLOATING BY GROOVING AND FINISHING EACH EDGE OF JOINT TO A RADIUS OF 1/8 INCH. REPEAT GROOVING OF CONTRACTION JOINTS AFTER APPLYING SURFACE FINISHES. ELIMINATE GROOVER TOOL MARKS ON CONCRETE SURFACES.

**CONCRETE PLACEMENT**

BEFORE PLACING CONCRETE, VERIFY THAT INSTALLATION OF FORMWORK, REINFORCEMENT, AND EMBEDDED ITEMS IS COMPLETE AND THAT REQUIRED INSPECTIONS HAVE BEEN PERFORMED.

DEPOSIT CONCRETE CONTINUOUSLY IN ONE LAYER OR IN HORIZONTAL LAYERS OF SUCH THICKNESS THAT NO NEW CONCRETE WILL BE PLACED ON CONCRETE THAT HAS HARDENED ENOUGH TO CAUSE SEAMS OR PLANES OF WEAKNESS. IF A SECTION CANNOT BE PLACED CONTINUOUSLY, PROVIDE CONTRACTION JOINTS AS INDICATED OR AS APPROVED BY ARCHITECT. DEPOSIT CONCRETE TO AVOID SEGREGATION.

- (1) CONSOLIDATE PLACED CONCRETE WITH MECHANICAL VIBRATING EQUIPMENT ACCORDING TO ACI 301.

HOT-WEATHER PLACEMENT: COMPLY WITH ACI 301.

**FINISHING FORMED SURFACES**



SECTION 092216 - NON-STRUCTURAL METAL FRAMING

GENERAL SUMMARY

THIS SECTION INCLUDES NON-LOAD-BEARING STEEL FRAMING MEMBERS FOR THE FOLLOWING APPLICATIONS:

- (1) INTERIOR FRAMING SYSTEMS (E.G., SUPPORTS FOR PARTITION WALLS, FRAMED SOFFITS, FURRING, ETC.)

SUBMITTALS

PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

QUALITY ASSURANCE

FIRE-TEST-RESPONSE CHARACTERISTICS: FOR FIRE-RESISTANCE-RATED ASSEMBLIES THAT INCORPORATE NON-LOAD-BEARING STEEL FRAMING, PROVIDE MATERIALS AND CONSTRUCTION IDENTICAL TO THOSE TESTED IN ASSEMBLY INDICATED ACCORDING TO ASTM E 119 BY AN INDEPENDENT TESTING AGENCY.

SOUND TRANSMISSION CHARACTERISTICS: FOR STC-RATED ASSEMBLIES THAT INCORPORATE NON-LOAD-BEARING STEEL FRAMING, 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.

PRODUCTS

NON-LOAD-BEARING STEEL FRAMING, GENERAL

FRAMING MEMBERS, GENERAL: COMPLY WITH ASTM C 754 FOR CONDITIONS INDICATED.

- (1) STEEL SHEET COMPONENTS: COMPLY WITH ASTM C 645 REQUIREMENTS FOR METAL, UNLESS OTHERWISE INDICATED.

STEEL FRAMING FOR FRAMED ASSEMBLIES

STEEL STUDS AND RUNNERS: ASTM C 645

- (1) MINIMUM BASE-METAL THICKNESS: 20 GAUGE, 0.0320 INCH.

SLIP-TYPE HEAD JOINTS: PROVIDE ONE OF THE FOLLOWING:

- (1) SINGLE LONG-LEG RUNNER SYSTEM: ASTM C 645 TOP RUNNER WITH 2-INCH-DEEP FLANGES IN THICKNESS NOT LESS THAN INDICATED FOR STUDS, INSTALLED WITH STUDS FRICTION FIT INTO TOP RUNNER AND WITH CONTINUOUS BRIDGING LOCATED WITHIN 12 INCHES OF THE TOP OF STUDS TO PROVIDE LATERAL BRACING.
(2) DOUBLE-RUNNER SYSTEM: ASTM C 645 TOP RUNNERS, INSIDE RUNNER WITH 2-INCH-DEEP FLANGES IN THICKNESS NOT LESS THAN INDICATED FOR STUDS AND FASTENED TO STUDS, AND OUTER RUNNER SIZED TO FRICTION FIT INSIDE RUNNER.
(3) DEFLECTION TRACK: STEEL SHEET TOP RUNNER MANUFACTURED TO PREVENT CRACKING OF FINISHES APPLIED TO INTERIOR PARTITION FRAMING RESULTING FROM DEFLECTION OF STRUCTURE ABOVE; IN THICKNESS NOT LESS THAN INDICATED FOR STUDS AND IN WIDTH TO ACCOMMODATE DEPTH OF STUDS.

FLAT STRAP AND BACKING PLATE: STEEL SHEET FOR BLOCKING AND BRACING IN LENGTH AND WIDTH INDICATED.

- (1) MINIMUM BASE-METAL THICKNESS: MATCH METAL STUD THICKNESS, MINIMUM.

AUXILIARY MATERIALS

FASTENERS FOR METAL FRAMING: OF TYPE, MATERIAL, SIZE, CORROSION RESISTANCE, HOLDING POWER, AND OTHER PROPERTIES REQUIRED TO FASTEN STEEL MEMBERS TO SUBSTRATES.

EXECUTION

INSTALLATION, GENERAL

INSTALLATION STANDARD: ASTM C 754.

- (1) GYPSUM BOARD ASSEMBLIES: ALSO COMPLY WITH REQUIREMENTS IN ASTM C 840 THAT APPLY TO FRAMING INSTALLATION.

INSTALLING FRAMED ASSEMBLIES

WHERE STUDS ARE INSTALLED DIRECTLY AGAINST EXTERIOR MASONRY WALLS OR DISSIMILAR METALS AT EXTERIOR WALLS, INSTALL ISOLATION STRIP BETWEEN STUDS AND EXTERIOR WALL.

INSTALL TRACKS (RUNNERS) AT FLOORS AND OVERHEAD SUPPORTS. EXTEND FRAMING FULL HEIGHT TO STRUCTURAL SUPPORTS OR SUBSTRATES ABOVE SUSPENDED CEILINGS. CONTINUE FRAMING AROUND DUCTS PENETRATING PARTITIONS ABOVE CEILING.

- (1) SLIP-TYPE HEAD JOINTS: WHERE FRAMING EXTENDS TO OVERHEAD STRUCTURAL SUPPORTS, INSTALL TO PRODUCE JOINTS AT TOPS OF FRAMING SYSTEMS THAT PREVENT AXIAL LOADING OF FINISHED ASSEMBLIES.
(2) DOOR OPENINGS: SCREW VERTICAL STUDS AT JAMBS TO JAMB ANCHOR CLIPS ON DOOR FRAMES; INSTALL RUNNER TRACK SECTION (FOR CRIPPLE STUDS) AT HEAD AND SECURE TO JAMB STUDS.
a. INSTALL TWO STUDS AT EACH JAMB, UNLESS OTHERWISE INDICATED.
b. INSTALL CRIPPLE STUDS AT HEAD ADJACENT TO EACH JAMB STUD, WITH A MINIMUM 1/2-INCH CLEARANCE FROM JAMB STUD TO ALLOW FOR INSTALLATION OF CONTROL JOINT IN FINISHED ASSEMBLY.
c. EXTEND JAMB STUDS THROUGH SUSPENDED CEILINGS AND ATTACH TO UNDERSIDE OF OVERHEAD STRUCTURE.
(3) OTHER FRAMED OPENINGS: FRAME OPENINGS OTHER THAN DOOR OPENINGS THE SAME AS REQUIRED FOR DOOR OPENINGS, UNLESS OTHERWISE INDICATED. INSTALL FRAMING BELOW SILLS OF OPENINGS TO MATCH FRAMING REQUIRED ABOVE DOOR HEADS.
(4) FIRE-RESISTANCE-RATED PARTITIONS (IF AND WHERE INDICATED): INSTALL FRAMING TO COMPLY WITH FIRE-RESISTANCE-RATED ASSEMBLY INDICATED AND SUPPORT CLOSURES AND TO MAKE PARTITIONS CONTINUOUS FROM FLOOR TO UNDERSIDE OF SOLID STRUCTURE.
a. FIRESTOP TRACK: WHERE INDICATED, INSTALL TO MAINTAIN CONTINUITY OF FIRE-RESISTANCE-RATED ASSEMBLY INDICATED.
(5) CURVED PARTITIONS:
a. BEND TRACK TO UNIFORM CURVE AND LOCATE STRAIGHT LENGTHS SO THEY ARE TANGENT TO ARCS.
b. BEGIN AND END EACH ARC WITH A STUD, AND SPACE INTERMEDIATE STUDS EQUALLY ALONG ARCS.

INSTALLATION TOLERANCE: INSTALL EACH FRAMING MEMBER SO FASTENING SURFACES VARY NOT MORE THAN 1/8 INCH FROM THE PLANE FORMED BY FACES OF ADJACENT FRAMING.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

GENERAL SUMMARY

THIS SECTION INCLUDES THE FOLLOWING:

- (1) INTERIOR GYPSUM BOARD.

SUBMITTALS

PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

SAMPLES: FOR THE FOLLOWING PRODUCTS:

- (1) TRIM ACCESSORIES: FULL-SIZE SAMPLE IN 12-INCH- LONG LENGTH FOR EACH TRIM ACCESSORY INDICATED.

QUALITY ASSURANCE

FIRE-RESISTANCE-RATED ASSEMBLIES (IF AND WHERE INDICATED): 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.

PRODUCTS

INTERIOR GYPSUM BOARD

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) MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
a. AMERICAN GYPSUM CO.
b. LAFARGE NORTH AMERICA INC.
c. NATIONAL GYPSUM COMPANY.
d. USG CORPORATION.

REGULAR TYPE:

- (1) THICKNESS: 5/8 INCH.
(2) LONG EDGES: TAPERED.

TYPE X (IF AND WHERE INDICATED OR REQUIRED TO MEET FIRE-RESISTANCE RATINGS):

- (1) THICKNESS: 5/8 INCH
(2) LONG EDGES: TAPERED.

TRIM ACCESSORIES

INTERIOR TRIM: ASTM C 1047.

- (1) MATERIAL: GALVANIZED OR ALUMINUM-COATED STEEL SHEET.
(2) SHAPES:
a. CORNERBEAD.

JOINT TREATMENT MATERIALS

GENERAL: COMPLY WITH ASTM C 475/C 475M.

JOINT TAPE:

- (1) INTERIOR GYPSUM WALLBOARD: PAPER.

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 DRYING-TYPE, ALL-PURPOSE COMPOUND.

- (3) FILL COAT: FOR SECOND COAT, USE DRYING-TYPE, ALL-PURPOSE COMPOUND.

- (4) FINISH COAT: FOR THIRD COAT, USE DRYING-TYPE, ALL-PURPOSE COMPOUND.

AUXILIARY MATERIALS

GENERAL: PROVIDE AUXILIARY MATERIALS THAT COMPLY WITH REFERENCED INSTALLATION STANDARDS AND MANUFACTURER'S WRITTEN RECOMMENDATIONS.

STEEL DRILL SCREWS: ASTM C 1002, UNLESS OTHERWISE INDICATED.

- (1) USE SCREWS COMPLYING WITH ASTM C 954 FOR FASTENING PANELS TO STEEL MEMBERS FROM 0.033 TO 0.112 INCH THICK.

SOUND ATTENUATION BLANKETS: ASTM C 665, TYPE I (BLANKETS WITHOUT MEMBRANE FACING) PRODUCED BY COMBINING THERMOSETTING RESINS WITH MINERAL FIBERS MANUFACTURED FROM GLASS, SLAG WOOL, OR ROCK WOOL, MINIMUM 3" THICKNESS.

- (1) FIRE-RESISTANCE-RATED ASSEMBLIES: COMPLY WITH MINERAL-FIBER REQUIREMENTS OF ASSEMBLY.

EXECUTION

APPLYING AND FINISHING PANELS, GENERAL

COMPLY WITH ASTM C 840.

EXAMINE PANELS BEFORE INSTALLATION. REJECT PANELS THAT ARE WET, MOISTURE DAMAGED, AND MOLD DAMAGED.

APPLYING INTERIOR GYPSUM BOARD

INSTALL INTERIOR GYPSUM BOARD IN THE FOLLOWING LOCATIONS:

- (1) REGULAR TYPE: VERTICAL SURFACES, UNLESS OTHERWISE INDICATED.
(2) TYPE X: WHERE REQUIRED FOR FIRE-RESISTANCE-RATED ASSEMBLY

INSTALLING TRIM ACCESSORIES

GENERAL: FOR TRIM WITH BACK FLANGES INTENDED FOR FASTENERS, ATTACH TO FRAMING WITH SAME FASTENERS USED FOR PANELS. OTHERWISE, ATTACH TRIM ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.

CONTROL JOINTS: INSTALL CONTROL JOINTS ACCORDING TO ASTM C 840 AND IN SPECIFIC LOCATIONS APPROVED BY ARCHITECT FOR VISUAL EFFECT.

INTERIOR TRIM: INSTALL IN THE FOLLOWING LOCATIONS:

- (1) CORNERBEAD: USE AT OUTSIDE CORNERS UNLESS OTHERWISE INDICATED.

FINISHING GYPSUM BOARD

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.

PREFILL OPEN JOINTS, ROUNDED OR BEVELED EDGES, AND DAMAGED SURFACE AREAS.

APPLY JOINT TAPE OVER GYPSUM BOARD JOINTS, EXCEPT THOSE WITH TRIM HAVING FLANGES NOT INTENDED FOR TAPE.

GYPSUM BOARD FINISH LEVELS: FINISH PANELS TO LEVELS INDICATED BELOW:

- (1) LEVEL 1: CEILING PLENUM AREAS, CONCEALED AREAS, AND WHERE INDICATED.
(2) LEVEL 4: AT PANEL SURFACES THAT WILL BE EXPOSED TO VIEW
a. PRIMER AND ITS APPLICATION TO SURFACES ARE SPECIFIED IN OTHER DIVISION 09 SECTIONS.

PROTECTION

PROTECT INSTALLED PRODUCTS FROM DAMAGE FROM WEATHER, CONDENSATION, DIRECT SUNLIGHT, CONSTRUCTION, AND OTHER CAUSES DURING REMAINDER OF THE CONSTRUCTION PERIOD.

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 092900

SECTION 09513 - RESILIENT BASE AND ACCESSORIES

GENERAL SUMMARY

SECTION INCLUDES:

- (1) RESILIENT BASE.

SUBMITTALS

PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

SAMPLES: FOR EACH TYPE OF PRODUCT INDICATED, IN MANUFACTURER'S STANDARD-SIZE SAMPLES BUT NOT LESS THAN 12 INCHES LONG, OF EACH RESILIENT PRODUCT COLOR, TEXTURE, AND PATTERN REQUIRED.

QUALITY ASSURANCE

FIRE-TEST-RESPONSE CHARACTERISTICS: AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO ASTM E 648 OR NFPA 253 BY A QUALIFIED TESTING AGENCY.

- (1) CRITICAL RADIANT FLUX CLASSIFICATION: CLASS I, NOT LESS THAN 0.45 W/SQ. CM.

PROJECT CONDITIONS

MAINTAIN AMBIENT TEMPERATURES WITHIN RANGE RECOMMENDED BY MANUFACTURER IN SPACES TO RECEIVE RESILIENT PRODUCTS.

UNTIL SUBSTANTIAL COMPLETION, MAINTAIN AMBIENT TEMPERATURES WITHIN RANGE RECOMMENDED BY MANUFACTURER.

INSTALL RESILIENT PRODUCTS AFTER OTHER FINISHING OPERATIONS, INCLUDING PAINTING, HAVE BEEN COMPLETED.

PRODUCTS

RESILIENT BASE

- (1) MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
a. ARMSTRONG WORLD INDUSTRIES, INC.
b. BURKE MERCER FLOORING PRODUCTS; DIVISION OF BURKE INDUSTRIES, INC.
c. ENDURA RUBBER FLOORING; DIVISION OF BURKE INDUSTRIES, INC.
d. FLEXCO, INC.
e. JOHNSONITE.
f. MUSSON, R. C. RUBBER CO.
g. NORA RUBBER FLOORING; FREUDENBERG BUILDING SYSTEMS, INC.
h. ROPPE CORPORATION, USA.

RESILIENT BASE STANDARD: ASTM F 1661.

- (1) MATERIAL REQUIREMENT: MATERIAL TO MATCH EXISTING

- (2) STYLE: STYLE TO MATCH EXISTING.

MINIMUM THICKNESS: MATCH THICKNESS OF EXISTING.

HEIGHT: MATCH HEIGHT OF EXISTING.

OUTSIDE CORNERS: JOB FORMED OR PREFORMED.

INSIDE CORNERS: JOB FORMED OR PREFORMED.

FINISH: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE TO MATCH EXISTING.

COLORS AND PATTERNS: AS SELECTED BY ARCHITECT FROM FULL RANGE OF INDUSTRY COLORS TO MATCH EXISTING.

INSTALLATION MATERIALS

TROWELABLE LEVELING AND PATCHING COMPOUNDS: LATEX-MODIFIED, PORTLAND CEMENT BASED OR BLENDING HYDRAULIC-CEMENT-BASED FORMULATION PROVIDED OR APPROVED BY MANUFACTURER FOR APPLICATIONS INDICATED.

ADHESIVES: WATER-RESISTANT TYPE RECOMMENDED BY MANUFACTURER TO SUIT RESILIENT PRODUCTS AND SUBSTRATE CONDITIONS INDICATED.

- (1) USE ADHESIVES THAT COMPLY WITH THE FOLLOWING LIMITS FOR VOC CONTENT WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24):
a. COVE BASE ADHESIVES: NOT MORE THAN 50 GL.

EXECUTION PREPARATION

PREPARE SUBSTRATES ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS TO ENSURE ADHESION OF RESILIENT PRODUCTS.

FILL CRACKS, HOLES, AND DEPRESSIONS IN SUBSTRATES WITH TROWELABLE LEVELING AND PATCHING COMPOUND AND REMOVE BUMPS AND RIDGES TO PRODUCE A UNIFORM AND SMOOTH SUBSTRATE.

DO NOT INSTALL RESILIENT PRODUCTS UNTIL THEY ARE SAME TEMPERATURE AS THE SPACE WHERE THEY ARE TO BE INSTALLED.

- (1) MOVE RESILIENT PRODUCTS AND INSTALLATION MATERIALS INTO SPACES WHERE THEY WILL BE INSTALLED AT LEAST 48 HOURS IN ADVANCE OF INSTALLATION.
a. ACROLEIN.
b. ACRYLONITRILE.
c. ANTIMONY.
d. BENZENE.
e. BUTYL BENZYL PHTHALATE.
f. CADMIUM.
g. DI (2-ETHYLHEXYL) PHTHALATE.
h. DI-N-BUTYL PHTHALATE.
i. DI-N-OCTYL PHTHALATE.
j. 1,2-DICHLOROBENZENE.
k. DIETHYL PHTHALATE.
l. DIMETHYL PHTHALATE.
m. ETHYLBENZENE.
n. FORMALDEHYDE.

SWEEP AND VACUUM CLEAN SUBSTRATES TO BE COVERED BY RESILIENT PRODUCTS IMMEDIATELY BEFORE INSTALLATION.

3.2 RESILIENT BASE INSTALLATION

COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS FOR INSTALLING RESILIENT BASE.

APPLY RESILIENT BASE TO WALLS, COLUMNS, PILASTERS, CASEWORK AND CABINETS IN TOE SPACES, AND OTHER PERMANENT FIXTURES IN ROOMS AND AREAS WHERE BASE IS REQUIRED.

INSTALL RESILIENT BASE IN LENGTHS AS LONG AS PRACTICABLE WITHOUT GAPS AT SEAMS AND WITH TOPS OF ADJACENT PIECES ALIGNED.

TIGHTLY ADHERE RESILIENT BASE TO SUBSTRATE THROUGHOUT LENGTH OF EACH PIECE, WITH BASE IN CONTINUOUS CONTACT WITH HORIZONTAL AND VERTICAL SUBSTRATES.

DO NOT STRETCH RESILIENT BASE DURING INSTALLATION.

3.3 CLEANING AND PROTECTION

COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS FOR CLEANING AND PROTECTION OF RESILIENT PRODUCTS.

COVER RESILIENT PRODUCTS UNTIL SUBSTANTIAL COMPLETION.

END OF SECTION 09513

SECTION 09123 - INTERIOR PAINTING

GENERAL SUMMARY

THIS SECTION INCLUDES SURFACE PREPARATION AND THE APPLICATION OF PAINT SYSTEMS ON THE FOLLOWING INTERIOR SUBSTRATES:

- (1) CONCRETE.
(2) STEEL
(3) GYPSUM BOARD.

SUBMITTALS

PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

SAMPLES: FOR EACH FINISH AND FOR EACH COLOR AND TEXTURE REQUIRED. PRODUCT LIST: PRINTOUT OF CURRENT "MPI APPROVED PRODUCTS LIST" FOR EACH PRODUCT CATEGORY SPECIFIED IN PART 2, WITH THE PROPOSED PRODUCT HIGHLIGHTED.

QUALITY ASSURANCE

MPI STANDARDS:
(1) PRODUCTS: COMPLYING WITH MPI STANDARDS INDICATED AND LISTED IN "MPI APPROVED PRODUCTS LIST."
(2) PREPARATION AND WORKMANSHIP: COMPLY WITH REQUIREMENTS IN "MPI ARCHITECTURAL PAINTING SPECIFICATION MANUAL" FOR PRODUCTS AND PAINT SYSTEMS INDICATED.

MOCKUPS: APPLY BENCHMARK SAMPLES OF EACH PAINT SYSTEM INDICATED AND EACH COLOR AND FINISH SELECTED TO VERIFY PRELIMINARY SELECTIONS MADE UNDER SAMPLE SUBMITTALS AND TO DEMONSTRATE AESTHETIC EFFECTS AND SET QUALITY STANDARDS FOR MATERIALS AND EXECUTION.

ARCHITECT WILL SELECT ONE SURFACE TO REPRESENT SURFACES AND CONDITIONS FOR APPLICATION OF EACH PAINT SYSTEM SPECIFIED IN PART 3.

- (1) ARCHITECT WILL SELECT ONE SURFACE TO REPRESENT SURFACES AND CONDITIONS FOR APPLICATION OF EACH PAINT SYSTEM SPECIFIED IN PART 3.
(2) FINAL APPROVAL OF COLOR SELECTIONS WILL BE BASED ON BENCHMARK SAMPLES.
a. IF PRELIMINARY COLOR SELECTIONS ARE NOT APPROVED, APPLY ADDITIONAL BENCHMARK SAMPLES OF ADDITIONAL COLORS SELECTED BY ARCHITECT AT NO ADDED COST TO OWNER.

EXTRA MATERIALS

FURNISH EXTRA MATERIALS DESCRIBED BELOW THAT ARE FROM SAME PRODUCTION RUN (BATCH MIX) AS MATERIALS APPLIED AND THAT ARE PACKAGED FOR STORAGE AND IDENTIFIED WITH LABELS DESCRIBING CONTENTS.

- (1) QUANTITY: FURNISH AN ADDITIONAL 5 PERCENT, BUT NOT LESS THAN 1 GAL. OF EACH MATERIAL AND COLOR APPLIED.

PRODUCTS PAINT, GENERAL

MATERIAL COMPATIBILITY:

- (1) PROVIDE MATERIALS FOR USE WITHIN EACH PAINT SYSTEM THAT ARE COMPATIBLE WITH ONE ANOTHER AND SUBSTRATES INDICATED, UNDER CONDITIONS OF SERVICE AND APPLICATION AS DEMONSTRATED BY MANUFACTURER, BASED ON TESTING AND FIELD EXPERIENCE.
(2) FOR EACH COAT IN A PAINT SYSTEM, PROVIDE PRODUCTS RECOMMENDED IN WRITING BY MANUFACTURERS OF TOPCOAT FOR USE IN PAINT SYSTEM AND ON SUBSTRATE INDICATED.

CHEMICAL COMPONENTS OF FIELD-APPLIED INTERIOR PAINTS AND COATINGS: PROVIDE PRODUCTS THAT COMPLY WITH THE FOLLOWING LIMITS FOR VOC CONTENT, EXCLUSIVE OF COLORANTS ADDED TO A TINT BASE, WHEN CALCULATED ACCORDING TO 40 CFR 59, SUBPART D (EPA METHOD 24) AND THE FOLLOWING CHEMICAL RESTRICTIONS; THESE REQUIREMENTS DO NOT APPLY TO PRIMERS OR FINISHES THAT ARE APPLIED IN A FABRICATION OR FINISHING SHOP:

- (1) FLAT PAINTS AND COATINGS: VOC CONTENT OF NOT MORE THAN 50 GL.
(2) NONFLAT PAINTS AND COATINGS: VOC CONTENT OF NOT MORE THAN 150 GL.

(3) AROMATIC COMPOUNDS: PAINTS AND COATINGS SHALL NOT CONTAIN MORE THAN 1.0 PERCENT BY WEIGHT OF TOTAL AROMATIC COMPOUNDS (HYDROCARBON COMPOUNDS CONTAINING ONE OR MORE BENZENE RINGS).

(4) RESTRICTED COMPONENTS: PAINTS AND COATINGS SHALL NOT CONTAIN ANY OF THE FOLLOWING:

- a. ACROLEIN.
b. ACRYLONITRILE.
c. ANTIMONY.
d. BENZENE.
e. BUTYL BENZYL PHTHALATE.
f. CADMIUM.
g. DI (2-ETHYLHEXYL) PHTHALATE.
h. DI-N-BUTYL PHTHALATE.
i. DI-N-OCTYL PHTHALATE.
j. 1,2-DICHLOROBENZENE.
k. DIETHYL PHTHALATE.
l. DIMETHYL PHTHALATE.
m. ETHYLBENZENE.
n. FORMALDEHYDE.

- o. HEXAVALENT CHROMIUM.
p. ISOPHORONE.
q. LEAD.
r. MERCURY.
s. METHYL ETHYL KETONE.
t. METHYL ISOBUTYL KETONE.
u. METHYLENE CHLORIDE.
v. NAPHTHALENE.
w. TOLUENE (METHYLBENZENE).
x. 1,1,1-TRICHLOROETHANE.
y. VINYL CHLORIDE.

COLORS: AS SELECTED BY ARCHITECT FROM MANUFACTURER'S FULL RANGE

PRIMERS/SEALERS

INTERIOR LATEX PRIMER/SEALER: MPI #50.

- (1) VOC CONTENT: E RANGE OF E3.

LATEX PAINTS

INTERIOR LATEX (EGGSHELL): MPI #52 (GLOSS LEVEL 3).

- (1) VOC CONTENT: E RANGE OF E3.

INTERIOR LATEX (SATIN): MPI #43 (GLOSS LEVEL 4).

- (1) VOC CONTENT: E RANGE OF E3.

INTERIOR LATEX (SEMIGLOSS): MPI #54 (GLOSS LEVEL 5).

- (1) VOC CONTENT: E RANGE OF E3.

FLOOR COATINGS

INTERIOR/EXTERIOR CLEAR CONCRETE FLOOR SEALER (SOLVENT BASED): MPI #104.

- (1) VOC CONTENT: E RANGE OF E2.

EXECUTION

EXAMINATION

EXAMINE SUBSTRATES AND CONDITIONS, WITH APPLICATOR PRESENT, FOR COMPLIANCE WITH REQUIREMENTS FOR MAXIMUM MOISTURE CONTENT AND OTHER CONDITIONS AFFECTING PERFORMANCE OF WORK.

MAXIMUM MOISTURE CONTENT OF SUBSTRATES: WHEN MEASURED WITH AN ELECTRONIC MOISTURE METER AS FOLLOWS:

- (1) CONCRETE: 12 PERCENT.
(2) GYPSUM BOARD: 12 PERCENT.

VERIFY SUITABILITY OF SUBSTRATES, INCLUDING SURFACE CONDITIONS AND COMPATIBILITY WITH EXISTING FINISHES AND PRIMERS.

BEGIN COATING APPLICATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED AND SURFACES ARE DRY.

- (1) BEGINNING COATING APPLICATION CONSTITUTES CONTRACTOR'S ACCEPTANCE OF SUBSTRATES AND CONDITIONS.

PREPARATION AND APPLICATION

COMPLY WITH MANUFACTURER'S WRITTEN INSTRUCTIONS AND RECOMMENDATIONS IN "MPI ARCHITECTURAL PAINTING SPECIFICATION MANUAL" APPLICABLE TO SUBSTRATES INDICATED.

CLEAN SUBSTRATES OF SUBSTANCES THAT COULD IMPAIR BOND OF PAINTS, INCLUDING DIRT, OIL, GREASE, AND INCOMPATIBLE PAINTS AND ENCAPSULANTS.

- (1) REMOVE INCOMPATIBLE PRIMERS AND REPRIME SUBSTRATE WITH COMPATIBLE PRIMERS AS REQUIRED TO PRODUCE PAINT SYSTEMS INDICATED.

APPLY PAINTS TO PRODU



SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

STANDARDS

COMPLY WITH ALL PERTINENT RECOMMENDATIONS CONTAINED IN THE 'LOW PRESSURE DUCT CONSTRUCTION STANDARDS', LATEST EDITION, AS PUBLISHED BY THE SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA).

FOUNDATIONS, SUPPORTS, AND ISOLATORS

THIS CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPORTS AND ISOLATION OF MECHANICAL DEVICES. HE SHALL FURNISH ALL MISCELLANEOUS STEEL NECESSARY TO HANG OR SUPPORT DUCTWORK PIPE AND/OR MECHANICAL EQUIPMENT.

FLASHING

FLASH AND COUNTER-FLASH AS REQUIRED TO PREVENT WATER LEAKS AROUND DUCTWORK, PIPING AND ALL SUCH OTHER MECHANICAL EQUIPMENT, DEVICES, OR PROJECTIONS THROUGH ROOF OR EXTERIOR WALLS THAT WILL BE FURNISHED AND INSTALLED BY THIS CONTRACTOR.

TEST AND BALANCE - H.V.A.C. SYSTEMS

AFTER THE INSTALLATION IS COMPLETE, TEST AND BALANCE ALL COMPONENTS OF THE HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS TO CONFORM TO THE AIR AND WATER VOLUMES SHOWN ON THE DRAWINGS.

FOR EACH COMPONENT OF THE SYSTEM, MAKE THE FOLLOWING TESTS AND SUBMIT ONE COPY OF ALL REPORTS TO THE PROJECT MANAGER.

- (1) BOILER PUMP FLOW RATES.
(2) AIR VOLUMES AT EACH SUPPLY, RETURN, AND EXHAUST GRILLE.
(3) WATER FLOW THROUGH ALL PRESET VAV REHEAT COILS.

MAKE ALL AIR TESTS BY MEANS OF VELOMETER OR ANEMOMETER READINGS, AND MAKE ALL STATIC PRESSURE TESTS BY MEANS OF PITOT TUBE READINGS.

ALL TESTING AND BALANCING SHALL BE CERTIFIED IN ACCORDANCE WITH HEBB (NATIONAL ENVIRONMENTAL BALANCING BUREAU).

END OF SECTION 23 05 00

SECTION 23 05 29 - HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT

DESCRIPTION OF WORK

CONTRACTOR SHALL PROVIDE AND INSTALL ALL HANGERS, SUPPORTS, ANCHORS, BRACKETS, CONCRETE PADS, GROUTING, ETC. FOR INSTALLATION OF EQUIPMENT AND ITEMS LISTED IN THE SPECIFICATIONS AND ON THE DRAWINGS. INSTALLATIONS SHALL BE COMPLETE WITH NECESSARY INSERTS, BOLTS, RODS, NUTS, WASHERS AND OTHER ACCESSORIES.

STRUCTURAL SUPPORTS

SUPPORT STEEL SHALL BE PAINTED. GALVANIZED STEEL SHALL NOT BE PAINTED, EXCEPT FIELD TOUCH-UP WITH ZINC-RICH PAINT AS NEEDED.

ALL STRUCTURAL STEEL ROLLED PLATES AND SHAPES SHALL CONFORM TO ASTM A36.

MSS STANDARD COMPLIANCE

PROVIDE FACTORY FABRICATED PIPE HANGERS AND SUPPORTS ON WHICH MATERIALS, DESIGN AND MANUFACTURE COMPLY WITH MANUFACTURERS STANDARDIZATION SOCIETY (MSS) MSS SP-58. SELECT AND APPLY PIPE HANGERS AND SUPPORTS IN ACCORDANCE WITH MSS SP-69. FABRICATE AND INSTALL HANGERS AND SUPPORTS IN ACCORDANCE WITH MSS SP-69.

SADDLES AND SHIELDS

PROVIDE FACTORY FABRICATED SADDLES OR SHIELDS UNDER PIPE HANGERS AND SUPPORTS OF ALL INSULATED PIPING.

SUPPORT AND HANGER SIZING

THE SIZE OF HANGERS AND SUPPORTS SHALL EXACTLY FIT PIPE SIZE FOR BARE PIPING AND EXACTLY FIT AROUND PIPING INSULATION WITH SADDLE OR SHIELD FOR INSULATED PIPING. PROVIDE COPPER PLATED HANGERS AND SUPPORTS FOR COPPER PIPE SYSTEMS.

HANGER AND SUPPORT SPACING

SPACING OF SUPPORTS AND HANGERS SHALL BE PER MSS SP-69. INSTALL ANCHORS AT PROPER LOCATIONS TO PREVENT STRESSES FROM EXCEEDING THOSE PERMITTED BY ANSI B31.1 AND TO PREVENT TRANSFER OF LOADING AND STRESSES TO CONNECTED EQUIPMENT.

END OF SECTION 23 05 29

SECTION 23 07 19 - MECHANICAL SYSTEMS INSULATION

SCOPE OF WORK

INSULATE PIPING AND EQUIPMENT UNLESS INDICATED AS NOT TO BE INSULATED.

INSULATE CONNECTION POINTS BETWEEN NEW AND EXISTING ITEMS.

REPAIR OR REPLACE INSULATION DAMAGED DURING CONSTRUCTION.

ITEMS NOT TO BE INSULATED

DUCTWORK: INDOOR RETURN AIR DUCTWORK IN CONDITIONED AREAS, EXHAUST AIR DUCTWORK.

GENERAL INSULATION DEFINITIONS

INSULATION THERMAL CONDUCTIVITY: NO GREATER THAN VALUE LISTED, IN BTU-INCH-HOUR-SQUARE FOOT-DEGREES F AT 75 DEGREES F MEAN TEMPERATURE.

WATER VAPOR PERMEANCE (ASTM E97 OR E98, PROCEDURE A): NO MORE THAN VALUE LISTED, IN PERMS. WATER VAPOR PERMEABILITY (ASTM C355): NO GREATER THAN VALUE LISTED, IN PERM-INCH.

PUNCTURE RESISTANCE (ASTM D781): NO LESS THAN VALUE LISTED.

FLAME SPREAD CLASSIFICATION (ASTM E84, NFPA 255): NO GREATER THAN VALUE LISTED. SMOKE DENSITY CLASSIFICATION (ASTM E84, NFPA 255): NO GREATER THAN VALUE LISTED. COMPOSITE LISTING INCLUDES INSULATION, JACKET, AND ADHESIVE.

DENSITY NO LESS THAN VALUE LISTED, IN POUNDS PER CUBIC FOOT.

DUCTWORK INSULATION - INDOOR, CONCEALED

IN CEILING SPACES, BUILDING SHAFTS, AND OTHER LOCATIONS WHERE NOT VISIBLE, INSULATE DUCTWORK WITH 1-1/2" THICK, BLANKET-TYPE, FIBERGLASS INSULATION WITH FACTORY-APPLIED VAPOR BARRIER, AND 2" STAPLING AND TAPING FLANGE ALONG ONE EDGE. INSULATION: ASTM C553, DENSITY OF 0.75, CONDUCTIVITY OF 0.32. VAPOR BARRIER: ALUMINUM FOIL, GLASS FIBER REINFORCEMENT, PERMEANCE OF 0.02, AND PUNCTURE RESISTANCE OF 50 UNITS. COMPOSITE FLAME SPREAD/ SMOKE DENSITY OF 25/60.

INSULATION INSTALLATION

ALL SYSTEMS SHALL BE TESTED AND APPROVED BEFORE BEING INSULATED. THE INSULATION SHALL BE APPLIED OVER CLEAN, DRY SURFACE.

FULL LENGTHS OF INSULATION SHALL BE USED EXCEPT AT END OF STRAIGHT SECTIONS AND AS REQUIRED TO ACCOMMODATE FITTINGS. INSULATION SHALL BE APPLIED WITH THE JOINTS TIGHTLY FITTED TOGETHER. CRACKS OR VOIDS SHALL BE FILLED WITH INSULATION. MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES SHALL BE STRICTLY ADHERED TO.

THE EDGES AND SEAMS AT ALL VISIBLE LOCATIONS SHALL BE FINISHED IN A NEAT AND WORKMANLIKE MANNER.

ALL EXPOSED DUCTWORK INSULATION SHALL BE APPLIED WITH EDGES BUTTED. INSULATION SHALL BE IMPALED OVER STICK CLIPS OR PINS WELDED TO THE DUCT, AND SECURED WITH SPEED CLIPS. SPACING OF PINS SHALL BE AS REQUIRED TO HOLD INSULATION FIRMLY IN PLACE BUT NOT LESS THAN ONE PPH PER SQUARE FOOT. ALL JOINTS AND PENETRATIONS OF THE VAPOR BARRIER SHALL BE SEALED WITH A 3" WIDE STRIP OF THE SAME MATERIAL, SUPPLIED WITH VAPOR BARRIER ADHESIVE TO BOTH SURFACES AS RECOMMENDED BY ADHESIVE MANUFACTURERS.

BLANKET INSULATION SHALL BE TIGHTLY SEALED AT ALL JOINTS AND SEAMS. INSULATION SHALL BE CUT LONGER THAN DUCTWORK PERIMETER TO ALLOW MAXIMUM THICKNESS ON ALL AREAS AND AVOID EXCESSIVE COMPRESSION. ALL JOINTS SHALL BE COVER LAPPED AT LEAST 2" AND STAPLED IN PLACE. THE STAPLED SEAMS SHALL BE SEALED WITH A MINIMUM 3" WIDE PRESSURE SENSITIVE TAPE DESIGNED FOR USE WITH THE DUCT INSULATION. ALL BREAKS IN THE VAPOR BARRIER FACING SHALL ALSO BE SEALED WITH THE TAPE. THE UNDERSIDE OF DUCTWORK 18" OR GREATER IN WIDTH, AND VERTICAL SURFACES 48" OR GREATER SHALL HAVE THE INSULATION ADDITIONALLY SECURED WITH MECHANICAL FASTENERS AND SPEED CLIPS SPACED APPROXIMATELY 12" ON CENTER. THE PROTRUDING ENDS OF THE FASTENERS SHALL BE CUT OFF FLUSH AFTER THE SPEED CLIPS ARE INSTALLED, AND THEN SEALED WITH THE SAME TAPE AS SPECIFIED ABOVE.

FINISHED INSTALLATION SHALL PROVIDE A CONTINUOUS AND EFFECTIVE VAPOR BARRIER.

END OF SECTION 23 07 19

SECTION 23 21 16 - BASIC PIPING MATERIALS AND METHODS

DESCRIPTION OF WORK

CONTRACTOR SHALL PROVIDE AND INSTALL ALL HYDRONIC PIPING AND COMPONENTS SHOWN ON THE DRAWINGS.

GENERAL PIPING REQUIREMENTS

ALL PIPING MATERIALS SHALL BE COMPATIBLE FOR TEMPERATURE, PRESSURE AND SERVICE.

ALL PIPING MATERIALS OF A GIVEN TYPE SHALL BE MANUFACTURED BY A SINGLE SOURCE, AND SUPPLIED BY A SINGLE SUPPLIER.

HYDRONIC PIPING SYSTEMS

FOR PIPING THROUGH 6" USE THE FOLLOWING:

- PIPE: TYPE L COPPER, HARD DRAWN, ASTM B 88
FITTINGS: WROUGHT COPPER, ANSI B16.22
JOINTS: SOLDERED THROUGH 2"; BRAZED FOR 2-1/2" THROUGH 6"

PIPE JOINTS

SOLDERED JOINTS: ASTM B32, ALLOY SB5, (95% TIN, 5% ANTIMONY, MAXIMUM 0.20% LEAD), UNLESS NOTED OTHERWISE, JOINTS MAY BE SCREWED OR FLANGED TO SUIT VALVES AND EQUIPMENT.

UNIONS

UNIONS IN COPPER PIPING SYSTEMS SHALL BE WROUGHT COPPER OR BRASS WITH SWEAT ENDS.

PIPE HANGERS AND SUPPORTS

PROVIDE ADJUSTABLE TYPE PIPE HANGERS, SUPPORTS AND ACCESSORIES FOR THE PROPER SUPPORT OF ALL PIPING.

DIELECTRIC PROTECTION FOR HANGERS AND SUPPORTS: WHERE COPPER PIPING IS SUPPORTED WITH STEEL HANGERS AND SUPPORTS, DIELECTRIC PROTECTION MUST BE PROVIDED. USE ONE OF THE FOLLOWING MEANS AS APPLICABLE:

- 1. COATED HANGERS (COPPER OR PLASTIC COATING)
2. INSULATION INSERTS
3. CUSHION CLAMPS
4. OTHER AS APPROVED BY ENGINEER.

PIPE SLEEVES

FURNISH AND SET PIPE SLEEVES PER DETAILS ON DRAWINGS.

DIELECTRIC FITTINGS

FOR PIPE 2 INCH AND LESS: PROVIDE BRASS COUPLING. (DIELECTRIC UNIONS ARE NOT ACCEPTABLE).

FOR PIPE 2-1/2 INCH AND LARGER: PROVIDE FLANGE UNION WITH DIELECTRIC GASKET AND BOLT SLEEVES.

STRAINERS

BODY SHALL BE BRONZE, CAST STEEL OR CAST IRON, TO MATCH PIPING MATERIALS. STRAINERS SHALL BE SAME SIZE AS PIPING, WITH SCREWED CONNECTIONS ON PIPING 2" AND SMALLER, AND FLANGED CONNECTIONS ON PIPING 2-1/2" AND LARGER. SCREEN AREA SHALL BE TWICE INTERNAL AREA OF PIPING. PRESSURE RATING SHALL BE THAT OF PIPING SYSTEM, MINIMUM 125 LB. PROVIDE 3/4" BALL VALVE BLOW DOWN VALVE ON ALL STRAINERS 2" AND LARGER.

FLEXIBLE METAL HOSE CONNECTORS

FOR COPPER PIPING SYSTEMS, USE COPPER CONSTRUCTION BRAIDED HOSES.

PIPING TRANSITIONS

FOR COPPER TO STEEL CONNECTIONS, SEE 'DIELECTRIC FITTINGS'.

GENERAL PIPING INSTALLATION REQUIREMENTS

WORK SHALL BE DONE IN ACCORDANCE WITH APPLICABLE ORDINANCES AND CODES. ARRANGE FOR INSPECTIONS.

INSTALL PIPING TO PERMIT COMPLETE DRAINING. PROVIDE CAPPED HOSE END BALL DRAIN VALVES AT ALL LOW POINTS.

IF HYDRONIC SYSTEM FLUIDS HAVE A PH BETWEEN 6.0 AND 10.0 AND MEETS THE REQUIREMENTS OF CITY OF BIRMINGHAM SEWER USE ORDINANCE, IT MAY BE DISCHARGED TO THE SANITARY SEWER. OTHERWISE, CONTRACTOR TO PROPERLY DISPOSE OF FLUIDS.

INSTALLED PIPING SHALL BE FREE FROM SAGGING. PROVIDE FOR EXPANSION AND CONTRACTION OF PIPING IN AN APPROVED AND SAFE MANNER BY MEANS OF LOOPS OR OFFSETS, WHERE MECHANICAL EXPANSION JOINTS ARE NOT SPECIFICALLY CALLED FOR.

BRANCH CONNECTIONS FOR HYDRONIC SYSTEMS, SHALL BE TAKEN OFF MAINS UP OR DOWN AT A 45 DEGREE ANGLE OR OFF THE SIDE.

BRANCH PIPING SHALL BE VALVED AT THE BRANCH CONNECTION POINTS.

PROVIDE FITTINGS AND SPECIALTIES NECESSARY TO PROPERLY INTERCONNECT ALL ITEMS AND SPECIALTIES WHETHER OR NOT SHOWN IN DETAIL.

CLEAN AND SWAB-OUT ALL PIPING BEFORE INSTALLATION. PIPING LEFT OPEN FOR EXTENDED PERIODS SHALL BE CAPPED.

LAY OUT PIPE LINES STRAIGHT, PLUMB AND IN TRUE ALIGNMENT. OFFSET AS REQUIRED TO AVOID INTERFERENCE WITH OTHER WORK, TO CONCEAL PIPING, TO ALLOW MAXIMUM HEADROOM AND TO AVOID INTERFERENCE WITH WINDOWS AND DOORS. LAY OUT ALL PIPES AND ESTABLISH THEIR LEVELS FROM BENCH MARKS, EXISTING FLOORS OR FINISHED GRADES.

PIPING SHALL BE CONCEALED UNLESS INDICATED OTHERWISE ON DRAWINGS. DO NOT CONCEAL PIPING UNTIL IT HAS BEEN INSPECTED, TESTED, FLUSHED AND APPROVED.

USE ECCENTRIC REDUCING FITTINGS TO INCREASE OR DECREASE PIPE SIZES. BUSHINGS ARE NOT ACCEPTABLE. ORIENT REDUCERS TO PREVENT TRAPPING OF WATER.

LOCATE GROUPS OF PIPE PARALLEL TO EACH OTHER, SPACED TO PERMIT APPLYING INSULATION AND SERVICING OF VALVES. INSTALL HOT AND COLD WATER LINES AT LEAST 6 INCHES APART. INSTALL PIPING AT LEAST 3 INCHES CLEAR OF ELECTRICAL CONDUIT AND AVOID RUNNING PIPE WITHIN 3'-6" OF ELECTRICAL EQUIPMENT, FROM FLOOR TO CEILING.

PIPE EXTENDING INTO FINISHED AREAS SHALL HAVE CHROME PLATED ESCUTCHEONS LARGE ENOUGH TO COVER PIPE SLEEVES AND SHALL FIT SNUGLY OVER PIPE OR INSULATION.

PITCH HYDRONIC PIPING UP IN DIRECTION OF FLOW AT 1/16" PER FOOT OR AS SPECIFIED ON DRAWINGS.

INSTALLATION OF PIPE HANGERS AND SUPPORTS

ARRANGE PIPE HANGERS AND SUPPORTS TO PERMIT PROPER PITCH OF PIPING, FREE TO MOVE WITH PIPE EXPANSION, INSTALLED AT PROPER INTERVALS TO TOTALLY PREVENT SAGGING AND ATTACHED TO BUILDING CONSTRUCTION THROUGH APPROVED MEANS BUILDING ATTACHMENTS. HANGERS SHALL BE LOCATED NEAR OR AT CHANGES IN PIPING DIRECTION AND CONCENTRATED LOADS, VALVES, STRAINERS, IN LINE PUMPS AND OTHER HEAVY EQUIPMENT SHALL BE SUPPORTED INDEPENDENT OF THE PIPES. AFTER SYSTEMS HAVE BEEN INSTALLED AND FILLED ADJUST HANGERS AND SUPPORTS TO EVENLY DISTRIBUTE WEIGHT, AND MAINTAIN PROPER PITCH.

VERTICAL PIPING: WHEN SUPPORT LOCATIONS ARE NOT INDICATED ON THE DRAWINGS, SUPPORT PIPING AT EVERY FLOOR LEVEL.

HORIZONTAL PIPING HANGER SPACING: SPACE HANGERS IN COMPLIANCE WITH APPLICABLE CODES. LOCATE HANGER CLOSE TO JOINTS.

INSTALLATION OF PIPE SLEEVES

INSTALL PIPE SLEEVES WHERE PIPING PASSES THROUGH BUILDING CONSTRUCTION INCLUDING ALL WALLS, FLOORS AND CEILINGS.

FOR NEW WALL CONSTRUCTION, PROMPTLY AND ACCURATELY LOCATE AND SECURELY SET SLEEVES IN FORMS BEFORE CONCRETE IS POURED. FOR MASONRY CONSTRUCTION, SET THE SLEEVES OVER THE PIPING FOR MASONRY CONTRACTOR TO BUILD AROUND.

INSTALLATION OF STRAINERS

PROVIDE Y-STRAINERS IN PIPING REGULATING CONTROL VALVES, TRAPS, PRESSURE RELIEF VALVES, PRESSURE REDUCING VALVES AND ELSEWHERE AS SHOWN ON DRAWINGS.

INSTALL STRAINER ELEMENTS PRIOR TO FLUSHING PIPING. REMOVE, CLEAN AND REINSTALL DURING FLUSHING.

FLUSHING AND CLEANING OF PIPING

FLUSH AND CLEAN HEATING HOT WATER SUPPLY AND RETURN SYSTEMS. PRIOR TO FLUSHING, TEMPORARILY REMOVE, ISOLATE OR BYPASS DIRT SENSITIVE EQUIPMENT AND DEVICES, INCLUDING THE FOLLOWING:

- (1) AUTOMATIC FLOW CONTROL VALVES
(2) HEATING AND COOLING COILS
(3) FLOW MEASURING DEVICES

REINSTALL AFTER FLUSHING IS COMPLETE.

PRIOR TO FLUSHING, INSTALL FINE MESH CONSTRUCTION STRAINERS AT INLET TO ALL EQUIPMENT WITH CONNECTIONS 2-1/2" AND LARGER. INSTALL FINE MESH CONSTRUCTION ELEMENT IN PERMANENT STRAINERS. DURING FLUSHING AND CLEANING, REMOVE AND CLEAN STRAINERS PERIODICALLY. AT COMPLETION OF FINAL FLUSH, CLEAN PERMANENT STRAINERS, REMOVE CONSTRUCTION STRAINERS.

PIPING SYSTEMS PRESSURE TESTING

GENERAL

- 1. TEST NEW SYSTEMS ONLY, FROM POINT OF CONNECTION TO THE EXISTING SYSTEMS. PERFORM INITIAL TESTS AND CORRECT DEFICIENCIES PRIOR TO REQUESTING ACCEPTANCE TEST.
2. PERFORM ACCEPTANCE PRESSURE TESTS IN THE PRESENCE OF THE OWNER AND AUTHORITIES HAVING JURISDICTION. ACCEPTANCE TESTS MUST BE SATISFACTORILY COMPLETED BEFORE PIPING SURFACES ARE CONCEALED.
3. PNEUMATIC TESTS SHALL BE CONDUCTED USING DRY, OIL FREE COMPRESSED AIR, CARBON DIOXIDE OR NITROGEN. EVACUATE PERSONNEL NOT DIRECTLY INVOLVED IN TESTING PRIOR TO PERFORMING PNEUMATIC TESTING. PERFORM TESTING IN TWO STAGES, INITIAL AND ACCEPTANCE. CONDUCT INITIAL TESTING AT 5 PSI OR LESS. SWAB JOINTS WITH A COMMERCIAL LEAK DETECTOR. REPAIR DEFICIENCIES PRIOR TO TESTING AT HIGHER PRESSURES. UNDER NO CIRCUMSTANCES SHALL PLASTIC PIPING OF ANY TYPE BE PNEUMATICALLY TESTED, INCLUDING PRE-ACCEPTANCE TESTS.
4. COMPONENTS SHALL BE REMOVED OR ISOLATED DURING TESTING IF DAMAGE MAY OCCUR DUE TO TEST PRESSURE AND/OR TEST MEDIA.
5. EXISTING HOT WATER PIPING CONNECTED TO PIPING TO BE TESTED SHALL BE SHUTOFF, DRAINED AND COOLED BEFORE TESTING.

ACCEPTANCE PRESSURE TESTING:

FOR EACH SYSTEM TESTED, PROVIDE A CERTIFICATE TESTIFYING THAT THE SYSTEM WAS SATISFACTORILY TESTED AND PASSED.

END OF SECTION 23 21 16

SECTION 23 30 00 - HVAC AIR DISTRIBUTION

DESCRIPTION OF WORK

HVAC DRAWINGS ARE INTENDED TO SHOW THE SCOPE AND GENERAL ARRANGEMENT OF THE WORK UNDER THIS CONTRACT. FOLLOW THESE DRAWINGS IN LAYING OUT THE EQUIPMENT AND DUCTWORK. WHERE JOB CONDITIONS REQUIRE MINOR CHANGES OR ADJUSTMENTS IN THE INDICATED LOCATIONS OR ARRANGEMENT OF THE WORK, SUCH CHANGES SHALL BE COORDINATED WITH THE CONSTRUCTION MANAGER AND MADE WITHOUT CHANGE IN THE CONTRACT AMOUNT.

EQUIPMENT INDICATED ON THE DRAWINGS, TOGETHER WITH ITS BASE AND/OR SUPPORT, DUCTWORK, ROOF OPENINGS, AND ELECTRICAL SERVICE ARE BASED ON THE MAKE AND MODEL INDICATED IN THE EQUIPMENT SCHEDULE OR IN THE SPECIFICATIONS. SHOULD AN EQUIVALENT ALTERNATE MAKE OF EQUIPMENT BE SELECTED, EVEN IF APPROVED BY THE OWNER AS EQUAL, COORDINATE AND MAKE THE MODIFICATIONS IN THE WORK WITHOUT CHANGE IN CONTRACT AMOUNT.

UNLESS OTHERWISE SHOWN ON DRAWINGS OR SPECIFIED HEREIN, PRODUCTS USED IN THE WORK SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS AND RECOMMENDATIONS. ANY CHANGES OR MODIFICATIONS PROPOSED WHICH ARE BELIEVED TO IMPROVE THE INSTALLATION SHALL BE APPROVED BY THE OWNER AND/OR ITS REPRESENTATIVE.

DUCTWORK

ALL DUCTWORK, UNLESS OTHERWISE SPECIFIED, IS TO BE FABRICATED AND INSTALLED AS RECOMMENDED IN CURRENT ISSUE OF ASHRAE GUIDE OR SMACNA USING LOCK FORMING QUALITY GALVANIZED STEEL COMPLYING WITH

ASTM A924 WITH G90 ZINC COATING IN ACCORDANCE WITH ASTM A653.

DAMAGED ZINC COATING SHALL BE TOUCHED UP WITH INORGANIC ZINC-RICH PAINT AS MANUFACTURED BY CARBOLINE. DUCTS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.

FABRICATE AND INSTALL ALL DUCTWORK IN STRICT ACCORDANCE WITH THE DRAWINGS.

ALL DUCT SIZES SHOWN ON THE DRAWINGS ARE NET DIMENSIONS INSIDE THE INSULATION. INCREASE DIMENSIONS WHERE LINED TO ALLOW FOR THE LINER.

SUPPLY AIR DUCTWORK SHALL BE CONSTRUCTED TO CONFORM TO SMACNA STANDARDS FOR 3" W.C. POSITIVE PRESSURE CLASSIFICATION, EXCEPT WHERE OTHERWISE INDICATED IN DESIGN DOCUMENTS/DRAWINGS.

RETURN AIR DUCTWORK SHALL BE CONSTRUCTED TO CONFORM TO SMACNA STANDARDS FOR 2" W.C. NEGATIVE PRESSURE CLASSIFICATION, EXCEPT WHERE OTHERWISE INDICATED IN DESIGN DOCUMENTS/DRAWINGS.

EXHAUST AIR DUCTWORK SHALL BE NEGATIVE PRESSURE CLASSIFICATION, EXCEPT WHERE OTHERWISE INDICATED IN DESIGN DOCUMENTS/DRAWINGS.

DUCTS PASSING THROUGH MASONRY WALLS OR CEILINGS SHALL HAVE THERMAL INSULATION INSTALLED BETWEEN DUCTS AND MASONRY AND SEALED TIGHT BY THIS CONTRACTOR.

WHEREVER OBSTRUCTIONS REQUIRE A CHANGE IN DUCT SHAPE, MAINTAIN THE EQUIVALENT AREA BY THE USE OF APPROVED TRANSITION FITTINGS.

TRANSITIONS

ALL TRANSITION FITTINGS SHALL HAVE A MAXIMUM ANGLE FOR EACH SIDE OF 20 DEGREE FOR DIVERGING FLOW TRANSITIONS AND 30 DEGREE MAXIMUM FOR CONTRACTING FLOW TRANSITIONS.

ELBOWS

ROUND DUCT ELBOWS SHALL BE MADE WITH A CENTER LINE RADIUS OF AT LEAST 1-1/2 TIMES THE DUCT DIAMETER.

RECTANGULAR DUCT ELBOWS SHALL BE MADE WITH EITHER FULL RADIUS ELBOWS WITH A CENTER LINE RADIUS OF AT LEAST 1-1/2 TIMES THE DUCT WIDTH OR SQUARE ELBOWS WITH DOUBLE THICKNESS TURNING VANES PER SMACNA GUIDE.

DUCT BRANCHES

ROUND DUCT BRANCHES SHALL BE MADE WITH A 45 DEGREE WYE BRANCH FITTING, A 45 DEGREE SADDLE TAP, OR A SPIN-IN TYPE FITTING WITH A SCOOP.

RECTANGULAR DUCT BRANCHES SHALL BE MADE WITH 45 DEGREE TAP FITTINGS.

VOLUME DAMPERS

FURNISH AND INSTALL FACTORY-FABRICATED MANUAL BALANCE DAMPERS WITH LOCKABLE HAND QUADRANT LEVER AND EXTENDED SHAFT FOR INSULATION STANDOFF ON ALL SUPPLY AIR INDIVIDUAL BRANCH CONNECTIONS AND WHERE INDICATED ON RETURN/EXHAUST AIR DUCTWORK.

LOCATE THE DAMPER AS CLOSE AS POSSIBLE TO THE MAIN DUCT. DAMPERS SHALL BE LOCATED SO AS TO BE EASILY ACCESSIBLE TO OPERATING PERSONNEL.

DAMPERS SHALL BE FABRICATED SO AS TO MINIMIZE AIR LEAKAGE AND TO PROVIDE A SECURE SHUTOFF OR THROTTLING EFFECT. ALL DAMPERS OR SPLITTERS SHALL BE SUFFICIENTLY STIFFENED TO PREVENT NOISE OR VIBRATION.

FIRE DAMPERS

FIRE DAMPERS SHOULD BE INSTALLED IN ACCORDANCE WITH NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODES OR LOCAL FIRE ORDINANCES, WHERE NECESSARY.

THERMAL AND ACOUSTICAL INSULATION

ALL DUCTWORK (EXCEPT EXHAUST AIR DUCTWORK) SHALL BE INSULATED UNLESS NOTED OTHERWISE ON DRAWINGS.

ALL SUPPLY, RETURN, AND OUTSIDE AIR DUCTWORK LOCATED INSIDE THE BUILDING SHALL BE EXTERNALLY INSULATED WITH 1 1/2-INCH - 3/4 LB. DENSITY DUCT WRAP WITH FOIL VAPOR BARRIER. APPLY INSULATION OVER CLEAN, DRY SURFACES WITH ADJOINING SECTIONS SEALED TIGHTLY.

EXTERIOR HVAC SUPPLY AND RETURN AIR DUCTWORK SEALANT SHALL BE NEOPRENE BASED PHENOLIC MASTIC, SOLVENT-RELEASE-CURING, 24 HOUR CURE TIME, ULTRAVIOLET (UV) RESISTANT, OPERATIONS TEMPERATURE RANGE OF -20 TO +300 DEG F, MANUFACTURED BY UNITED MCGILL, TYPE UNI-WEATHER.

EXTERIOR HVAC SUPPLY AND RETURN AIR DUCTWORK INSULATION CLADDING SHALL BE GALVANIZED STEEL AND SLOPED ON TOP HORIZONTAL SURFACES TO ALLOW WATER DRAINAGE. CLADDING SHALL BE SEALED AIR-TIGHT.

DIFFUSERS AND GRILLES

FURNISH AND INSTALL ALL DIFFUSERS AND GRILLES OF TYPE AND SIZE AS SHOWN ON THE DRAWINGS.

BRACING AND HANGERS

ALL DUCTS SHALL BE BRACED AND STIFFENED SO AS NOT TO BREATHE, RATTLE, VIBRATE OR SAG. THE REINFORCEMENT SHALL BE INSTALLED IN STRICT ACCORDANCE WITH SMACNA'S DUCT CONSTRUCTION STANDARDS. BRACING SHALL BE SUPPLIED TO THE OUTSIDE OF ALL DUCTS AND MAY CONSIST OF STANDING SEAMS, MODIFIED "S" SLIPS OR ANGLES, AND CROSS-BRACING SUPPLEMENTED BY ANGLE STIFFENERS. ALL RECTANGULAR DUCTWORK SHALL BE CROSS BROKEN.

DUCTS UP TO 28-INCH MAXIMUM SIZE SHALL BE HUNG BY STEEL STRAPS 1-INCH X 18-GAUGE. LARGER DUCTS SHALL BE SUPPORTED BY 1/4" THREADED RODS AND ANGLE IRON TRAPEZE.

OPENINGS

THE CONTRACTOR SHALL ADVISE THE ENGINEER/ARCHITECT/PROJECT MANAGER AS TO THE PROPER SIZE AND SHAPE OF ALL NECESSARY OPENINGS FOR DUCTWORK, GRILLES, EXHAUST FANS, AND GRAVITY RELIEF VENTS, THAT ARE NOT ALREADY SHOWN ON THE DRAWINGS.

DUCTWORK INSTALLATION

ALL DUCTWORK SYSTEMS SHALL BE CONSTRUCTED WITH THE MATERIALS SPECIFIED HEREWITH AND SHALL BE INSTALLED IN A PERMANENT AND WORKMANLIKE MANNER. INTERIOR OF ALL DUCTS SHALL BE SMOOTH AND FREE FROM OBSTRUCTIONS.

THE CONTRACTOR SHALL PROVIDE ALL SUPPORTS FOR THIS WORK AS SHOWN ON THE DRAWINGS, UNLESS OTHERWISE INDICATED.

ALL DUCTS SHALL BE RUN SO AS TO GIVE THE MAXIMUM HEAD ROOM AND TO AVOID INTERFERENCE WITH OTHER BRANCHES OF WORK SUCH AS EXISTING ELECTRICAL AND PIPE LINES.

THE ROUTING OF THE DUCTS SHALL NOT DEVIATE FROM THE DRAWINGS WITHOUT APPROVAL.

EVERY BRANCH SHALL BE CONNECTED TO THE MAIN DUCT AT THE TOP OR SIDE AND AT AN ANGLE NOT EXCEEDING 45 DEGREES, UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS.

THE DUCTWORK SHALL BE FREE FROM DENTS, FINNS, PROJECTIONS, AND BRANCH PIPES SHALL NOT PROJECT INTO THE MAIN DUCTS.

ALL OVER HEAD DUCTWORK SHALL BE RIGIDLY SUPPORTED FROM THE BUILDING STRUCTURE. NO CUTTING OR WELDING OF BUILDING STRUCTURE WILL BE PERMITTED WITHOUT APPROVAL FROM THE

ENGINEER/ARCHITECT/PROJECT MANAGER.

THE END OF ALL HORIZONTAL DUCTS SHALL BE PROVIDED WITH AIRTIGHT, REMOVABLE BLIND FLANGES EXCEPT WHERE NOTED.

SUPPORT DUCTS SUFFICIENTLY TO PLACE NO LOAD ON CONNECTING EQUIPMENT AND TO CARRY WEIGHT OF SYSTEM IF PLUGGED WITH MATERIAL. MAXIMUM SUPPORTING INTERVAL 10 FEET FOR 8 INCHES OR SMALLER DUCTS, 16 FEET INTERVAL FOR LARGER DUCTS.

END OF SECTION 23 30 00

SECTION 23 33 00 - DUCTWORK AND ACCESSORIES

SCOPE OF WORK

WORK UNDER THIS SECTION INCLUDES: (1) DUCTWORK MATERIALS, CONSTRUCTION, FABRICATION, AND SUPPORTING, INCLUDING APPLICATION SCHEDULE.

- (2) VOLUME CONTROL DAMPERS.
(3) AIR TURNING VANES.
(4) FLEXIBLE DUCT CONNECTIONS.
(5) DIFFUSERS, GRILLES AND REGISTERS.
(6) DUCT SEALING, INSPECTION AND LEAK TESTING.



**GALVANIZED STEEL DUCTWORK**

ASTM A653, A924 MILL GALVANIZED STEEL SHEET, 1.25 OZ PER SQ. FT. ZINC COATING ON EACH SIDE IN CONFORMANCE WITH COATING DESIGNATION G-90.

**FLEXIBLE DUCTWORK:** FACTORY INSULATED, 4" W.G. NEGATIVE TO 6" W.G. POSITIVE PRESSURE CLASS ACOUSTICAL DUCT, WITH FULL INTERNAL LINER TO SHIELD AIR FROM FIBERGLASS.

**VOLUME CONTROL DAMPERS**

GENERAL VOLUME DAMPER REQUIREMENTS:

- (1) PROVIDE FACTORY FABRICATED VOLUME DAMPERS IN ALL SUPPLY, RETURN AND EXHAUST BRANCH DUCTS AND WHERE INDICATED ON DRAWINGS, CONSTRUCTED PER SMACNA 1995, FIGURES 2-12 AND 2-13 WITH LOCKING QUADRANT AND 8" MAXIMUM BLADE WIDTH.
(2) VOLUME DAMPER MAY BE INTEGRAL WITH BRANCH TAKE-OFF FITTING. FOR SYSTEMS 2" TO 6" WG CONSTRUCTION:

- (1) HIGH PERFORMANCE RECTANGULAR DAMPERS: 16 GAUGE FRAME, 14 GAUGE EQUIVALENT AIRFOIL BLADES, CONCEALED OPPOSED BLADE LINKAGE, CONTINUOUS SHAFT, LOW LEAKAGE JAMB AND EDGE SEALS.
(2) ROUND DAMPERS: STEEL, SLEEVED IN DUCT STYLE, WITH NEOPRENE BLADE SEAL

**DIFFUSERS, GRILLES AND REGISTERS**

PERFORMANCE OF ALL UNITS SHALL BE BASED ON TESTS CONDUCTED IN ACCORDANCE WITH AEC STANDARDS 1052 A2, "AIR DIFFUSING EQUIPMENT TEST CODE" AND ASHRAE STANDARD 3388 "METHOD OF TESTING FOR RATING THE ACOUSTIC PERFORMANCE OF AIR CONTROL AND TERMINAL DEVICES AND SIMILAR EQUIPMENT." DIFFUSERS, REGISTERS AND GRILLES SHALL BE WHITE FINISH UNLESS NOTED OTHERWISE.

REGISTERS AND CEILING DIFFUSERS: REGISTERS AND CEILING DIFFUSERS INSTALLED IN CEILINGS SHALL BE CAREFULLY LOCATED SO AS TO CREATE A SYMMETRICAL PATTERN WITH OTHER CEILING MOUNTED COMPONENTS. CHECK REFLECTED CEILING PLANS ON ARCHITECTURAL DRAWINGS FOR EXACT LOCATIONS.

SUPPLY, RETURN, AND EXHAUST DIFFUSERS: DIFFUSERS SHALL BE 24" X 24" STEEL MATERIAL, WITHOUT DAMPER.

SUPPLY REGISTERS: REGISTERS SHALL BE PROVIDED WITH INDIVIDUALLY ADJUSTABLE HORIZONTAL AND VERTICAL LOUVERS WITH AN ADJUSTABLE OPPOSED BLADE DAMPER, STEEL MATERIAL.

RETURN AND EXHAUST REGISTERS: RETURN AND EXHAUST REGISTERS SHALL HAVE A DEGREE, 1/2" BLADE SPACING AND AN ADJUSTABLE OPPOSED BLADE DAMPER.

**DUCTWORK INSTALLATION**

PROVIDE NECESSARY OFFSETS, TRANSITIONS AND STREAMLINERS TO AVOID INTERFERENCE WITH THE BUILDING CONSTRUCTION, PIPING, OR EQUIPMENT. LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES.

REPAIR DAMAGED GALVANIZED SURFACES WITH ZINC RICH PAINT.

ENCLOSE DAMPERS LOCATED BEHIND ARCHITECTURAL INTAKE OR EXHAUST LOUVERS IN A SHEET METAL COLLAR AND SEAL TO BUILDING CONSTRUCTION.

SET PLENUM DOORS 6" TO 12" ABOVE FLOOR. ARRANGE DOOR SWINGS SO THAT FAN STATIC PRESSURE HOLDS DOOR IN CLOSED POSITION.

PROVIDE TEMPORARY CLOSURES ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.

PROVIDE STRAIGHT RUNS OF DUCTWORK AT EQUIPMENT, FANS, COILS, AIR TERMINAL UNITS, AND HUMIDIFIERS PER MANUFACTURER'S RECOMMENDATIONS.

PROVIDE FLEXIBLE CONNECTOR WHERE DUCTWORK CONNECTS TO FANS, AIR HANDLING UNITS AND OTHER ROTATING EQUIPMENT AND WHERE INDICATED ON DRAWINGS.

FLEXIBLE DUCTWORK: UNLESS NOTED OTHERWISE, INSTALL FLEXIBLE DUCTWORK AT MAXIMUM LENGTHS OF 5 FEET. PROVIDE SHEETMETAL ELBOW FITTINGS FOR 90 DEGREE TURNS.

**DUCTWORK HANGERS AND SUPPORTS**

HANG AND SUPPORT DUCTWORK PER SMACNA 1995, CHAPTER 4.

DO NOT HANG DUCTWORK FROM PIPING, OTHER DUCTS OR EQUIPMENT.

PROVIDE AT LEAST TWO SUPPORTS FOR EACH LENGTH OF DUCT. INSTALL SUPPORTS ON BOTH SIDES OF DUCT TURNS, BRANCH FITTINGS AND TRANSITIONS.

SUPPORT UNINSULATED RECTANGULAR DUCTS IN SIZES TO 36" BY NON-PERFORATED GALVANIZED STEEL STRAP OR BY TRAPEZOIDAL HANGERS. SUPPORT INSULATED RECTANGULAR DUCT AND DUCT LARGER THAN 36" WITH TRAPEZOIDAL HANGERS.

USE ANGLE IRON "V" CONSTRUCTION SUPPORTS OR SIMILARLY RIGID CONSTRUCTION FOR VERTICAL DUCTING WHICH NEEDS LATERAL SUPPORT.

ANCHOR DUCT AND SUPPORTS TO PREVENT SWAYING. AFTER SYSTEM START-UP REPLACE OR OTHERWISE ALLEVIATE CONDITION OF ANY DUCT SUPPORT ELEMENT WHICH VIBRATES.

WHERE DUCTWORK SYSTEM CONTAINS HEAVY EQUIPMENT, HANG EQUIPMENT INDEPENDENTLY OF THE DUCTWORK.

**DUCT LEAKAGE TESTING:**

- (1) CONDUCT DUCTWORK LEAK TESTING FOR ALL DUCTWORK WITH PRESSURE CLASSIFICATION OF MORE THAN 2" WG, POSITIVE OR NEGATIVE.
(2) PRIOR TO FABRICATION AND INSTALLATION, DEVELOP AND SUBMIT FOR APPROVAL A DUCTWORK TESTING PLAN, INDICATING LOCATIONS OF TEMPORARY CAPS, SQUARE FEET OF DUCTWORK, TEST PRESSURE, LEAKAGE CLASS AND ALLOWABLE LEAKAGE.
(3) NOTIFY THE OWNER'S REPRESENTATIVE AT LEAST (2) DAYS PRIOR TO EACH TEST.
(4) PROVIDE NECESSARY TEST APPARATUS. PROVIDE, AND LATER REMOVE ALL TEMPORARY CAPS OR SEALS NECESSARY TO COMPLETE LEAK TESTING.
(5) AFTER COMPLETING VISUAL INSPECTION, CONDUCT DUCTWORK LEAKAGE TESTS AT THE SPECIFIED PRESSURE CLASS FOR THE DUCT. LEAKAGE SHALL NOT EXCEED A SMACNA LEAKAGE CLASS 3. RESEAL AND RETEST AS REQUIRED TO ACHIEVE SPECIFIED LEAKAGE.
(6) SUBMIT LEAKAGE TEST REPORT FOR APPROVAL, USING SMACNA OR OTHER APPROVED FORM.

**ACCESS DOORS IN DUCTWORK**

PROVIDE ACCESS DOORS IN DUCTWORK TO PERMIT ACCESS TO THE LINKAGE SIDE OF AUTOMATIC DAMPERS, FIRE DAMPERS, SMOKE DAMPER, COMBINATION FIRE/SMOKE DAMPERS, UPSTREAM SIDE OF COILS, FILTERS, HUMIDIFIERS, AIRFLOW MEASURING STATIONS, OTHER EQUIPMENT OR DEVICES REQUIRING ACCESS OR OTHER LOCATIONS AS INDICATED ON DRAWINGS FOR CLEANING, MAINTENANCE, OR INSPECTION PURPOSES.

HANG ACCESS DOORS ON HEAVY GAUGE CONTINUOUS HINGES AND SECURE IN THE CLOSED POSITION BY METAL CLINCHING TYPE CAM LATCHES. HINGES SHALL MOVE FREELY, WHERE SPACE CONDITIONS PRECLUDE HINGES. PROVIDE FOUR HEAVY DUTY CAM-LOCK TYPE LATCHES, IN ADDITION TO A RETAINER CHAIN.

ACCESS DOORS SHALL BE OF DOUBLE WALL INSULATED CONSTRUCTION OF NOT LESS THAN 20 GAUGE SHEET METAL, NEOPRENE GASKETED AROUND THE ENTIRE PERIMETER. INSULATION BETWEEN THE METAL PANELS SHALL BE OF THE SAME THICKNESS AS THE DUCT OR PANEL ADJACENT TO THE ACCESS DOORS. DOORS SHALL MATCH DUCT MATERIAL, TYPE, AND AT A MINIMUM, THE PRESSURE CLASS OF THE DUCT SYSTEM IN WHICH THEY ARE INSTALLED.

MINIMUM SIZE: 24 INCHES BY 24 INCHES WHEN PERMITTED BY DUCT SIZE. FOR SMALLER DUCTS, PROVIDE LARGEST SIZE ACCESS DOOR THAT CAN BE ACCOMMODATED BY DUCT HEIGHT OR WIDTH.

**GENERAL DAMPER CONSTRUCTION REQUIREMENTS**

DAMPERS SHALL BE RATED FOR THE MAXIMUM CLOSE-OFF PRESSURE AT THE INSTALLED LOCATION, BUT NOT LESS THAN THE RATINGS AS INDICATED IN THE DAMPER CONSTRUCTION AND APPLICATION SCHEDULE. DAMPERS INSTALLED IN GALVANIZED DUCTWORK SHALL BE ALL GALVANIZED COMPONENTS INCLUDING BLADES, SHAFTS, BEARINGS, LINKAGES, ETC. OR AS INDICATED IN OTHER SECTIONS.

FIRE DAMPERS, FIRE/SMOKE DAMPERS, SMOKE DAMPERS, AND COMBINATION SMOKE/ISOLATION DAMPERS

**GENERAL:**

- (1) DEVICES SHALL BE OF THE APPROPRIATE SERVICE FOR THE PARTITION RATING INTO WHICH THEY ARE INSTALLED.
(2) DAMPERS SHALL MEET THE REQUIREMENTS OF NFPA 90A AND LABELED IN ACCORDANCE WITH THE LATEST EDITIONS OF UL 555, UL 555S, AND UL 555C.
(3) PROVIDE DYNAMIC RATED DAMPERS
(4) EACH DAMPER SHALL BE RATED TO CLOSE AGAINST THE MAXIMUM DESIGN AIR VELOCITY AND PRESSURE AT ITS INSTALLED LOCATION, WITH AN ADDITIONAL 400 FPM VELOCITY AND 0.5 IN. W.G. STATIC PRESSURE SAFETY FACTOR.
(5) DAMPERS OF ALL RATINGS AND TYPES SHALL BE OF THE NOMINAL 100 PERCENT FACE AREA TYPE, WITH BLADE PACKAGE AND FRAME COMPONENTS OUT OF THE AIRSTREAM (TYPE B). DAMPERS SHALL INCLUDE THE REQUIRED OVERSIZE ENCLOSURES THAT SHALL BE SEALED BY THE DAMPER MANUFACTURER FOR THE APPROPRIATE DUCT PRESSURE CLASS. DAMPERS SHALL HAVE RECTANGULAR, FLAT OVAL OR ROUND DUCT COLLARS FOR CONNECTION TO MATING DUCTWORK.
(6) FURNISH SLEEVES AND MOUNTING ACCESSORIES AS REQUIRED PER CODE.

**FIRE DAMPERS**

- (1) FIRE DAMPERS SHALL BE PROVIDED AS SHOWN ON THE DRAWINGS AND WHEREVER DRAWINGS INDICATE FIRE RATED PARTITIONS.
(2) FUSIBLE LINK TEMPERATURE RATING FOR FIRE DAMPERS SHALL BE 165 DEGREES F, OR 50 DEGREES F ABOVE THE HIGHEST DUCT SYSTEM TEMPERATURE, WHICHEVER IS GREATER.

**BALANCE DAMPERS**

FOR PRESSURE DEPENDENT SYSTEMS, AS A MINIMUM, PROVIDE BALANCE DAMPERS AT EACH BRANCH DUCT, AT EACH OUTLET OR INLET, AND AS INDICATED FOR SUPPLY AIR, RETURN AIR, AND EXHAUST AIR DUCT SYSTEMS.

FOR PRESSURE INDEPENDENT SYSTEMS, AS A MINIMUM, BALANCE DAMPERS SHALL BE PROVIDED AT EACH BRANCH FOR EACH OUTLET DOWNSTREAM OF EACH SUPPLY AIR TERMINAL AIRFLOW UNIT (TAU) AND AT EACH BRANCH INLET UPSTREAM OF EACH RETURN AIR OR EXHAUST AIR TAU BOX AND AS INDICATED.

COMPLY WITH SMACNA REQUIREMENT AND PROVIDE CONTINUOUS ROD AND BEARINGS ON EACH END OF SHAFT REGARDLESS OF PRESSURE CLASS.

USE 3/8 INCH CONTINUOUS SQUARE ROD AND 16 GAUGE STIFFENED BLADE FOR DUCT SIZES 18 INCHES WIDE BY 18 INCHES HIGH AND SMALLER, OR 12 INCHES DIAMETER AND SMALLER.

USE 1/2 INCH CONTINUOUS SQUARE ROD AND 16 GAUGE STIFFENED BLADE FOR SINGLE BLADE DAMPERS IN DUCTS 19 INCHES TO 48 INCHES WIDE BY A MAXIMUM OF 10 INCHES HIGH; AND IN 12-INCH TO 16-INCH ROUND DUCTS.

WHEN MULTI-BLADE DAMPERS ARE REQUIRED, USE A MANUFACTURED 16 GAUGE, STIFFENED, OPPOSED BLADE DAMPER IN A 14 GAUGE HAT CHANNEL STEEL FRAME WITH REINFORCED CORNERS. ALL HARDWARE SHALL BE GALVANIZED, EXCEPT USE BRASS TRUNNIONS AND BRONZE, STEEL, OR SYNTHETIC BEARINGS.

QUADRANT SHALL BE LOCKING TYPE.

QUADRANT END OF DAMPER ROD SHALL BE FACTORY SLOTTED TO INDICATE BLADE POSITION.

PROVIDE GALVANIZED OR STAINLESS STEEL SHEET METAL "HAT SECTION" ON DUCTS WITH EXTERIOR INSULATION SO THAT QUADRANT WILL BE EXPOSED. PROVIDE TIGHT SEALING NYLON BRUSHING AT DUCT OPENING FOR DAMPER SHAFT UNDER HAT SECTION.

EACH SQUARE ROD SHALL BE INSTALLED SO THAT QUADRANT WILL BE ACCESSIBLE FOR ADJUSTING.

PROVIDE 24-INCH-BY-24-INCH ACCESS DOOR THROUGH CEILING OR WALL CONSTRUCTION FOR EACH BALANCE DAMPER THAT IS NOT ACCESSIBLE.

**REGISTERS, GRILLES AND DIFFUSERS**

**GENERAL:**

- (1) DIFFUSERS, GRILLES, AND REGISTERS SHALL BE OF STEEL OR ALUMINUM CONSTRUCTION, FACTORY PRIMED AND PAINTED WITH BAKED ENAMEL OR ACRYLIC, WHITE COLOR, UNLESS OTHERWISE SCHEDULED.
(2) DIFFUSERS, REGISTERS AND GRILLES SHALL BE COMPATIBLE WITH THE DESIGNED CEILING/WALL TYPE. PROVIDE REGISTERS AND GRILLES WITH FRAMES THAT ARE COMPATIBLE WITH ADJACENT CONSTRUCTION, WITH COUNTERSUNK MOUNTING HOLES. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT DETAILS OF CEILING/WALL CONSTRUCTION.
(3) ENGINEERING DATA SHALL BE BASED UPON TESTS CONDUCTED IN ACCORDANCE WITH THE LATEST ASHRAE STANDARD 70, METHOD OF TESTING FOR RATING THE PERFORMANCE OF AIR OUTLETS AND INLETS AT NON-ISOTHERMAL CONDITIONS. PUBLISHED NOISE CRITERIA (NC) DATA SHALL BE DETERMINED BASED UPON A 10 DB ROOM ATTENUATION! ACROSS ALL OCTAVE BANDS. LAB TEST REPORTS SHALL BE AVAILABLE UPON REQUEST.
(4) THE DIFFUSERS SHALL BE CONSTRUCTED WITH AN INTEGRAL LEAK-PROOF COLLAR EXTENDING MINIMUM 1 INCH ABOVE THE CORE TO ACCOMMODATE DUCT CONNECTION. SQUARE AND RECTANGULAR COLLARS SHALL HAVE WELDED CORNERS.

**RETURN AND EXHAUST DIFFUSER:**

- (1) DIFFUSERS SHALL BE SQUARE WITH NECK SIZES AS INDICATED ON DRAWINGS.
(2) THE DIFFUSERS SHALL BE CONSTRUCTED WITH AN INTEGRAL LEAK-PROOF COLLAR EXTENDING MINIMUM 1 INCH ABOVE THE CORE TO ACCOMMODATE DUCT CONNECTION. SQUARE AND RECTANGULAR COLLARS SHALL HAVE WELDED CORNERS.
(3) SIDEWALL ADJUSTABLE SUPPLY REGISTER:
(1) SIDEWALL REGISTERS SHALL HAVE MITERED CORNERS, DOUBLE

DEFLECTION ADJUSTABLE BLADES, AND HORIZONTAL FRONT BLADES.

LOW WALL RETURN/EXHAUST REGISTERS:

- (1) RETURN AND EXHAUST REGISTERS SHALL HAVE (1) SET OF FIXED BLADES, 42 TO 45 DEGREE DEFLECTION.
(2) WALL RETURN AND EXHAUST REGISTERS MOUNTED 18 INCHES AFF OR LOWER, SHALL BE HAVE MITERED CORNERS, FIXED BLADES, HORIZONTAL FRONT LOUVERS. FRAME AND BLADE SHALL BE MANUFACTURED OF MINIMUM 8 GAUGE ALUMINUM OR 12 GAUGE STEEL FOR RUGGED USE.

LOW WALL REGISTERS SHALL UTILIZE A HINGED REGISTER FACE WITH TURN SCREWS FOR ACCESS TO FILTER MEDIA, MOUNTED IN A FACTORY PROVIDED CHANNEL BEHIND THE REGISTER FACE.

**SUPPLY AND RETURN BAR GRILLE**

- (1) BAR GRILLES SHALL BE EXTRUDED ALUMINUM, NOMINAL 1/8 INCH WIDE BARS WITH 0 DEGREE DEFLECTION, ON MAXIMUM 1/4 INCH CENTERS, OR AS SCHEDULED.
(2) CONTINUOUS GRILLES OVER 72 INCHES IN LENGTH SHALL BE BUTTED TOGETHER USING KEVED SPLICES FOR PRECISE ALIGNMENT.
(3) CONCEALED SPRING LATCH FASTENERS SHALL BE USED FOR ATTACHING GRILLE TO PLASTER FRAME. NO SCREW HOLES SHALL BE VISIBLE ON PLASTER FRAME OR GRILLE.
(4) PROVIDE BLANK-OFF BAFFLES FOR INACTIVE SECTIONS OF GRILLES, AS NOTED ON THE DRAWINGS.

**SHEET METAL ACCESSORIES INSTALLATION**

INSTALL SHEET METAL ACCESSORIES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, CONTRACT DRAWINGS AND APPROVED SUBMITTALS.

SHEET METAL MATERIALS SHALL BE FREE OF PITTING, SEAM MARKS, ROLLER MARKS, STAINS, DISCOLORATIONS, AND OTHER IMPERFECTIONS.

REFER TO OTHER RELATED SECTIONS FOR INSTALLATION REQUIREMENTS, INCLUDING JOINT CONNECTIONS AND SEALANT REQUIREMENTS.

INSTALL DUCT ACCESSORIES ACCORDING TO APPLICABLE DETAILS IN SMACNA "HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE."

INSTALL DUCT ACCESSORIES OF MATERIALS SUITED TO DUCT MATERIALS. USE GALVANIZED-STEEL ACCESSORIES IN GALVANIZED-STEEL DUCTS, STAINLESS-STEEL ACCESSORIES IN STAINLESS STEEL DUCTS, USE ALUMINUM ACCESSORIES IN ALUMINUM DUCTS.

**DUCT ACCESS DOORS INSTALLATION**

LOCATE ACCESS DOORS SO THEY CAN BE OPENED COMPLETELY WITHOUT INTERFERENCES AND TO ALLOW EASY ACCESS BY MAINTENANCE PERSONNEL. DOOR LABELS AND LETTERING ON LABELS SHALL BE IN ACCORDANCE WITH THE MECHANICAL IDENTIFICATION SECTION. PROVIDE 1-INCH-HIGH MINIMUM LETTERS.

FIRE, SMOKE, COMBINATION FIRE/SMOKE DAMPER OR SIMILAR AUTOMATIC SHUTTING DEVICE ACCESS DOORS SHALL BE MOUNTED DOWNSTREAM (AFTER SHUTOFF) TO PERMIT RESETTING AND INSPECTION.

DOORS SHALL SEAL TIGHTLY INTO FRAME.

LABEL ACCESS DOORS TO NOTE EQUIPMENT THAT IS ACCESSED THROUGH THE DOOR. LABELS AND LETTERING ON LABELS SHALL BE IN ACCORDANCE WITH THE MECHANICAL IDENTIFICATION SECTION. PROVIDE 1-INCH-HIGH MINIMUM LETTERS.

**DUCT TEST HOLES INSTALLATION**

PROVIDE DUCT TEST HOLES WHERE REQUIRED FOR TESTING AND BALANCING PURPOSES AND AS SHOWN ON DRAWINGS.

**DAMPER INSTALLATION**

DAMPERS SHALL BE INSTALLED SQUARE AND PLUMB TO CASING, DUCT, WALL, ETC. WITHOUT RACKING. ALIGN AND ADJUST DAMPERS TO ENSURE PROPER OPENING AND CLOSING WITHOUT BINDING OR HESITATION.

SEAL COMPLETELY AROUND FRAME.

INSTALL DAMPERS DESIGNED FOR HORIZONTAL MOUNTING IN HORIZONTAL ORIENTATION, AND DAMPERS DESIGNED FOR VERTICAL MOUNTING IN VERTICAL ORIENTATION.

ADEQUATELY REINFORCE MULTIPLE SECTION DAMPERS PER MANUFACTURER'S RECOMMENDATIONS.

INSTALL DAMPERS SO QUADRANTS WILL BE ACCESSIBLE FOR ADJUSTING.

COORDINATE ACCESS THROUGH CEILINGS OR WALLS TO ENSURE EACH DAMPER IS ACCESSIBLE.

INSTALL VOLUME DAMPERS AT POINTS ON SUPPLY, RETURN, AND EXHAUST SYSTEMS WHERE BRANCHES EXTEND FROM LARGER DUCTS. WHERE DAMPERS ARE INSTALLED IN DUCTS HAVING DUCT LINER, INSTALL DAMPERS WITH HAT CHANNELS OF SAME DEPTH AS LINER, AND TERMINATE LINER WITH HOSING AT HAT CHANNEL.

SET DAMPERS TO FULLY OPEN POSITION BEFORE TESTING, ADJUSTING, AND BALANCING.

**FIRE, SMOKE, AND COMBINATION FIRE/SMOKE DAMPERS INSTALLATION**

PROVIDE SLEEVES, MOUNTING ANGLES, AND ALL OTHER REQUIRED ACCESSORIES.

FIRE DAMPERS SHALL NOT BE INSTALLED IN HAZARDOUS EXHAUST SYSTEMS.

DEMONSTRATE RE-SETTING OF FIRE DAMPERS TO AUTHORITIES HAVING JURISDICTION.

INSTALL FIRE, SMOKE, AND COMBINATION FIRE AND SMOKE DAMPERS ACCORDING TO UL LISTING.

**REGISTERS, GRILLES AND DIFFUSERS INSTALLATION**

SUPPORT DEVICES INDEPENDENT OF THE CEILING CONSTRUCTION WHEN REQUIRED FOR SAFE AND WORKMANLIKE INSTALLATION.

PAINT VISIBLE DUCT, MOUNTING CLIPS, AND ACCESSORIES BEHIND REGISTERS AND GRILLES FLAT BLACK.

ADJUST THROW PATTERNS AS SHOWN ON DRAWINGS.

**FIELD QUALITY CONTROL**

TESTS AND INSPECTIONS:

- (1) OPERATE DAMPERS AND OPERATORS TO VERIFY FULL RANGE OF MOVEMENT.
(2) INSPECT LOCATIONS OF ACCESS DOORS AND VERIFY PROPER LABELING AND ACCESS TO EQUIPMENT.
(3) OPERATE FIRE, SMOKE, AND COMBINATION FIRE AND SMOKE DAMPERS TO VERIFY FULL RANGE OF MOVEMENT AND VERIFY THAT PROPER HEAT-RESPONSE DEVICE IS INSTALLED.
(4) INSPECT TURNING VANES FOR PROPER AND SECURE INSTALLATION.

**COMMISSIONING**

PERFORM THE COMMISSIONING ACTIVITIES AS OUTLINED IN THE DIVISION 01 SECTION COMMISSIONING AND OTHER REQUIREMENTS OF THE CONTRACT DOCUMENTS.

END OF SECTION 23 33 00

**SECTION 26 05 33 - ELECTRICAL MATERIALS AND METHODS**

**CONDUIT REQUIREMENTS**

CONDUITS SHALL BE ELECTRICAL METALLIC TUBING (EMT) ELECTRO-GALVANIZED OR HOT DIPPED GALVANIZED INSIDE AND OUTSIDE. FITTINGS AND BUSHINGS SHALL BE GALVANIZED STEEL SET SCREW TYPE.

FINAL CONNECTIONS TO MOTORS, TRANSFORMERS AND EQUIPMENT SUBJECT TO VIBRATION OR REMOVAL FOR MAINTENANCE SHALL BE 1/2" MINIMUM LIQUID TIGHT FLEXIBLE METALLIC CONDUIT WITH STEEL LIQUID TIGHT FITTINGS. TRANSFORMER CONNECTIONS MAY BE NON-LIQUID TIGHT FLEXIBLE METALLIC CONDUIT IN ELECTRICAL ROOMS ONLY.

CONNECTIONS TO RECESSED POWER RECEPTACLES, AND LIGHT SWITCHES, IN AREAS WITH ACCESSIBLE CEILINGS:

- (1) IN EXISTING PARTITIONS AND WALLS WHERE THE SURFACE IS NOT BEING OTHERWISE OPENED UP, THE FINAL CONNECTIONS TO NEW DEVICES MAY BE MADE USING FLEXIBLE METALLIC CONDUIT OR TYPE MC CABLE CONNECTIONS TO OTHER RECESSED DEVICES, (INCLUDING COMMUNICATION OUTLET BOXES, JUNCTION OR PULL BOXES, ETC.) SHALL BE WITH STANDARD CONDUIT OF THE TYPE APPROPRIATE FOR THE WALL CONSTRUCTION.

FLEXIBLE METALLIC CONDUIT SHALL BE GALVANIZED STEEL OR ALUMINUM. FITTINGS SHALL BE OF STEEL WITH CADMIUM OR GALVANIZED FINISH. FITTINGS SHALL BE MACHINE SCREW CLAMP TYPE, SINGLE OR TWO-PIECE. SELF-LOCKING, TWIST-IN TYPE FITTINGS ARE NOT ACCEPTABLE.

LIQUID TIGHT FLEXIBLE METALLIC CONDUIT SHALL CONSIST OF A FLEXIBLE, GALVANIZED STEEL CORE, A CONTINUOUS COPPER GROUND STRIP AND A POLYVINYL CHLORIDE JACKET. FITTINGS SHALL BE STEEL LIQUID TIGHT GROUNDING TYPE FROM THE SAME MANUFACTURER AS THE CONDUIT.

SIZE CONDUITS IN ACCORDANCE WITH THE NEC, BUT NOT LESS THAN THE SIZES SHOWN ON THE DRAWINGS. MINIMUM POWER AND CONTROL CONDUIT SIZE SHALL BE 1/2". MINIMUM TELECOMMUNICATIONS CONDUIT SIZE SHALL BE 1".

INSTALL CONCEALED AND EXPOSED CONDUITS AND CABLE TRAYS PARALLEL TO OR AT RIGHT ANGLES TO BUILDING LINES. CONDUITS SHALL NOT BE EMBEDDED IN CONCRETE SLABS EXCEPT WHERE SPECIFICALLY SHOWN. INSTALL SURFACE RACEWAYS AS CLOSE TO ROOM CORNERS OR TRIM FEATURES AS POSSIBLE TO MAKE THE SURFACE RACEWAYS LESS OBVIOUS. WHERE CONDUITS ARE ROUTED OVER BEAMS AND UNDER CORRUGATED DECKING, CONDUITS SHALL BE OFFSET 3" BELOW THE DECKING TO AVOID DAMAGE FROM FUTURE DECKING PENETRATIONS.

MAKE DIRECTIONAL CHANGES IN PRIMARY POWER DISTRIBUTION CONDUITS ABOVE GROUND WITH SWEEPS AND LONG RADIUS ELBOWS.

CONCEAL CONDUITS WHEREVER POSSIBLE AND PRACTICAL. WHEN CONDUITS CANNOT BE CONCEALED IN FINISHED AREAS, USE SURFACE RACEWAYS WITH MATCHING BOXES FROM THE SAME MANUFACTURER AS THE RACEWAYS.

METAL CONDUITS, FITTINGS, ENCLOSURES AND RACEWAYS SHALL BE MECHANICALLY JOINED TOGETHER IN A FIRE ASSEMBLY TO FORM A CONTINUOUS ELECTRICAL CONDUCTOR PROVIDING EFFECTIVE ELECTRICAL GROUNDING CONTINUITY.

PROVIDE EXPANSION FITTINGS BETWEEN ADJACENT BUILDINGS, AT BUILDING EXPANSION JOINTS AND IN STRAIGHT RUNS AT THE INTERVALS SPECIFIED IN THE MANUFACTURER'S INSTRUCTIONS.

LOW VOLTAGE SIGNAL CIRCUITS SHALL BE SEPARATED OR SHIELDED FROM POWER CIRCUITS TO PREVENT THE INDUCTION OF NOISE INTO THE SIGNAL CIRCUITS.

EMT ENTERING SHEET METAL ENCLOSURES AND OUTLET BOXES SHALL BE SECURED IN PLACE BY A CONNECTOR WITH A LOCKNUT. RIGID CONDUIT SHALL BE SECURED WITH LOCKNUT INSIDE AND OUTSIDE AND A BUSHING. SUFFICIENT THREAD ON THE CONNECTOR OR CONDUIT SHALL EXTEND INTO THE ENCLOSURE SO THAT THE BUSHING WILL BUTT TIGHT INTO THE CONNECTOR OR CONDUIT. BUSHINGS SHALL NOT BE USED AS JAMB NUTS OR IN LIEU OF LOCKNUTS.

FLEXIBLE METALLIC CONDUIT TO MOTORS AND SIMILAR EQUIPMENT SHALL NOT EXCEED 3'-0" IN LENGTH, AND SHALL HAVE ADEQUATE SLACK TO ABSORB THE MAXIMUM VIBRATION. FLEXIBLE CONDUIT CONNECTIONS TO LIGHTING FIXTURES SHALL NOT EXCEED 6'-0" IN LENGTH.

**BOX REQUIREMENTS**

PROVIDE SHEET STEEL OUTLET BOXES, EXTENSIONS, AND PLASTER RINGS FOR EMT, FLEXIBLE METAL CONDUIT, AND TYPE MC CABLE.

BOXES SHALL BE SIZED FOR ALL CONDUCTORS AND DEVICES TO BE CONTAINED WITHIN. BOX EXTENSIONS SHALL NOT BE USED TO CORRECT FOR UNDERSIZED BOXES. A SINGLE EXTENSION MAY BE USED AS FOLLOWS ONLY IF ALL FREE CONDUCTORS EXTEND AT LEAST 3 INCHES OUTSIDE OF THE EXTENSION OPENING.

- (1) ON BOXES BEING FLUSH MOUNTED IN MASONRY WALLS.
(2) ON EXISTING BOXES IN WALLS THAT ARE BEING FURRED OUT.
(3) ON EXISTING BOXES FOR CONNECTING TO AN EXISTING CIRCUIT.
(4) ON FIRE ALARM, SECURITY AND CLOCK SYSTEM BOXES WHERE REQUIRED BY THE SYSTEM MANUFACTURER'S INSTRUCTIONS.

PLASTER RINGS SHALL NOT BE CONSIDERED BOX EXTENSIONS, BUT THEIR CAPACITIES MAY BE INCLUDED IN BOX FILL CALCULATIONS.

BOX COVERS SHALL BE FASTENED IN PLACE BY MACHINE SCREWS OR HINGES AND LATCHES. SELF-TAPPING OR SHEET METAL FASTENERS ARE NOT ACCEPTABLE.

**SUPPORT REQUIREMENTS**

SURFACE MOUNTED EQUIPMENT SHALL BE SECURED TO STEEL CHANNELS. THE CHANNELS SHALL BE ATTACHED WITH TOGGLE BOLTS TO HOLLOW TILE, BLOCK OR SIMILAR SURFACES, AND ATTACHED WITH SCREWS OR BOLTS AND EXPANSION SHIELDS TO SOLID MASONRY OR CONCRETE.

HANGERS AND BRACKETS SHALL BE MADE OF STEEL PIPE, CHANNEL IRON, ANGLE IRON OR PREFABRICATED STEEL CHANNEL.

ANCHORS SHALL BE LEAD SHIELD ANCHORS OR PLASTIC EXPANSION ANCHORS FOR SMALL LOADS, AND EXPANSION OR EPOXY ANCHORS FOR LARGE LOADS. POWDER-DRIVEN ANCHORS SHALL NOT BE USED.

SUPPORT ALL ELECTRICAL ITEMS INDEPENDENTLY OF SUPPORTS PROVIDED BY THE OTHER TRADES.

SUPPORT CONDUITS AND BOXES USING STEEL CONDUIT STRAPS OR 1/4-INCH MINIMUM DIAMETER THREADED ROD HANGERS. SUSPENDED CEILING HANGERS OR HANGER WIRE SHALL NOT BE USED.

HANGERS SHALL BE OF SUFFICIENT STRENGTH THAT THEIR DEFLECTION AT MID SPAN DOES NOT EXCEED 1/240 OF THE HANGER SPAN LENGTH AFTER THE CABLES ARE INSTALLED.

ROUTE FLEXIBLE METALLIC CONDUIT, MANUFACTURED WIRING SYSTEMS AND TYPE MC CABLE PARALLEL TO OR PERPENDICULAR TO BUILDING LINES, AND IN A HEAT AND WORKMANLIKE MANNER. COIL THE EXCESS AND SUPPORT INDEPENDENTLY OF THE CEILING GRID SYSTEM.

PENETRATIONS, SLEEVES AND FIRE SEALS

CUT FLOOR AND WALL PENETRATIONS NEATLY AND TO THE MINIMUM SIZE REQUIRED FOR INSTALLATION OF THE EQUIPMENT AND RACEWAYS.

PROVIDE GALVANIZED STEEL PIPE SLEEVES FOR ALL CONDUITS PENETRATING FLOORS, EXTERIOR WALLS AND ROOFS.

EXTEND FLOOR SLEEVES ABOVE THE FLOOR A MINIMUM OF 2 INCHES.

EMBED SLEEVES IN NEW CONCRETE OR STEP-CORE CONCRETE AND GROUT SLEEVES INTO EXISTING CONCRETE WITH EPOXY GROUT.

SEAL FLOOR SLEEVES USING FIRE-SEALING SYSTEMS APPROVED BY A NATIONALLY RECOGNIZED TESTING LABORATORY.

PATCH BOTH SIDES OF WALL PENETRATIONS CUT FOR ELECTRICAL EQUIPMENT AND RACEWAYS TO SEAL AGAINST THE PASSAGE OF AIR, SOUND AND FIRE.

SEAL CONDUIT PENETRATIONS IN FIRE RATED WALLS USING FIRE-SEALING CAULK APPROVED BY A NATIONALLY RECOGNIZED TESTING LABORATORY.

SEAL CONDUIT PENETRATIONS IN NON-RATED WALLS USING MASONRY MATERIALS THAT MATCH THE WALL CONSTRUCTION.

FIRE SEAL BETWEEN RECESSED OUTLET BOXES LOCATED ON OPPOSITE SIDES OF A FIRE RATED WALL IF THE BOX OPENINGS ARE OVER 16 SQUARE INCHES AND THE BOXES ARE LESS THAN 24 INCHES APART.

**FIELD QUALITY CONTROL**

PERFORM VISUAL INSPECTIONS TO VERIFY THE FOLLOWING:

- (1) THE EQUIPMENT IS PROPERLY INSTALLED AND ANCHORED.
(2) THE EQUIPMENT IS FREE FROM DAMAGE AND DEFECTS.
(3) ELECTRICAL TERMINATIONS HAVE BEEN PROPERLY TIGHTENED.
(4) THE EQUIPMENT HAS BEEN THOROUGHLY CLEANED INSIDE AND OUTSIDE.
(5) THE EQUIPMENT IS PROPERLY LABELED AND LABELS ARE CORRECT.

END OF SECTION 26 05 33

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Table with 2 columns: A, PRELIMINARY, 12/17/2019. Includes revision table with columns for REVISION and DATE.

Table with 2 columns: PLOT DATE, 12/17/2019 8:12 AM; DRAWN BY, KZIMES; REVIEWED BY, DWNWIETHAMMER; PROJECT MANAGER, DWNWIETHAMMER.

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**GENERAL NOTES**

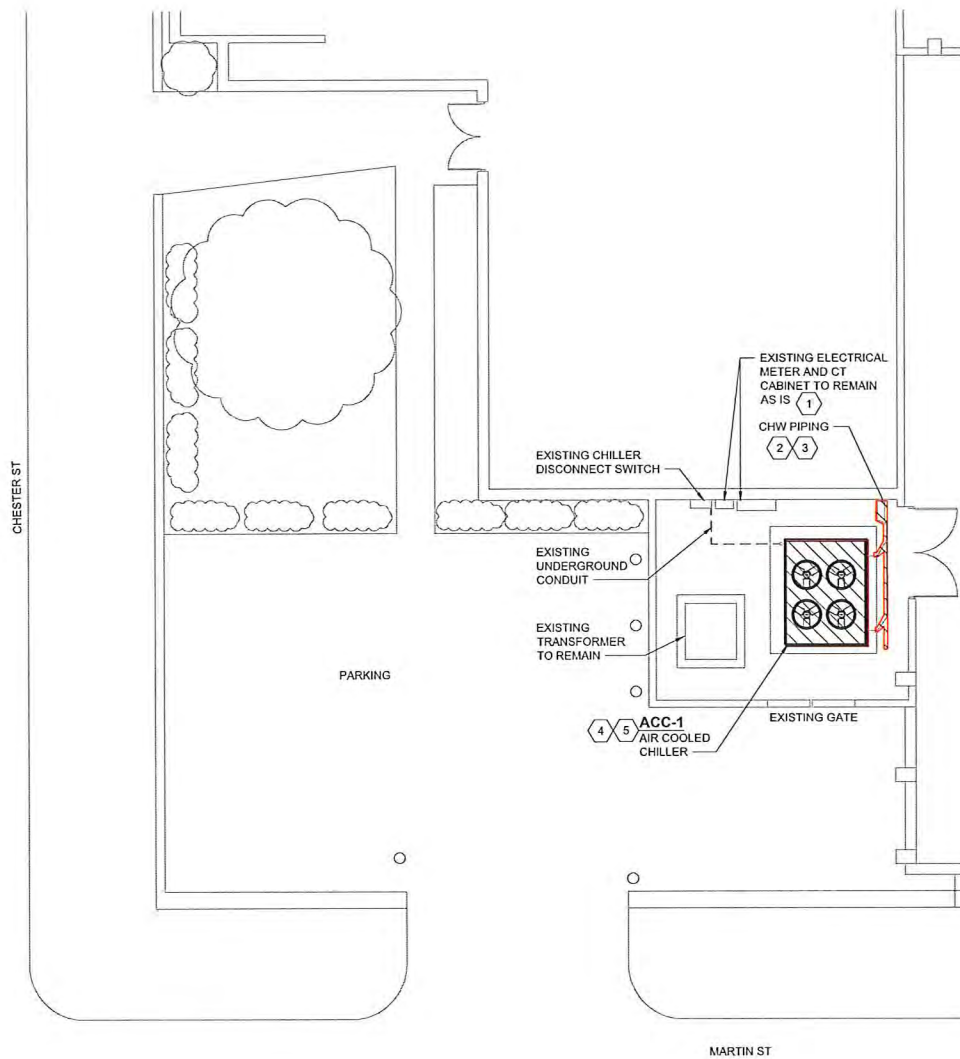
1. SEE GENERAL NOTES, SPECIFICATIONS, AND ADDITIONAL PROJECT INFORMATION.
2. HATCHING DENOTES ITEMS TO BE DEMOLISHED
3. SEE LEGEND ON MEP1.1

**DRAWING KEYNOTES (DEMOLITION)**

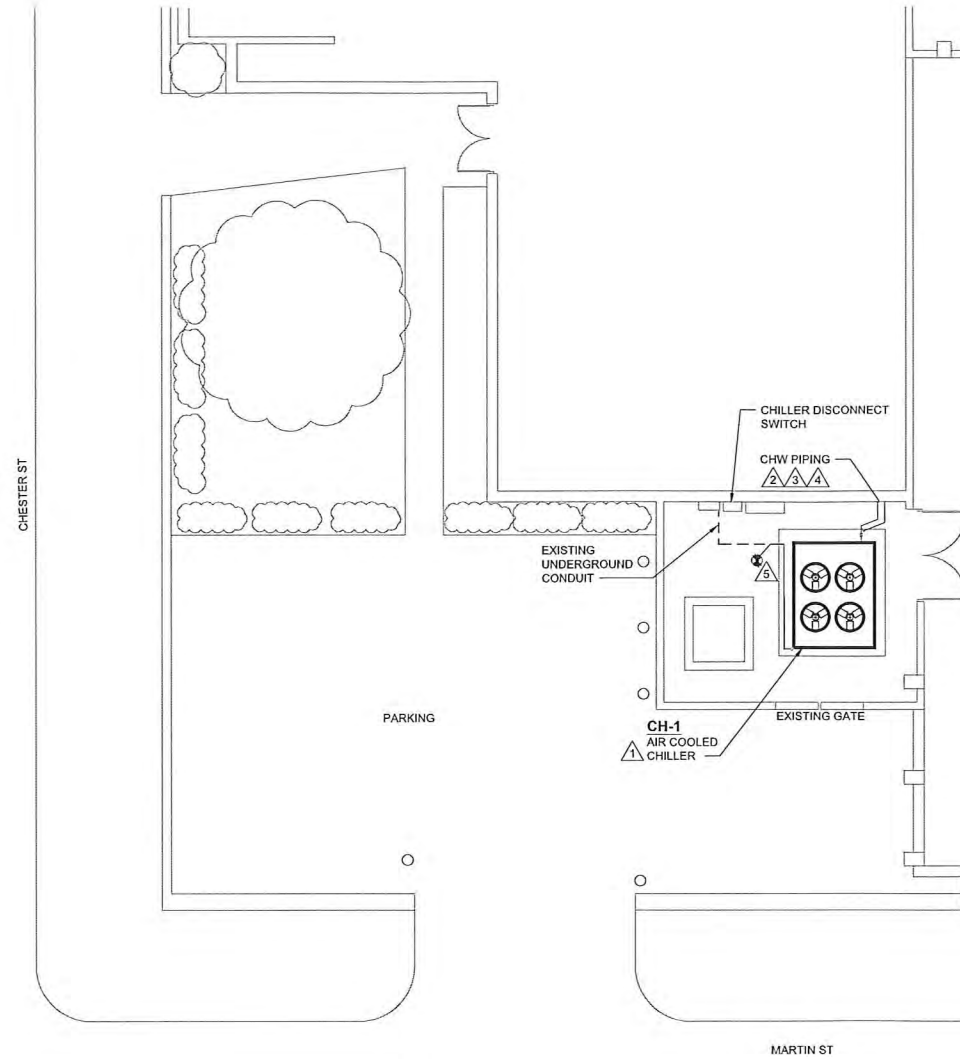
- (X) DEMOLITION KEYNOTES
1. DISCONNECT ELECTRICAL POWER TO CHILLER. DEMOLISH WIRE BACK TO DISCONNECT SWITCH. EXISTING RACEWAY SHALL REMAIN AS IS.
  2. DISCONNECT PANEL TO HEAT TRACING AND REMOVE
  3. DISCONNECT AND DEMOLISH EXISTING CHILLED WATER PIPING TO CHILLER. REMOVE PIPING BACK TO WALL
  4. RECLAIM REFRIGERANT FROM CHILLER PRIOR TO DEMOLITION
  5. DISCONNECT, RIG, REMOVE, AND PROPERLY DISPOSE OF EXISTING CHILLER

**DRAWING KEYNOTES (NEW WORK)**

- (A) NEW WORK KEYNOTES
1. PURCHASE NEW CHILLER (CH-1), RECEIEVE, UNLOAD AND RIG, AND INSTALL ON EXISTING CONCRETE PAD
  2. INSTALL NEW CHILLED WATER (CHW) PIPING FROM EXISTING AT WALL TO NEW CHILLER
  3. RE-INSTALL HEAT TRACING ON NEW CHW PIPING
  4. INSTALL NEW INSULATION ON CHW PIPING
  5. EXTEND ELECTRICAL CONDUIT (ABOVE GROUND) TO NEW CHILLER. INSTALL NEW WIRE (X#X,#XG) FROM DISCONNECT SWITCH TO CHILLER.



**PARTIAL SITE PLAN - DEMOLITION**  
SCALE: 1/8"=1'-0" @ 24x36 SHEET



**PARTIAL SITE PLAN - NEW WORK**  
SCALE: 1/8"=1'-0" @ 24x36 SHEET



**KEY PLAN**  
SCALE: NO SCALE

**PRELIMINARY**  
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**HVAC EQUIPMENT UPGRADES**

MECHANICAL

PARTIAL  
SITE  
PLAN

PROJ. NO.: 13063.01

**MEP1.0 A**  
SHEET NO. REV





**GENERAL NOTES**

- SEE GENERAL NOTES, SPECIFICATIONS, LEGEND, AND ADDITIONAL PROJECT INFORMATION.
- HATCHING DENOTES ITEMS TO BE DEMOLISHED

**DRAWING KEYNOTES**

(X) DEMOLITION KEYNOTES

- DISCONNECT AND DEMOLISH EXISTING CONTROL PANELS ALONG WITH EXISTING COMMUNICATION WIRING BETWEEN PANELS. EXISTING RACEWAYS SHALL REMAIN AS IS.
- DEMOLISH EXISTING NATURAL GAS PIPING FROM BOILERS BACK TO NATURAL GAS MAIN IN CEILING IN BOILER ROOM.
- DISCONNECT AND DEMOLISH EXISTING BOILERS AND ASSOCIATED FLUE AS SHOWN. REMOVE FLUE BACK TO MAIN DUCT AND CAP.
- DISCONNECT POWER TO EXISTING HHV PUMPS, AND DEMOLISH. REMOVE WIRING FROM DISCONNECT TO PUMPS. EXISTING RACEWAY SHALL REMAIN AS IS.
- DISCONNECT AND DEMOLISH CHEMICAL "SHOT" FEEDER AND EXPANSION TANK

**LEGEND**

	WATER PUMP
	TIE-IN POINT
	DIAMETER
	ANALOG INPUT
	ANALOG OUTPUT
	DIGITAL INPUT
	DIGITAL OUTPUT
	MOTOR STARTER
	CURRENT SENSING RELAY
	ISOLATION/SHUT-OFF VALVE
	CHECK VALVE
	BUTTERFLY VALVE
	STRAINER
	TRIPLE DUTY VALVE
	CIRCUIT SETTER
	DRAIN/VENT
	REDUCER
	UNION
	FLEXIBLE CONNECTION
	PIPE INSULATION
	PRESSURE RELIEF VALVE
	FLOW SWITCH
	INSTRUMENT WELL
	TEMPERATURE INDICATOR
	TEMPERATURE SENSOR
	PRESSURE INDICATOR
	RECEPTACLE

**ABBREVIATIONS**

ACC	AIR COOLED CHILLER
AHU	AIR HANDLING UNIT
B	BOILER
CH	CHILLER
CHW	CHILLED WATER
CHWP	CHILLED WATER PUMP
CP	CONTROL PANEL
GHW	GAS HOT WATER (HEATER)
HHW	HEATING HOT WATER
HHWP	HEATING HOT WATER PUMP
MCP	MASTER CONTROL PANEL
MUA	MAKE-UP AIR



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DRAWN BY: KZIMES		
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PROJECT MANAGER: DWNIEHAMMER		
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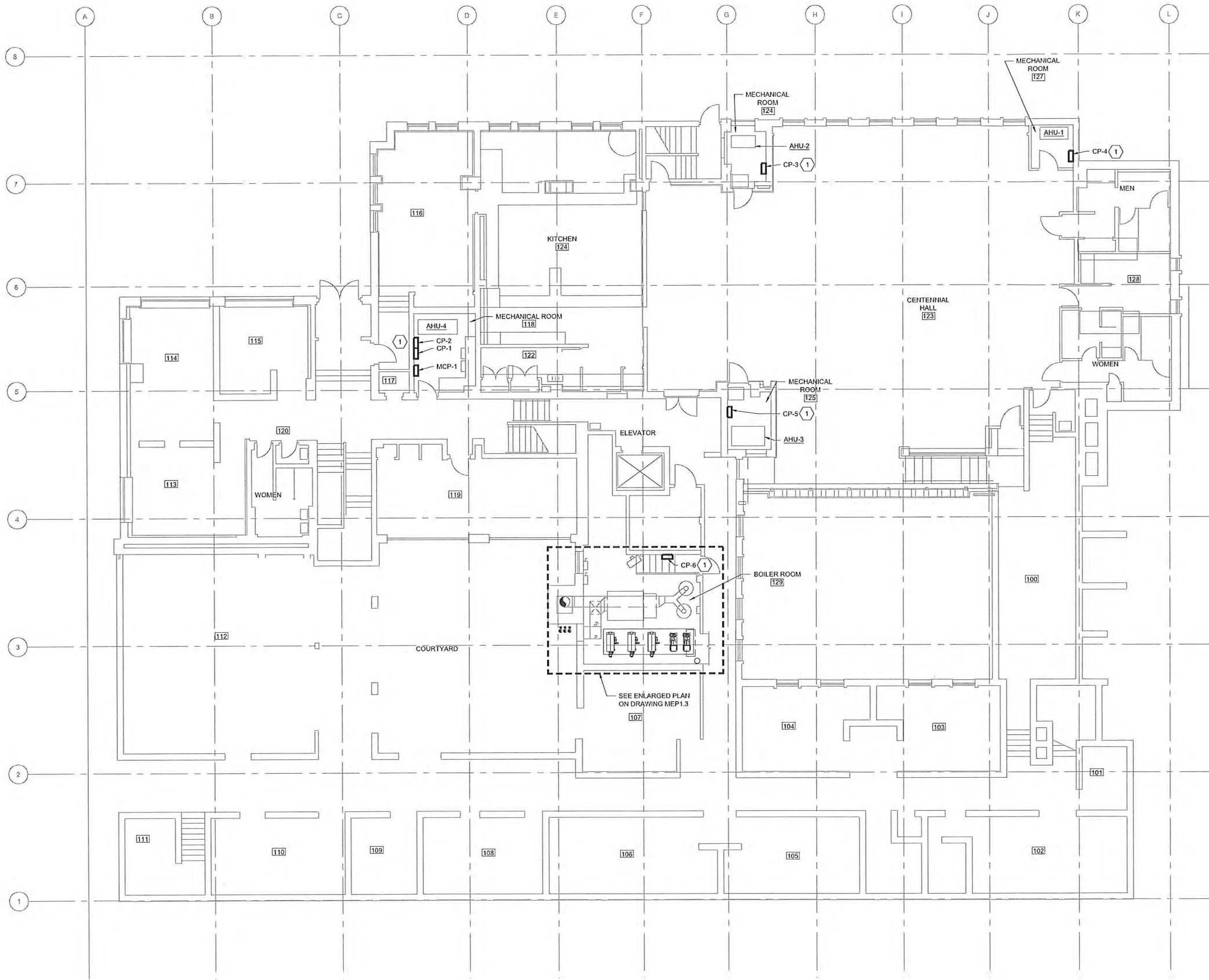
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**HVAC EQUIPMENT UPGRADES**

MEP
LOWER LEVEL
MEP
DEMOLITION
PROJ. NO.: 13063.01
<b>MEP1.1</b>
SHEET NO. REV

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**LOWER LEVEL PLAN - DEMOLITION**  
SCALE: 1/8"=1'-0" @ 24x36 SHEET





**GENERAL NOTES**

1. SEE GENERAL NOTES, SPECIFICATIONS, AND ADDITIONAL PROJECT INFORMATION.
2. HATCHING DENOTES ITEMS TO BE DEMOLISHED
3. SEE LEGEND ON MEP1.1

**DRAWING KEYNOTES**

- (X) NEW EQUIPMENT KEYNOTES
1. INSTALL NEW CONTROL PANELS IN MECHANICAL ROOMS AS SHOWN. CONNECT EXISTING RACEWAY TO NEW PANELS. PULL NEW COMMUNICATION WIRING (PER DETAIL ON MEP4.0) ALONG WITH PULL STRING.



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**LOWER LEVEL PLAN NEW WORK**  
 SCALE: 1/8"=1'-0" @ 24x36 SHEET

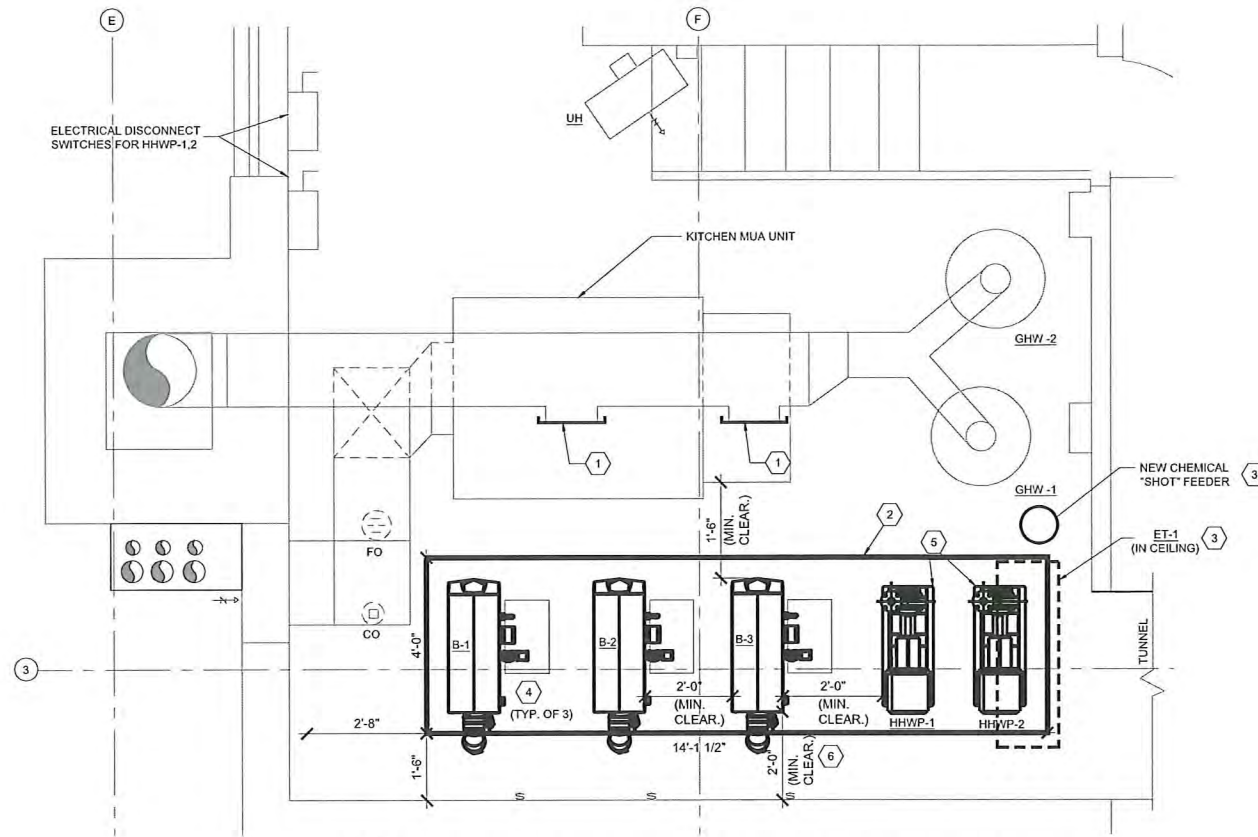
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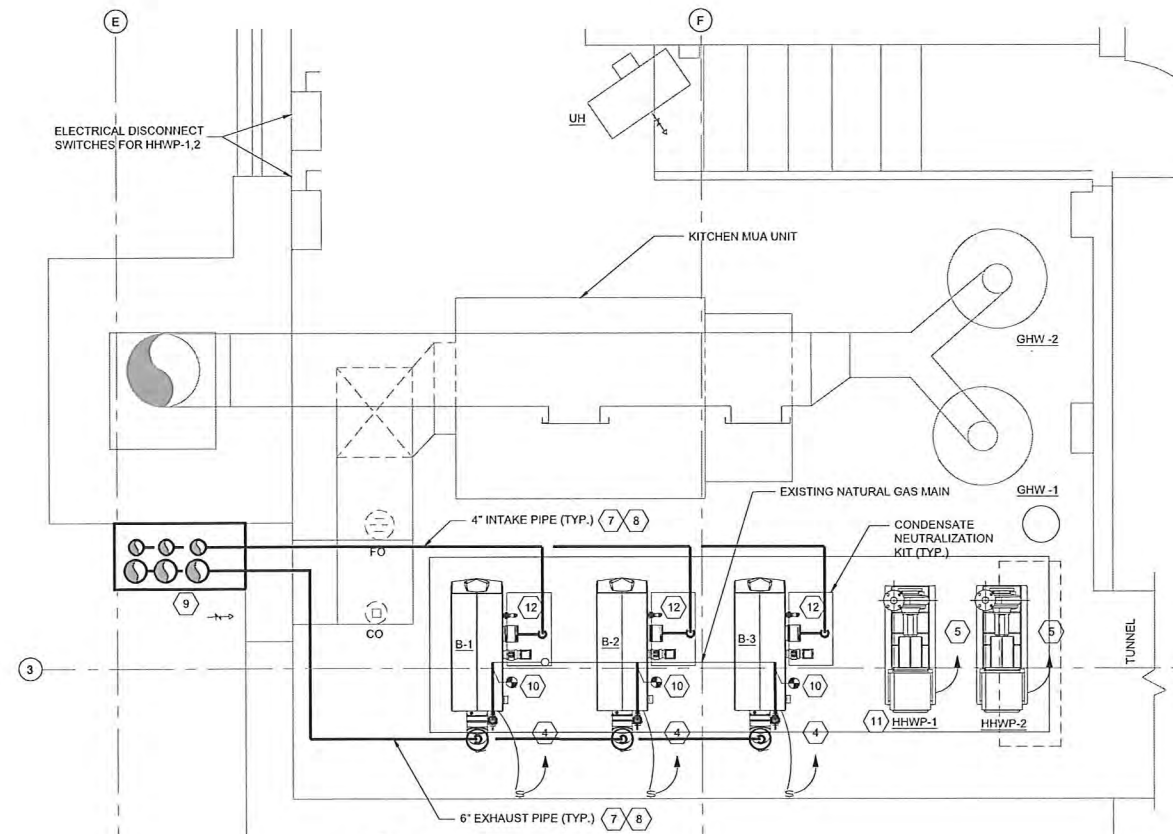
MECHANICAL  
 LOWER LEVEL  
 TEMPERATURE  
 CONTROLS

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**MEP1.2 A**  
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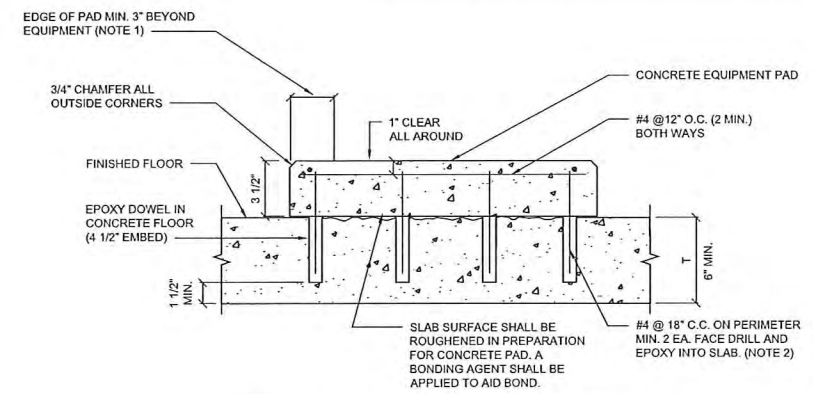
**ENLARGED BOILER ROOM #129 PLAN - EQUIPMENT PLAN**  
SCALE: 1/2"=1'-0" @ 24x36 SHEET



**ENLARGED BOILER ROOM #129 PLAN - PIPING PLAN**  
SCALE: 1/2"=1'-0" @ 24x36 SHEET

**GENERAL NOTES**

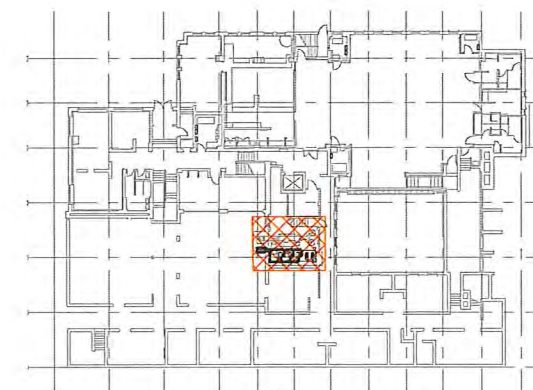
- SEE GENERAL NOTES, SPECIFICATIONS, AND ADDITIONAL PROJECT INFORMATION.
  - SEE LEGEND ON MEP1.1
- DRAWING KEYNOTES**
- (X) NEW WORK KEYNOTES
- INSTALL CAP ON EXISTING FLUE DUCT BRANCH
  - FORM AND POUR NEW 4" CONCRETE EQUIPMENT PADS FOR NEW EQUIPMENT AS SHOWN. SEE DETAIL BELOW.
  - INSTALL NEW EXPANSION TANK (ET-1) IN CEILING SIMILAR TO EXISTING. PROVIDE AND INSTALL NEW CHEMICAL SHOT FEEDER.
  - PURCHASE AND INSTALL NEW HHW BOILERS (B-1,2,3) AS SHOWN. PROVIDE POWER TO NEW BOILERS FROM ELECTRICAL PANEL RP-XX.
  - PURCHASE AND INSTALL NEW HHW PUMPS (HHWP-1,2) AS SHOWN. EXTEND EXISTING CONDUIT TO NEW PUMPS. INSTALL NEW WIRING (X#X, #XG) FROM DISCONNECT SWITCHES TO PUMPS.
  - PROVIDE MINIMUM CLEARANCES AROUND BOILERS. SEE DWG MEP2.1, DETAIL: BOILER - RECOMMENDED MAINTENANCE CLEARANCES FOR MORE INFORMATION.
  - PROVIDE AND INSTALL NEW PVC OUTSIDE AIR INTAKE AND EXHAUST PIPING FOR EACH BOILER. ROUTE PIPE OUTSIDE THROUGH WALL, AND UP ALONG CHIMNEY IN COURTYARD. PROVIDE SUPPORTS AS REQUIRED. SEAL WALL PENETRATIONS WITH WATER TIGHT SEAL, AS REQUIRED.
  - PROVIDE AND INSTALL INSULATION ON HHW SUPPLY AND RETURN PIPING.
  - PROVIDE PIPE ENCLOSURE FOR PIPE RUNNING OUTSIDE ALONG CHIMNEY IN COURTYARD. PAINT TO MATCH EXISTING BRICK.
  - TIE BOILERS INTO EXISTING NATURAL GAS LINE.
  - CONNECT BOILER SUPPLY (HWS) AND RETURN (HWR) WATER PIPING TO THE HEATING HOT WATER SYSTEM, INCLUDING HHW PUMPS, EXPANSION TANK, SHOT FEEDER, AIR SEPARATOR, ETC. PER MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS. SEE HEATING HOT WATER (HHW) SYSTEM SCHEMATIC ON DWG MEP3.0 FOR MORE DETAILS ON THE SYSTEM.
  - PROVIDE AND INSTALL CONDENSATE AND DRAIN PIPING FROM BOILERS TO NEAREST FLOOR DRAIN PER MANUFACTURER'S RECOMMENDATIONS. CONNECT CONDENSATE THROUGH CONDENSATE NEUTRALIZATION KIT (PROVIDED WITH BOILER). PROVIDE HOUSING FOR CONDENSATE NEUTRALIZATION KIT AND INSTALL PER MANUFACTURER'S INSTRUCTIONS.



- NOTES:**
- CONTRACTOR TO VERIFY WITH NEW EQUIPMENT BASE DIMENSIONS.
  - DOWELS SHALL USE HIT-RE 100 ADHESIVE SYSTEM OR APPROVED EQUAL.

**DETAIL - CONCRETE EQUIPMENT PAD**

SCALE: NONE



**KEY PLAN**  
SCALE: NO SCALE

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**HVAC EQUIPMENT UPGRADES**

MECHANICAL  
ENLARGED  
BOILER ROOM PLAN  
NEW WORK

PROJ. NO.: 13063.01  
**MEP1.3**  
SHEET NO. REV



**CHILLER - AIR COOLED PACKAGED SCHEDULE (CH)**

MARK	LOCATION SERVICE	NOM TON	CAPACITY TON	FLUID		EVAPORATOR/CHILLED WATER					CONDENSER				COMPRESSOR				REFRIG	OPER WT (LBS)	EFFICIENCY			ELECTRIC			MANUFACTURER MODEL NO	REQUIRED OPTIONS	NOTES
				TYPE	% CONC	FLOW (GPM)	EWT (°F)	LWT (°F)	W/PD (FT)	FF	AMB T (°F)	NO FANS	FAN PWR EA (KW)	TOTAL FAN FLA	QTY	TYPE	CKTS	REFG STEPS			EER	IPLV	MCA	MFCB	V/PH/Hz				
CH-1	PARKING LOT CHILLED WATER	52	48.9	PROPYLENE GLYCOL	30	124.1	55	45	17.4	0.0001	95	4	0.969		4	SCROLL	2	4	R410A	3,806	10.37	15.47	246		208/3/60	TRANE CGAM-052	A,B,C,D,F,G,H,J,K	1, 2, 3	

**NOTES:**  
 1. SELECTION BASED ON 95°F DB, 78°F WB OUTSIDE AIR CONDITIONS.  
 2. CHILLER MIN FLOW RATE IS 58.8 GPM.  
 3. SINGLEPOINT POWER, INDIVIDUAL COMPRESSOR CIRCUIT BREAKERS, FACTORY FURNISHED AND MOUNTED DISCONNECT.

**OPTIONS:**  
 A. EXTRA EFFICIENCY  
 B. FREEZE PROTECTION  
 C. CONDENSER FINS - LANCED ALUMINUM W/ 'COMPLETECOAT'  
 D. BACNET INTERFACE  
 E. PUMP PACKAGE  
 F. BUFFER TANK  
 G. ELASTOMERIC ISOLATORS  
 H. WATER STRAINER/J. SUPER QUIET  
 K. 110V CONVENIENCE RECEPTACLE

**GAS FIRED HOT WATER BOILER (B)**

MARK	LOCATION	SERVICE	HEATING MBH		WATER			GAS INPUT		ELECTRICAL		MANUFACTURER MODEL NO	REMARKS	
			INPUT	OUTPUT	GPM	EWT °F	LWT °F	PD	CFH	WG	AMPS			VOLT/PH/Hz
B-01	MECH ROOM HHW	HHW	600	516	65	160	180	—	600	10	15	120/1/60	LOCHINVAR KBN601	SEE NOTE 1,2
B-02	MECH ROOM HHW	HHW	600	516	65	160	180	—	600	10	15	120/1/60	LOCHINVAR KBN601	SEE NOTE 1,2
B-03	MECH ROOM HHW	HHW	600	516	65	160	180	—	600	10	15	120/1/60	LOCHINVAR KBN601	SEE NOTE 1,2

**NOTES:**  
 1. INSTALL BOILER IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS  
 2. VENT AND COMBINED VENT MATERIALS, LENGTH, AND DIAMETER MUST BE DETERMINED USING THEIR NATIONAL FUEL GAS CODE, ANSIZ223.1 - LATEST EDITION OR OTHER ACCEPTED ENGINEERING DESIGN METHOD  
 3. REQUIRED OPTIONS: CONDENSATE NEUTRALIZATION KIT, BACNET MSTP

**PUMP SCHEDULE (P)**

MARK	LOCATION	SERVICE	TYPE	FLOW (GPM)	HEAD (FEET)	TEMP (°F)	ELECTRIC			MANUFACTURER MODEL NO	NOTES
							SIZE	RPM	VOLT/PH/Hz		
HHWP-1	ROOM 129	HHWP	WATER	108	45					BELL & GOSSETT 60-2x7	1
HHWP-2	ROOM 129	HHWP	WATER	108	45					BELL & GOSSETT 60-2x7	1

**NOTES:**  
 1. PUMP IS EXISTING AND IS LISTED FOR REFERENCE ONLY

**EXPANSION TANK SCHEDULE (ET)**

MARK	LOCATION	SERVICE	TYPE	GALLONS	SIZE (DIA x LGTH)	PRV SETTING PSIG	RV SETTING PSIG	CONN SIZE		OPER WT (LBS)	MANUFACTURER MODEL NO	REMARKS
								FILL	SYSTEM			
ET-1	BOILER RM	HHW/CHW	HORIZONTAL BLADDER	23	20" x 29"	-	-	-	-	120	TACO CA90-125	SEE NOTES

**NOTES:**  
 1. ASME CONSTRUCTION  
 2. BASED ON MINIMUM FILL TEMPERATURE OF 40°F



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 REVISION DATE  
 PLOT DATE: 12/17/2019 8:28 AM  
 DRAWN BY: KZIMES  
 REVIEWED BY: DWNIEHAMMER  
 PROJECT MANAGER: DWNIEHAMMER  
 FILE:

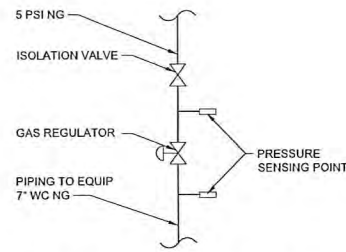
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**HVAC EQUIPMENT UPGRADES**

MECHANICAL  
 MECHANICAL SCHEDULES

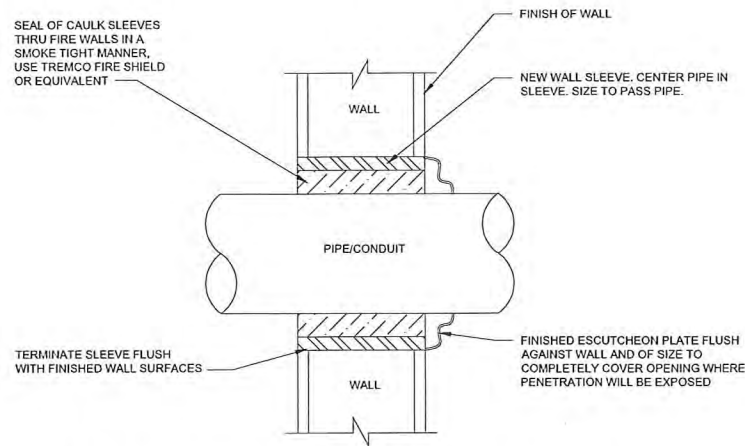
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**MEP2.0** A  
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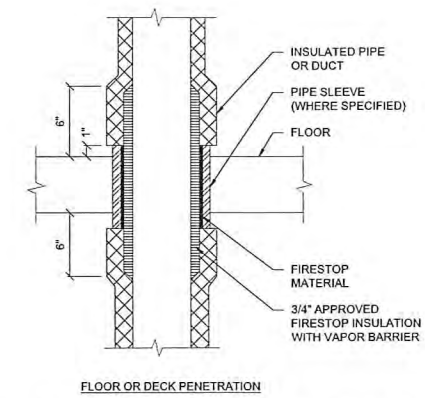




(TYPICAL FOR ALL GAS FIRED EQUIPMENT)  
**TYPICAL GAS REGULATOR  
 MANIFOLD DETAIL**

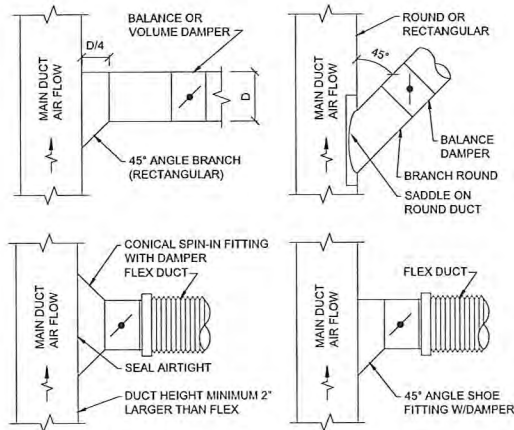


**PIPE/CONDUIT SLEEVE DETAIL THRU INTERIOR WALL**  
 SCALE: NO SCALE

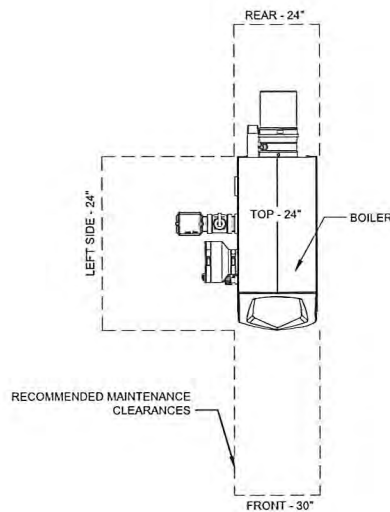


**PIPE PENETRATION OF FIRE / SMOKE BARRIER FLOOR**  
 SCALE: NO SCALE

- NOTE:  
 1. APPLICABLE TO PENETRATION OF ALL FIRE RATED MEMBRANES, IN ACCORDANCE WITH NFPA 101. REFER TO SPECIFICATIONS SECTION 07270, FIRE STOPPING SYSTEMS.

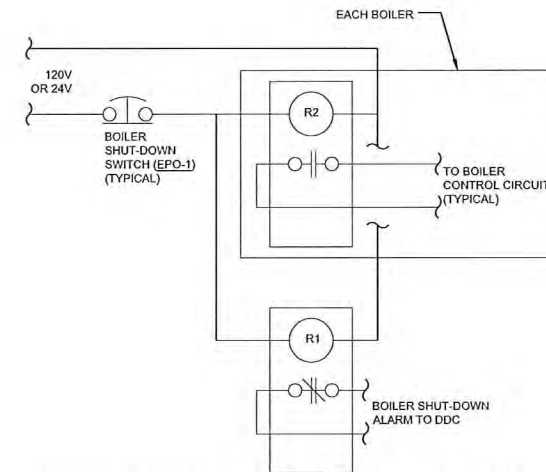


**TYPICAL DUCT TAP DETAIL**



**BOILER - RECOMMENDED MAINTENANCE CLEARANCES**  
 SCALE: NO SCALE

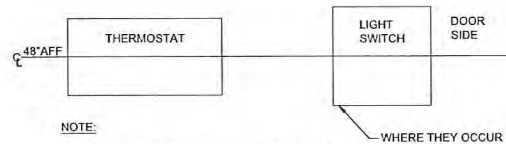
- NOTE:  
 1. THIS CLEARANCE INFORMATION IS BASED ON A LOCHINVAR, KNIGHT BOILER, MODEL #KBN701.



**REMOTE BOILER EMERGENCY SHUTDOWN WIRING**  
 SCALE: NO SCALE

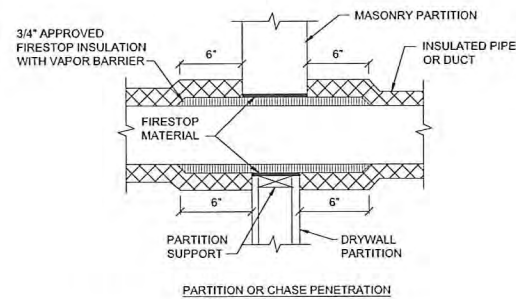
- NOTES:  
 1. LOCATE A SWITCH AT EACH ENTRANCE JUST INSIDE BOILER ROOM. REFER TO FLOOR PLANS FOR QUANTITY AND LOCATION OF ROOM ENTRANCES. COORDINATE SWITCH LOCATION WITH ALL OTHER TRADES.  
 2. PROVIDE SIGN (NAME PLATE) TO BE PLACED DIRECTLY ABOVE OR BELOW EACH PUSH BUTTON SWITCH THAT READS: "EMERGENCY BOILER SHUTDOWN".  
 3. SUPPLY POWER TO CONTROL RELAY FROM EMERGENCY POWER CIRCUIT.  
 4. WIRE BOILERS CONTROL CIRCUITS (POWER FROM SECONDARY SIDE OF CONTROL TRANSFORMERS) THRU NORMALLY OPEN RELAY CONTACTS. COORDINATE EXACT WIRING AND TERMINATION REQUIREMENTS WITH BOILER MANUFACTURER.  
 5. MOUNT SHUTDOWN CONTROL RELAYS AT RESPECTIVE BOILER CONTROL PANELS.  
 6. PROVIDE PUSH BUTTON SWITCH (PUSH TO LATCH - TURN KEY OR PULL TO RELEASE) WITH MUSHROOM HEAD OPERATOR AND NORMALLY CLOSE (NC) CONTACTS. PROVIDE WITH PROPER ENCLOSURE TO ENSURE THAT PUSH BUTTON CANNOT BE ACTIVATED BY ACCIDENT.

SEQUENCE OF OPERATION:  
 UNDER NORMAL OPERATING CONDITIONS THE CIRCUIT SHALL BE ENERGIZED AND THE RELAYS NORMALLY OPEN (NO) CONTACTS SHALL BE CLOSED. WHEN A SWITCH IS PUSHED (LATCHED) THE RELAY CONTACTS SHALL OPEN AND INTERRUPT EVERY BOILER'S CONTROL CIRCUIT. WHEN SWITCH IS RELEASED, THE RELAY SHALL BE ENERGIZED AND ITS NORMALLY OPEN CONTACTS SHALL CLOSE, ENERGIZING EVERY BOILER'S CONTROL CIRCUIT.  
 DDC SHALL ACTIVATE AND ALARM WHEN REMOTE SWITCH HAS BEEN PUSHED.



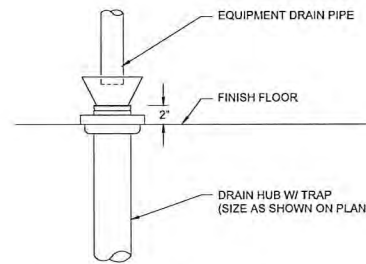
- NOTE:  
 1. THERMOSTAT SHALL BE MOUNTED AT 48\"/>

**TYPICAL THERMOSTAT MOUNTING DETAIL**



- DETAIL NOTE:  
 1. APPLICABLE TO PENETRATION OF ALL FIRE RATED MEMBRANES, IN ACCORDANCE WITH NFPA 101. REFER TO SPECIFICATIONS SECTION 07270, FIRE STOPPING SYSTEMS.

**TYPICAL DUCT PENETRATION OF FIRE  
 OR SMOKE BARRIER WALL DETAIL**



**EQUIPMENT DRAIN  
 DETAIL**  
 SCALE: NO SCALE

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REVIEWED BY:		DWNIETHAMMER
PROJECT MANAGER:		DWNIETHAMMER
FILE:		

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**HVAC EQUIPMENT UPGRADES**

MECHANICAL  
 MECHANICAL  
 DETAILS

PROJ. NO.: 13060.01

**MEP2.1 A**  
 SHEET NO. REV



**GENERAL NOTES**

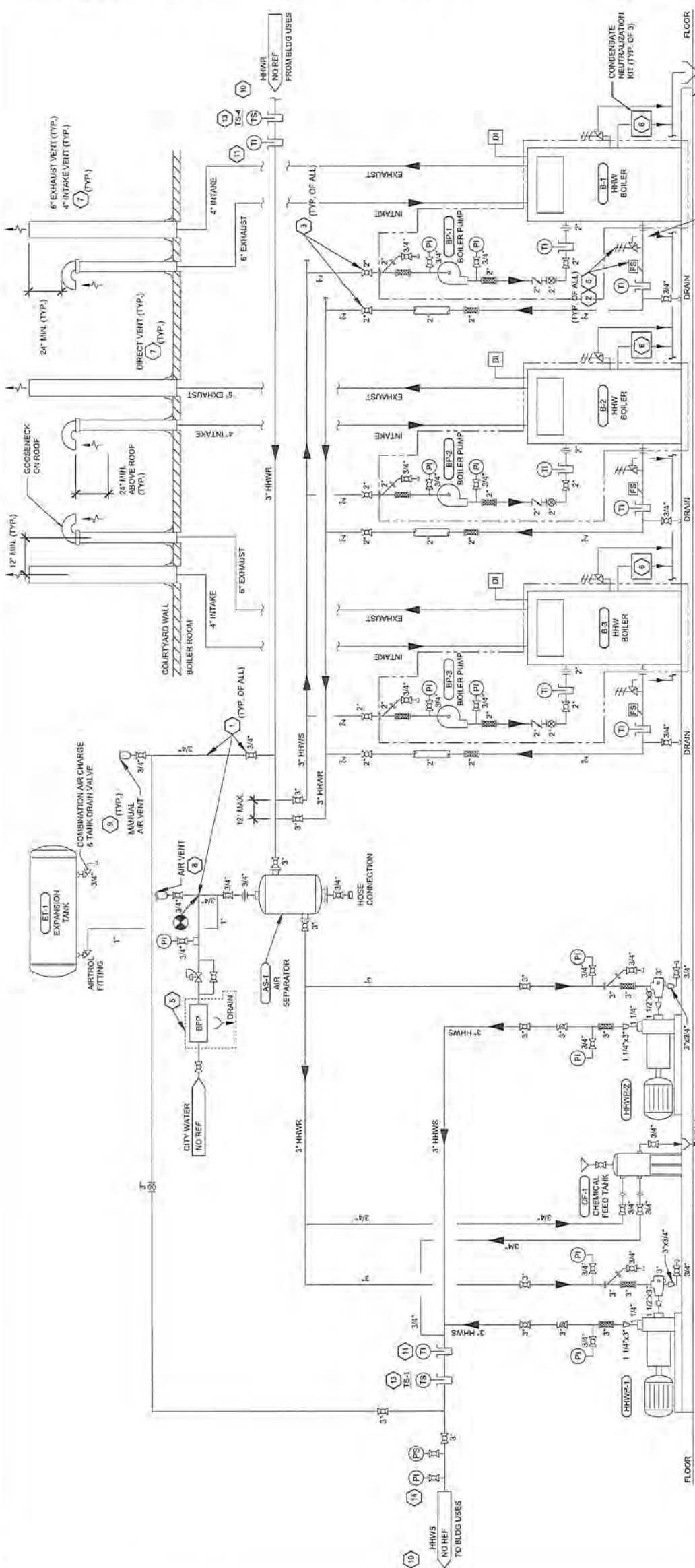
1. SEE GENERAL NOTES, SPECIFICATIONS, AND ADDITIONAL PROJECT INFORMATION.
2. SEE LEGEND ON SHEET 1.

**KEY NOTES:**

1. NEW EQUIPMENT KEYNOTES.
1. ALL PIPING COMPONENTS AND ACCESSORIES TO BE NEW UNLESS OTHERWISE NOTED.
2. SIZE OF PRESSURE RELIEF VALVE PER BOILER MANUFACTURER.
3. BOILER ISOLATION VALVES SHALL NOT BE LOCATED OVER BOILERS.
4. PRESSURE RELIEF VALVE DISCHARGE PIPING SHALL BE INSTALLED TO A DISCHARGE POINT AT FLOOR. ALL DRAINS ARE TO BE COMBINED AND PIPED TO THE NEAREST FLOOR DRAIN.
5. EXISTING BACKFLOW PREVENTER.
6. PRESSURE RELIEF VALVE, FLOW SWITCH (FS-1), AND NEUTRALIZATION KIT SHALL BE PROVIDED WITH BOILER AND INSTALLED BY CONTRACTOR.
7. INSTALL FLUE WITH MATERIALS RATED FOR CONDENSING BOILERS. INSTALL FLUE DRAIN AND PIPE DRAIN TO FLOOR DRAIN. INSTALL INTAKE VENT AS SHOWN. ALL INTAKE VENTS SHALL BE INSTALLED PER MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.
8. AUTOMATIC AIR VENT SHALL BE BELL AND GOSSETT, MODEL #107A.
9. MANUAL AIR VENTS SHALL BE PROVIDED AT ALL HIGH POINTS IN THE SYSTEM.
10. HHW PIPING TIE-IN LOCATION IN BOILER ROOM.
11. TEMPERATURE INDICATORS SHALL BE WETC, LIQUID III, MODEL #107A. PRESSURE INDICATORS SHALL BE WENSLER 0-160 PSIG.
12. ALL BUILDING AUTOMATION SYSTEM (BAS) ITEMS PROVIDED AND INSTALLED BY CONTRACTOR.
13. MECHANICAL CONTRACTOR TO INSTALL NEW TEMPERATURE SENSORS (TS-1/TS-2) AND ADD THERMOWELLS. INSTALL TS-2 AND THERMOWELL FOR TS-3. COORDINATE LOCATION WITH FACILITY MANAGER AND TEMPERATURE CONTRACTOR (TCC). ALL CONTROLS WIRING DONE BY TCC.
14. COORDINATE LOCATION OF PRESSURE SENSOR (PS-1) WITH FACILITY MANAGER AND TEMPERATURE CONTRACTOR (TCC). ALL CONTROLS WIRING DONE BY TCC.

**LEGEND:**

— OUTLINE OF PACKAGED EQUIPMENT



NOTE: CONDENSATE SHALL BE NEUTRALIZED BEFORE DRAIN.

**HEATING HOT WATER (HHW) SYSTEM SCHEMATIC**

**EQUIPMENT KEY**

ITEM NO.	DESCRIPTION
FIELD MOUNTED EQUIPMENT	
CSR-1,2	CURRENT SENSING RELAY
TS-1,2,3,4	RGD TEMP. SENSOR, 20-250°F
FS-1	FLOW SWITCH (PROVIDE VW BOILER)
OAS-1	OUTSIDE AIR SENSOR (B-1)
OAS-2	OUTSIDE AIR SENSOR (B-2)

**HEATING HOT WATER SEQUENCE OF OPERATION**

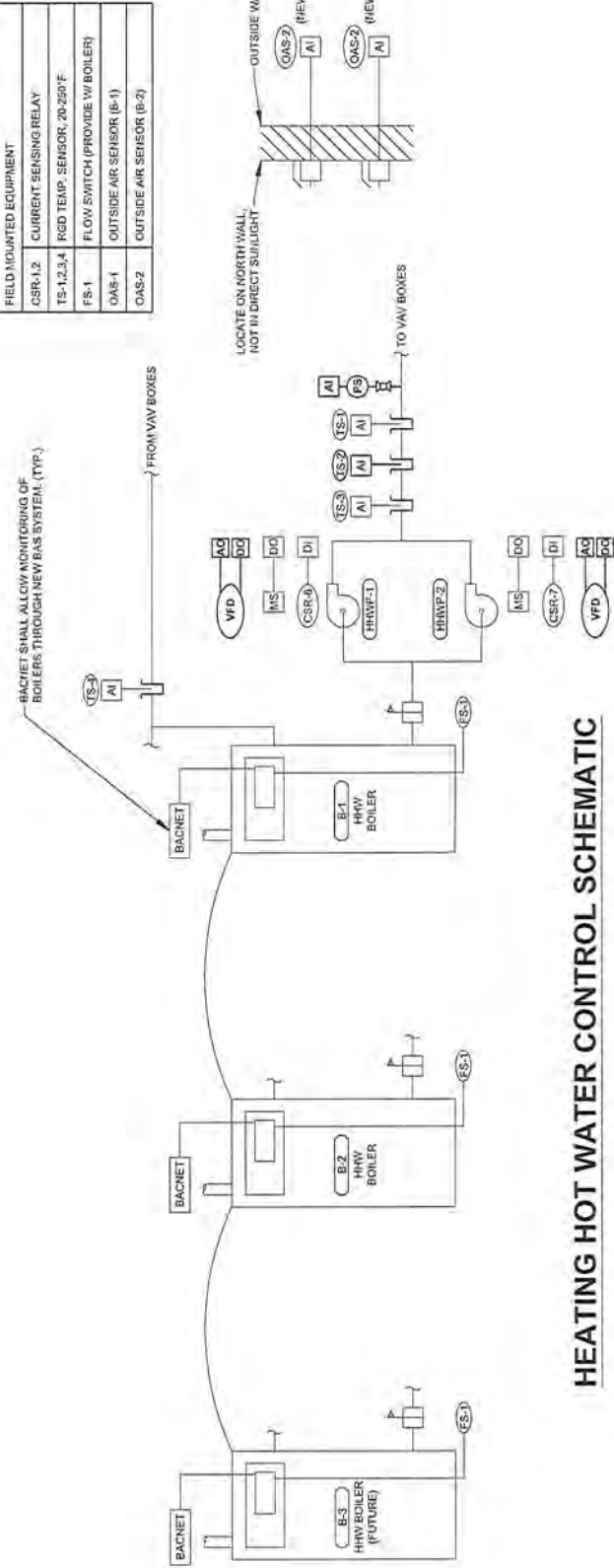
THE BOILER PACKAGED CONTROLS SHALL MAINTAIN A HHW SETPOINT TEMPERATURE AT HOT JUNCTIONS BY VARYING AN ALARM CONTACT SHALL ANNUNCIATE THE BAS WHENEVER THERE IS AN ALARM CONDITION. WHEN THERE IS PROOF OF SUFFICIENT WATER FLOW, THE BOILER CONTROLS SHALL BE ACTIVATED. THE BOILER SHALL BE DEACTIVATED BY ITS OWN PACKAGED CONTROLS UPON HHWS SETPOINT BECOMING SATISFIED.

ONE HHW PUMP SHALL RUN WHENEVER THE BOILER IS ENERGIZED. DURING BOILER OPERATION, ONE HHW PUMP SHALL RUN CONTINUOUSLY AND THE OTHER PUMP IS STANDBY (WITH THE STARTER IN THE AUTOMATIC POSITION). IF THE LEAD PUMP FAILS, THE STANDBY PUMP IS ACTIVATED. THE BAS SHALL MONITOR PUMP STATUS THROUGH CURRENT SENSING RELAYS.

ALARM SETPOINTS SHALL BE SET FOR SUPPLY AND RETURN HOT WATER PRESSURE AND TEMPERATURE. SYSTEM SHALL ALARM WITH A 10°F DEVIATION FROM THE SETPOINT (ADJUSTABLE).

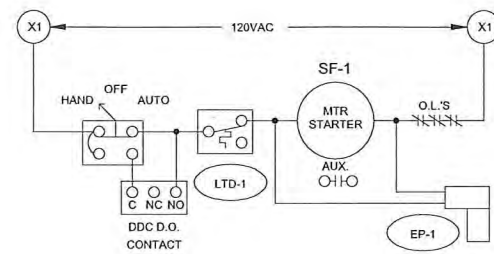
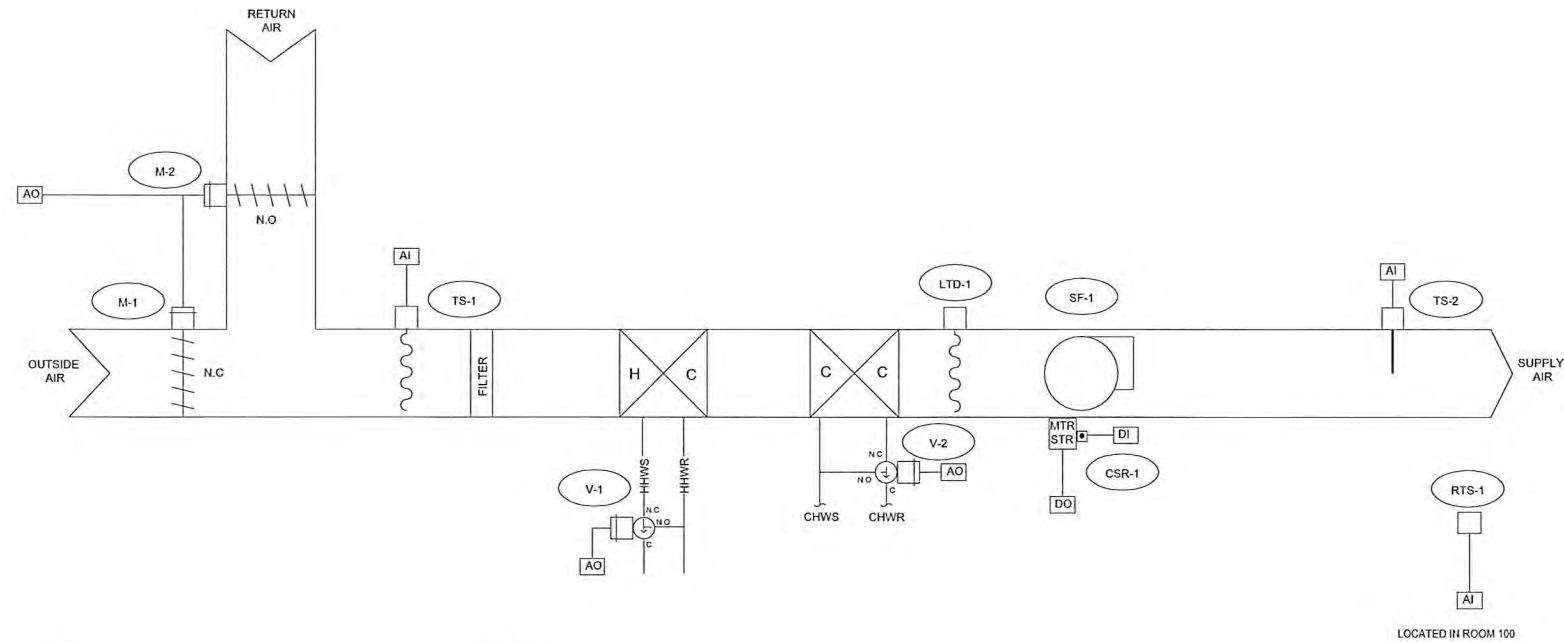
**BUILDING MANAGEMENT SYSTEM**

BAS CONTROLS: CONNECT PRESSURE AND TEMP. SENSORS TO THE BACNET TRACER SC OUTSIDE AIR SENSORS AND EXISTING AIR HANDLING UNITS AND CONNECT TO NETWORK USING BACNET CONTROLLER. PROVIDE REQUIRED GRAPHICS FOR EACH SYSTEM COMPONENT. PROVIDE AS-BUILT CONTROL DRAWINGS AND OPERATION & MAINTENANCE MANUALS.



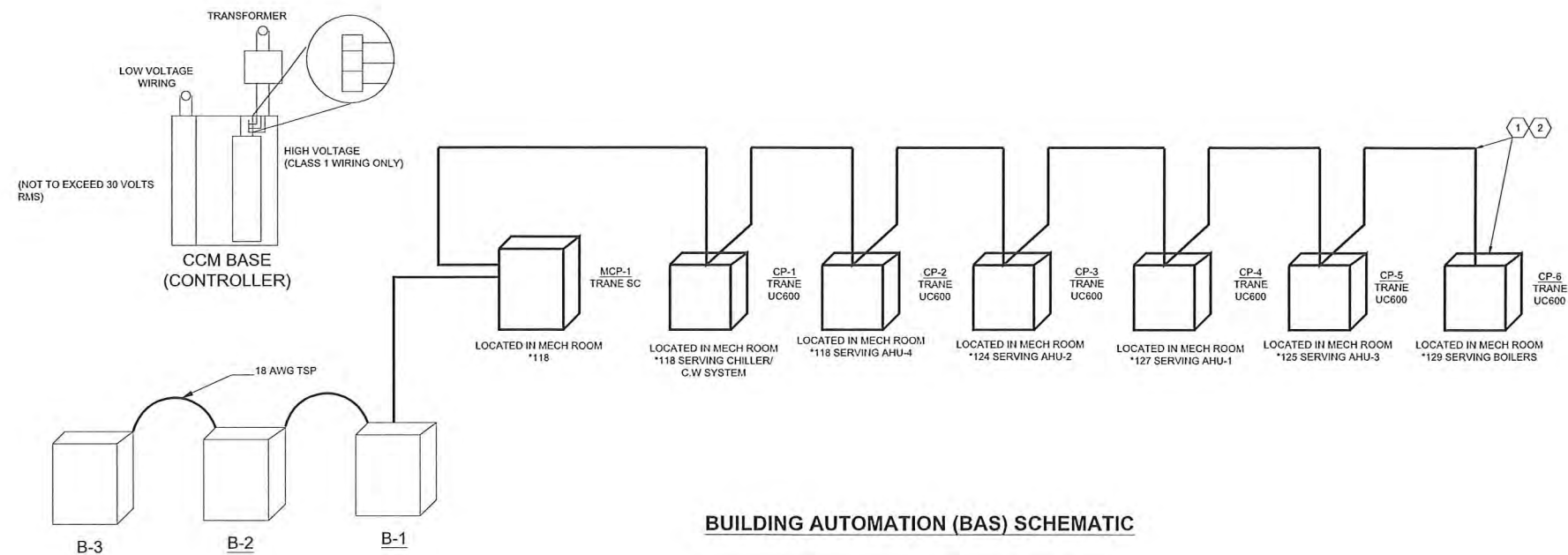
**HEATING HOT WATER CONTROL SCHEMATIC**





**HVAC-1 CONTROL SCHEMATIC  
(ALSO APPLIES TO HVAC-2,3,4)**

**HVAC-1 SUPPLY FAN MOTOR WIRING DIAGRAM**



**BUILDING AUTOMATION (BAS) SCHEMATIC**

EQUIPMENT LIST		
ITEM NO.	NO. REQ'D	DESCRIPTION
CSR-1	1	CURRENT SENSING RELAY (EXISTING)
LTD-1	1	LOW TEMPERATURE DETECTION THERMOSTAT (EXISTING)
M-1,2	2	MOTOR (EXISTING)
RTS-1	1	ROOM TEMPERATURE SENSOR (EXISTING)
TS-1	1	TEMPERATURE SENSOR (EXISTING)
TS-2	2	TEMPERATURE SENSOR (EXISTING)
V-1	1	EXISTING 3-WAY CHW VALVE
V-2	1	EXISTING 3-WAY CHW VALVE
MCP-1	1	MASTER CONTROL PANEL CPU w/K
B-1,2,3	3	BOILERS
CP-1 Thru 6	6	CONTROL PANELS WALL MOUNT WITH ENCLOSURE

**AIR HANDLING UNIT HVAC-1 CONTROL**

THE DDC SYSTEM INDEXES BETWEEN OCCUPIED AND UNOCCUPIED MODES OF OPERATION BASED ON THE OCCUPANCY SCHEDULE. THE SUPPLY FAN (SF-1) IS STARTED AND STOPPED AUTOMATICALLY BY THE DDC SYSTEM. THE DDC SYSTEM MONITORS THE SUPPLY FAN STATUS BY CURRENT SENSING RELAY (CSR-1).

**OCCUPIED MODE**

UPON SUPPLY FAN (SF-1) START UP, E.P. RELAY (EP-1) ENERGIZES PASSING MAIN AIR TO SWITCHING RELAY (R-1), WHICH ALLOWS THE OUTDOOR AIR DAMPER (M-1) AND RETURN DAMPER (M-2) TO OPERATE.

THE DDC SYSTEM MODULATES THE OUTSIDE AIR DAMPER (M-1), RETURN AIR DAMPER (M-2), HEATING COIL VALVE (V-1) AND MECHANICAL COOLING, IN SEQUENCE, TO MAINTAIN THE ROOM SET POINT TEMPERATURE (70°F AT OUTSIDE AIR OF 32°F, 74°F AT OUTSIDE AIR 55°F).

WHEN ECONOMIZER IS GREATER THAN 62°F WET BULB AND THE OUTSIDE AIR TEMPERATURE IS GREATER THAN 55°F, THE DDC SHALL ENERGIZE THE MECHANICAL COOLING SYSTEM. AFTER THE ROOM TEMPERATURE SENSOR (RTS-1) REACHES ITS SET POINT (74°F) THE MECHANICAL COOLING SYSTEM SHALL BE DE-ENERGIZED AND BE PROHIBITED TO OPERATE FOR A MINIMUM OF 15 MINUTES TO PREVENT SHORT CYCLING.

LOW TEMPERATURE DETECTION THERMOSTAT (LTD-1) WILL STOP SUPPLY FAN (SF-1) AND RETURN THE DAMPERS (M-1,2) TO THEIR NORMAL POSITIONS WHEN THE LOW TEMPERATURE SET POINT (38°F) IS REACHED.

**UNOCCUPIED MODE**

THE DDC SYSTEM DE-ENERGIZES SF-1 AND RETURNS ALL DAMPERS TO THEIR NORMAL POSITIONS. THE DDC SHALL MONITOR ROOM TEMPERATURE SENSOR (RTS-1) AND ENERGIZE AC-1 AS REQUIRED TO MAINTAIN THE UNOCCUPIED TEMPERATURE SET POINT (60°F WINTER), ALL DAMPERS (M-1,2) SHALL REMAIN IN THEIR NORMAL POSITION.

**GENERAL NOTES**

- SEE GENERAL NOTES, SPECIFICATIONS, AND ADDITIONAL PROJECT INFORMATION.

**KEY NOTES:**

- NEW EQUIPMENT KEYNOTES:
- CONTRACTOR TO USE EXISTING RACEWAY TO INSTALL NEW WIRE (18 AWG TSP)
- NEW CONTROL CABINET TO BE PROVIDED BY CONTRACTOR.



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**HVAC EQUIPMENT UPGRADES**

MEP  
HVAC-1 CONTROLS SCHEMATIC

**PRELIMINARY**  
DATE: 12/17/19

PROJ. NO.: 13063.01  
**MEP4.0 A**  
SHEET NO. REV