DESIGN CRITERIA

1. ASHRAE Design Requirements
   A. Heating/Cooling Loads
      a. Heating
         - Outside air temperatures: 34 degrees F DB (ASHRAE 99.6%).
      b. Cooling
         - Outside air temperatures: 110 degrees F DB / 70 degrees F WB (ASHRAE 99%).
   B. Building Design
      a. ASHRAE and Energy Code guidelines.
      b. Indoor relative humidity at 50 percent RH for cooling loads only.
         - Humidity is not being controlled or maintained in the heating or cooling equipment modes.

2. Design Ventilation
   A. Use ASHRAE 62 Standard or State of AZ Code.
   B. See Ventilation Schedule on drawings.
   C. See floor plans for rooms that need to be in a positive or negative relation to other rooms shown by the difference in supply and return or exhaust air quantities.

GENERAL

1. The term General Contractor (GC), as used in these documents, refers to the Contractor / Construction Manager in responsible charge of the project in terms of coordination, scheduling, subcontractor coordination, etc. This term refers to, but is not limited to, General Contractor, Construction Manager, Design Build Contractor, Prime Contractor, etc. The term is referencing the entity that coordinates the work of other trades.

2. These drawings are diagrammatic and indicate the general extent of the work. The contractor shall be responsible for the coordination and proper installation of all mechanical systems. The contractor shall provide all necessary offsets and fitting which may be required due to space constraints or other conditions.

3. The mechanical systems or its modifications are designed to be a complete operating system and stable after the building or its modifications are fully completed. It is solely the contractor's responsibility to determine construction, installation, and programming procedures and sequences to have a complete and working system and to insure the safety of the construction personnel, public, building and its component parts, and adjacent buildings and properties. This includes the addition of whatever temporary or permanent bracing, etc. that may be necessary to brace new or existing construction, walls, and framing to remain so that the structure is braced for construction loads, etc. and that no horizontal or vertical settlement or any damage occurs to the adjacent new or permanent supports and bracing that are installed. Design of these supports shall be provided by the contractor. Provide all materials, labor, equipment, and accessories required to furnish and install the systems identified in specifications and drawings.

4. It is the contractor's responsibility to enforce all applicable safety codes and regulations during all phases of construction.

5. Construction loads shall not exceed structural design live loads. The contractor shall be responsible for all design required to support construction equipment used in constructing this project. Verify and coordinate with structural drawings.

6. The contractor shall perform all construction for the project in a manner and sequence that are based on accepted industry standards that recognize the interaction of the components that comprise the systems, without causing distress, unanticipated movements or irregular load paths as a result of the construction means and methods employed.

7. The contractor shall provide all miscellaneous supporting steel, etc. for the proper installation of all mechanical systems.

8. Before fabrication and/or installing any work, contractor shall see that it does not interfere with clearance required for finish on beams, columns, pilasters, walls, or other structural or architectural members, as shown on architectural drawings. If any work is so installed and it later develops that architectural design cannot be followed, contractor shall, at his own expense, make such changes in his work as architect may direct to permit completion of architectural work in accordance with plans and specifications.

9. All piping shall be protected as required by the applicable Mechanical, Plumbing, Fire Protection and Building Codes: " General Regulations" and other Code Chapters.

10. Pipes passing through or under walls shall be protected from breakage. Pipes passing through studs, joist, rafters or similar members less than 1 1/2" from the nearest edge of the members shall be protected by steel shield plates.

11. Piping shall be installed to prevent strains and stresses that exceed the structural strength of the pipe. Where necessary, provisions shall be made to protect piping from the damage resulting from pipe expansion and contraction and structural/soil settlement. Expansion joint fittings shall be used where necessary to provide for expansion and contraction of the pipes. Sleeved openings shall be sized appropriately to accommodate pipe movement and structural/soil settlement. Expansion joint fittings shall be of the typical material suitable for use with the type of piping in which fittings are installed. At a minimum install rubber mechanical joint couplings or CSA-certified expansion joints on all vertical piping at every other floor of the building and rigidly support the stack pipe on alternating floors to direct any movement into the appropriate expansion compensator. Design of these expansion fittings shall be provided by the contractor. Any analysis which requires additional support or expansion detailing shall be shared with the mechanical design professional and any stresses or point loads created by the engineered system shall be shared with the structural designer for review.

12. Install additional offsets on piping or ductwork where required to obtain maximum headroom or to avoid conflict with other work without additional cost to owner.

13. Report any interferences between work under this division and that of any other contractors to architect as soon as they are discovered. Architect will determine which equipment shall be relocated, regardless of which was first installed, and his decision shall be final.

14. The contractor shall coordinate floor, wall, and roof penetrations, louver sizes, etc. with general trades.

15. Principal openings on these drawings through the framing are shown on the structural drawings. The mechanical contractor shall examine the structural and mechanical drawings for the required openings and shall verify size and location of all openings with the general contractor. General contractor shall provide all openings required through the framing by the mechanical, electrical, plumbing, or other trades, whether or not shown on the structural drawings. Any deviation from the openings shown on the structural drawings shall be brought to the engineer's attention for review.

16. All mechanical and electrical work: Ductwork, plumbing, piping, wiring, lighting, etc. and all architectural items that need to be removed during the modification of or reinforcing of, existing structure shall be replaced in kind by the respective contractor. The contractors shall keep all existing systems in operation during the construction phase of the project.

17. All contractors are required to examine the drawings and specifications carefully, visit the site and fully inform themselves as to all existing conditions and limitations, prior to agreeing to perform the work. Failure to visit the site and familiarize themselves with the existing conditions and limitations will in no way relieve the contractor from furnishing any materials or performing any work in accordance with drawings and specification without additional cost to the owner to have a complete and working system.

18. Details labeled "Typical Details" or "Typical" on drawings apply to situations occurring on the whole project that are the same or similar to those specifically detailed. Such details apply whether or not details are referenced at each location on drawings. Notify engineer for clarifications regarding applicability of "Typical Details".

19. Work and coordinate these drawings with architectural, civil, structural, mechanical, plumbing, fire protection, electrical, and technology drawings.

20. Do not scale drawings.

21. Any discrepancies between mechanical and architectural drawings shall be brought to the attention of the architect and mechanical engineer.

22. Should any of the general notes conflict with any details or instructions on plans, or in the specifications, the strictest provision shall govern.

23. Shop drawings and submittals
   A. Shop drawings and submittals shall be checked and coordinated with other materials and contracts by the general, mechanical and electrical contractors and shop drawings and submittals shall bear the prime contractor's review stamp with the checker's initials before being submitted to the architect for approval.
   B. When the contractor has been authorized to use the architect and engineer's drawings as construction coordination drawings, the contractor must remove all title blocks, professional seals and any other references to the architect and engineer from those drawings. The contractors name and title shall be placed on the drawings.
   C. Where voltage, amp draw, dimensions and elevations of existing construction could affect the new construction, it is the contractor's responsibility to make field verifications and measurements in time for their incorporation into the shop drawings.

24. Refer to architectural and electrical reflected ceiling plans for exact location of light fixtures. Contractors to coordinate locations of lighting, speakers, air diffusers, grilles, sprinkler heads and the like, with reflected ceiling lay-outs as required and directed by the architect.

25. Ductwork or piping shall not be located over the top of any electrical panels or equipment.

26. Contractor shall include in his bid all cutting, trenching, and patching associated with the installation of this projects work.

27. Cutting, Patching and Drilling
   A. All cutting and patching of the building construction required for this work shall be by this contractor unless shown on architectural drawings and confirmed as to size and location prior to new construction. Cutting shall be in a neat and workmanlike manner.
   B. Neatly saw cut all rectangular openings, set sleeve through opening, and finish patch or provide trim flange around opening.
   C. Neatly saw cut floors and patch floor to match existing, including floor covering.
   D. Contractor shall field verify slab-on-grade or supported floor construction type prior to cutting. Under no circumstances shall this contractor cut a floor thicker than 4 inches, a structural floor slab, whether on grade or supported, without prior written approval from the architect. If floor slab indicated to be cut on mechanical plans is found to be structural in nature, do not cut. Contact architect immediately for further directions.
   E. Core drill and sleeve all round openings.
   F. Do not cut any structural components without architect's written approval, including, but not limited to roof joists, columns, floor joists, beams, girders, structural floor slabs, rebar, etc.
   G. Patch, and finish to match adjacent areas that have been cut, damaged or modified as a result of the installation of the mechanical systems. Fire-stop all penetrations of fire rated construction in a code approved manner.
   H. All contractors shall confirm with owner, prior to bid, times available for noise producing work such as cutting and core drilling of floors, walls, etc. as well as times for work which requires access into adjoining tenant spaces. Include any premium time in bid.
   I. Exact location of roof top air conditioning units shall be approved by the structural engineer. Mechanical contractor shall furnish and install all supplemental support steel for equipment and roof penetrations after approval of structural engineer.
   J. The mechanical contractor shall coordinate work with the general contractor prior to construction. The mechanical contractor shall provide information regarding openings in walls, floors, etc., concrete equipment pads and foundations to the general contractor. If the mechanical contractor fails to comply with this request, or if incorrect information is given, the necessary cutting and patching will be performed by the general contractor, the mechanical contractor's expense.
   K. All openings required for this branch of work shall be accomplished in time to be incorporated in, and be compatible with the construction program; otherwise this contractor shall be responsible and pay for all changes made necessary for his failure to do so. Pipe holes in floors and walls shall be core drilled if not sleeved during construction.

28. Refer to mechanical, plumbing, fire protection, and electrical plans for location of mechanical, plumbing, and electrical equipment. Coordinate location of disconnect switch associated with each piece of mechanical and plumbing equipment with electrical contractor.

29. Installation requirements for all HVAC, plumbing, and fire protection systems shall be reviewed and coordinated with all other trades involved prior to rough-in. Give equipment shop drawings from installer/supplier/contractor equipment, as required, for review and coordination to all other trades involved. Contact architect/engineer with any discrepancies found between construction drawings and equipment being furnished prior to rough-in.

30. The contractor shall furnish all access panels or doors in hard ceilings and walls with a size as required for servicing and testing, for equipment, valves and/or devices furnished under this contract. The general contractor shall install access panels. The contractor shall coordinate the size and location of each access panel with the architect and general contractor prior to rough-in.

31. Firestopping
   A. All penetrations through fire rated walls associated with the installation shall be sleeved and fire-stopped using a UL approved method. UL approved method shall meet or exceed fire rating of structure being penetrated. Reference architectural plans for fire rated structures. If shown, reference architectural, mechanical and electrical drawings for penetration details.
   B. All openings through fire rated walls, floors, and/or roofs for ductwork, piping, conduit, etc., shall be fire sealed with a calcium salicate, silicone "RTV" foam, "3M" fire rated sealants, Hilti Firestop Systems, or approved equal to maintain the intended fire rating and associated UL ratings as recommended by the architect and/or sealant manufacturer.
   C. All fire stopping sealants shall be thixotropic so as not so slump or sag and shall be trowelable. Fire stopping sealants shall be intumescent and shall be free of asbestos, halogens, and volatile solvents.
   D. Fire stopping materials shall be classified in the Underwriters Laboratories (UL) fire resistance directory or listed in the Warnock Hersey International Directory.

32. All equipment and devices for this project must be UL listed. Devices, equipment, systems shall be installed per National Electrical Code requirements and manufacturer's instructions.

33. All conduit and cabling shall be properly supported as required by the National Electrical Code. For existing installations, the contractor shall be responsible to replace and/or rework existing conduit and/or cabling that is not in compliance with this requirement.

34. All materials and work in the ceiling return air plenum shall be approved for plenum rated application in accordance to the current building code. Where open wiring methods for low voltage systems is permitted by the contract documents and local authority, the conductor insulation must be plenum rated.

35. All hot water heating supply and return branch run-out piping shall be 3/4 inches unless otherwise noted on drawing.

36. Shop Areas and Material Storage
   A. No plumbing or mechanical trade is permitted to use as shop working area, any concrete slab that is to receive metallic waterproofing, asphalt tile, plastic tile, etc., except by express permission of the architect.
   B. The contractor shall make provisions for the delivery and safe storage of his materials and equipment in coordination with the work of others. Materials and equipment shall be delivered at such stages of the work as will expedite the work as a whole and shall be marked and stored in such a way as to be easily checked and inspected. The arrival and placing of large equipment items shall be scheduled early enough to permit entry and setting when there is no restriction or problem due to size and weight.

37. Temporary Heat
   A. The HVAC contractor under this division shall set up temporary heat and other services as may be required and/or requested by the general contractor. See "General Conditions" and "Special Conditions." This contractor shall pay expenses resulting from temporary heat and services used solely by him.

DEMOLITION

1. The architectural drawings are to be used only as a guideline for demolition. The contractor must visit the site prior to bidding to verify all work required for a complete job and include the cost of such work in his bid.

2. The mechanical drawings are intended to show only the general existing building construction within the area of demolition. The drawings do not show all systems, quantities, sizes, obstructions, etc., and are not intended to be used by the contractor to define the complete scope of demolition. The contractor must field verify the actual building and systems conditions to define all elements within the scope of demolition.

3. Examine areas and conditions under which demolition work must be performed. This contractor shall coordinate his work with other trades performing demolition work and/or demolition work performed by the owner. In every instance of demolition and/or remodeling, the contractor shall figure a complete job as none other shall be accepted.

4. The extent of work shown or not shown shall include removal and legally dispose off site, all the items and systems being removed.

5. Where temperature controls are indicated for demolition, retain the services or a temperature control contractor to perform such demolition.

6. This contractor shall retain on the premises in neatly stacked piles where instructed for selection by the owner, all material, wire, fixtures and/or equipment which are specified to be removed or replaced. All such items, not selected for salvage by the owner, shall become the property of this contractor and shall be removed from the premises and legally disposed.

7. Conform to all applicable codes for demolition of items and systems, safety of adjacent systems, dust control, legal run-off control, disposal and all items necessary to complete the work completely.

8. Demolition shall be done in a manner so as not to damage adjacent work and not affect the operation of systems to remain in use. Any item to remain that is damaged by the contractor shall be replaced and/or repaired at the contractor's expense.

9. Demolition and cutting shall be done in a manner which does not deform or apply loads to the existing framing and equipment of the building to remain.

10. All walls, ceilings, floors, etc., being disturbed by the work shall be returned to finished conditions to match existing by the contractor and contractor shall do his own cutting and patching as necessary under his contract.

11. The contractor shall maintain existing services to and in the existing area as required.

12. The existing systems to remain are to be supported as required until the modified elements are installed and supported.

13. If necessary, the contractor shall provide temporary services in the existing areas.

14. Existing slabs shall be saw-cut in a manner that does not cause the steel framing or the rebar supporting the slab to be cut. Contractor shall field verify slab thickness and rebar spacing.

15. Existing slabs shall be core drilled at reentrant corners of new floor openings to prevent over cutting.

16. The demolished systems shall be reduced to pieces of a weight, and transported across the remaining structure in a manner, such that the remaining structure is not overstressed.

17. The electrical contractor shall disconnect and remove electric service to all mechanical equipment being removed as a result of the renovation.

18. Equipment and devices shall be removed complete including hangers, supports, controls, conduit, wire, pipes, ductwork, etc. Wiring shall be disconnected at circuit breakers, removed and breakers marked "spare."

19. All open ended piping and ductwork that is to remain shall be capped and property secured.

20. Any existing pipes, ductwork, conduit, low voltage control, wiring and/or electrical and mechanical devices being disturbed by the work shall be reworked by this contractor as required to return to its former existing operating condition.

21. Any pipes or ductwork, or control wiring, or tubing feeding through devices or equipment being relocated, reworked, or abandoned and serving other devices, and/or equipment shall be maintained in working condition.

22. Mechanical contractor shall remove and reclaim any refrigerant in existing systems prior to demolition of any equipment according to federal requirements.

23. All asbestos removal will be handled by the owner and is not a part of this work.

24. Use of explosives shall not be permitted.

25. Existing architectural, mechanical and electrical equipment and systems shall be protected from damage resulting from demolition.

26. Contractor shall submit a proposed deconstruction sequence to the owner and architect for review prior to commencement of work.

EXCAVATING / BACKFILLING

1. The contractor shall familiarize himself with the survey and the geotechnical investigation report before starting construction. All underground work shall be in accordance with the recommendations of the geotechnical report except where noted otherwise on drawings or specifications.

2. All building pad preparation and patching shall follow the recommendations of the geotechnical report and the structural drawings and architectural drawings (uno).

3. All objectionable materials encountered are to be removed from excavated areas of the site per the geotechnical report.

4. If unstable subgrade sectors cannot be stabilized by excavation and re-compaction, then crushed stone or similar coarse aggregate materials shall be rolled into the subgrade until a firm subgrade reaction is achieved.

5. The geotechnical engineer shall determine on site or off site imported material that can be used for engineered fill. All fill material shall be approved by the geotechnical engineer.

6. The proposed engineered fill materials are to be placed in lifts not exceeding eight (8) inches in loose measured thickness. Each lift is to be compacted as follows:
   A. Slab on grade: Minimum of 95 percent maximum density as ASTM D698.

7. All fill materials shall be free of organic contaminations and other deleterious matter.

8. For back fill against basement walls, retaining walls, footings, etc., place in 8 inch thick layers, with each lift compacted at near optimum moisture content, until a minimum in place density of 95 percent of the maximum density as determined by ASTM D698 is achieved.

9. All soil surrounding and under footing shall be protected from frost action and freezing during the course of construction.

10. Notify structural engineer of any unusual soil conditions that are in variance with the geotechnical report.

CONCRETE PADS

1. This contractor shall provide to the general contractor, dimensions for the concrete foundations or bases under all equipment that rests on floors in mechanical equipment rooms or outside on grade. He shall follow drawings and/or manufacturer's literature with regard to design and construction of same. In the absence of more specific information, either on drawings or manufacturer's literature, the bases shall be level, shall have a minimum height above finished floor of 4 inches and extend 3 inches beyond the skids, feet or bed plate of the item of equipment.

2. Concrete pedestals and/or saddles for support of piping and/or tanks shall be designed to withstand stresses to which they may be subjected and to distribute properly the load and impact over building areas.

3. Concrete shall be a of mix producing compressive strength after 28 days of 3,000 psi minimum reinforcing and bolts shall be provided as required and work shall be done in accordance with applicable articles covering concrete work.

4. Space approximately 1 inch thick between bottom of equipment and top of concrete foundation or base which remains after shimming, shall be filled completely with grouting. Grout shall be made up with sand and cement designed for the purpose which does not shrink on setting up. Exposed surface of grouting shall be finished to make a neat appearance.

MECHANICAL LEGEND

CD	CONDENSATE DRAIN PIPING
CW	DOMESTIC COLD WATER PIPING
HW	DOMESTIC HOT WATER PIPING
RHW	DOMESTIC RECIRCULATING HOT WATER PIPING
HW (120°)	DOMESTIC HOT WATER PIPING - 120°F
RHW (120°)	DOMESTIC RECIRCULATING HOT WATER PIPING - 120°F
HW (140°)	DOMESTIC HOT WATER PIPING - 140°F
RHW (140°)	DOMESTIC RECIRCULATING HOT WATER PIPING - 140°F
D	DRAIN LINE
G	GAS PIPING
G-P	GAS PIPING # PSIG
GW	GREASE WASTE
GV	GREASE WASTE VENT
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
RO	REVERSE OSMOSIS WATER PIPING
SAN	SANITARY SEWER PIPING
V	VENT PIPING
	PIPING ABOVE GRADE/FLOOR
	PIPING BELOW GRADE/FLOOR
	EXISTING PIPING TO BE REMOVED
	EXISTING PIPING TO REMAIN
	VALVE - 2-WAY MODULATING VALVE
	VALVE - PRESSURE REGULATING / REDUCING VALVE
	VALVE - 3-WAY MODULATING VALVE
	VALVE - AUTOMATIC CONTROL VALVE
	VALVE - BALANCE VALVE
	VALVE - CHECK VALVE
	VALVE - MODULATING VALVE
	VALVE - RELIEF VALVE
	VALVE - SHUTOFF VALVE
	PRESSURE GAUGE W/COCK
	STEAM TRAP
	STRAINER
	THERMOMETER
	PIPE UNION
M	UTILITY METER
	DIRECTION OF DOWNWARD PITCH
	DIRECTION OF FLOW

	ROOMS OR AREAS SHOWN SHADED ON THIS PLAN, WITH THE FOLLOWING SHADE TYPE ▒▒▒ ARE DEDICATED FOR A SPECIFIC USE. EXAMPLES INCLUDE ELECTRICAL ROOMS, TECHNOLOGY/DATA CLOSETS, EXIT STAIRWELLS, AND ELEVATOR EQUIPMENT ROOMS. UNDER NO CIRCUMSTANCES SHALL PIPING, DUCTWORK, OR EQUIPMENT BE INSTALLED IN OR ROUTED THROUGH THESE ROOMS OR AREAS EXCEPT FOR BRANCH PIPING OR DUCTWORK SPECIFICALLY SERVING THE ROOM OR AREA. DEDICATED SPACE SHALL EXTEND VERTICALLY FROM FLOOR TO STRUCTURAL CEILING.
SA	DUCT-TYPE SMOKE DETECTOR WITH REMOTE TEST STATION AND AUXULIARY RELAY FURNISHED AND WIRED BY ELECTRICAL CONTRACTOR; INSTALLED IN DUCTWORK BY MECHANICAL CONTRACTOR PER CODE. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR AND MANUFACTURER. PROVIDE CONDUIT AND WIRING NECESSARY TO SHUT DOWN HVAC UNIT UPON ACTIVATION OF SMOKE DETECTOR.
DTS	DUCT TEMPERATURE SENSOR
	EXISTING DUCTWORK TO REMAIN
	EXISTING DUCTWORK TO BE REMOVED
MFSD	MOTORIZED FIRE/SMOKE DAMPER
FD	FIRE DAMPER
SD	SMOKE DAMPER
MOD	MOTOR OPERATED DAMPER
BDD	BACKDRAFT DAMPER
CO2	CARBON DIOXIDE DETECTOR
CO	CARBON MONOXIDE DETECTOR
H AC-1	HUMIDISTAT
T AC-1	THERMOSTAT
S	SENSOR
T	TEMPERATURE SENSOR
S H	HUMIDITY SENSOR
	POINT OF CONNECTION
XX / XX	EQUIPMENT TAG
CONV - A	CONNECTOR DESIGNATION CONV-A = TYPE (SEE SCHEDULE)
CUH-1	CABINET UNIT HEATER DESIGNATION CUH-1 = SEE SCHEDULE
UH-1	UNIT HEATER DESIGNATION UH-1 = SEE SCHEDULE
	SUPPLY OR OUTDOOR AIR DUCT
	RETURN OR EXHAUST DUCT
	DUCT LINING
SA-1	DUCT SOUND ATENUATOR SA-1 = SEE SCHEDULE
	DUCT UP
	DUCT DOWN
UC	1" DOOR UNDERCUT
or	DUCT RISE
	TRANSFER AIR
	DIFFUSER BLANK-OFF
	AIRFLOW DIRECTION
℄	CENTERLINE

CONTRACTOR TO PROVIDE THE MECHANICAL INSPECTOR A TEST AND BALANCE REPORT AT TIME OF FINAL INSPECTION.

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ABBREVIATIONS

A	AMPS
ACU	AIR CONDITIONING UNIT
AD	AREA DRAIN
ADD'L	ADDITIONAL
AF	AIRFOIL BLADE FAN
AFC	ABOVE FINISH COUNTER
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AHU	AIR HANDLING UNIT
AP	ACCESS PANEL
ARCH	ARCHITECTURAL
B	BOILER
BDD	BACKDRAFT DAMPER
BLDG	BUILDING
BOT	BOTTOM
BT	BATHTUB
C	CONDENSER
CB	CATCH BASIN
CC	COOLING COIL
CD	CEILING DIFFUSER
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CI	CAST IRON
CJ	CONTROL JOINT
CL	CENTERLINE
CLG	CEILING
CO	CLEANOUT
COL	COLUMN
CONST	CONSTRUCTION
CONT	CONTINUOUS
CONTR	CONTRACTOR
CONV	CONVECTOR
CS	CLINIC SINK
CT	COOLING TOWER
CTX	CONNECT TO EXISTING
CU	CONDENSING UNIT
CUH	CABINET UNIT HEATER
D	DAMPER
DCBP	DOUBLE CHECK BACKFLOW PREVENTER
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY
DE	DISHWASHER EXHAUST
DET	DETAIL
DF	DRINKING FOUNTAIN
DIA(ø)	DIAMETER
DN	DOWN
DS	DOWN SPOUT
DSW	DISCONNECT SWITCH
DT	DRAIN TILE
DWDI	DOUBLE WIDTH DOUBLE INLET FAN
DWG	DRAWING
DWH	DOMESTIC WATER HEATER
EA	EXHAUST AIR
EBB	ELECTRIC BASEBOARD
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EG	EXHAUST GRILLE
EH	ELECTRIC HEATER
EJ	EXPANSION JOINT
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EM	EMERGENCY
EQ	EQUIPMENT
ETR	EXISTING TO REMAIN
EUH	ELECTRIC UNIT HEATER
EWC	ELECTRIC WATER COOLER
EWH	ELECTRIC WATER HEATER
EXIST (E)	EXISTING
EXP	EXPANSION
F	FURNACE
FA	FIRE ALARM
FBD	FACE & BYPASS DAMPER
FC	FORWARD CURVE BLADE FAN
FCO	FLOOR CLEAN-OUT
FCU	FAN COIL UNIT
FD	FLOOR DRAIN / FIRE DAMPER
FFE	FINISH FLOOR ELEVATION
FPB	FAN POWER BOX
FPC	FIRE PROTECTION CONTRACTOR
FS	FLOW SWITCH
FT	FIN TUBE RADIATION / FEET
G	GRILLE (EXHAUST, RETURN, OR TRANSFER)
GA	GAUGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GE	GENERAL EXHAUST
GND	GROUND
GRE	GRAVITY ROOF EXHAUSTER
GUH	GAS UNIT HEATER
GWH	GAS WATER HEATER
H	HUMIDIFIER
HB	HOSE BIBB
HC	HEATING COIL
HE	HOOD EXHAUST
HOA	HAND-OFF-AUTOMATIC
HORIZ	HORIZONTAL
HP	HORSEPOWER
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HX	HEAT EXCHANGER
IE	INVERT ELEVATION
JB	JUNCTION BOX
KEC	KITCHEN EQUIPMENT CONTRACTOR
KHE	KITCHEN HOOD EXHAUST
KVA	KILOVOLT AMPERE
KW	KILOWATT
L	LOUVER
LAV / L	LAVATORY
LT	LAUNDRY TUB
LTG	LIGHTING
MA	MAKE-UP AIR
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MB	MOP BASIN
MBH	1,000 BTU/H
MC	MECHANICAL CONTRACTOR
MECH	MECHANICAL
MH	MANHOLE
MFR	MANUFACTURER
MIN	MINIMUM
MTD	MOUNTED
MXB	MIXING BOX
(N)	NEW
NEC	NATIONAL ELECTRIC CODE
NF	NON FUSED
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
(NIC)	NOT IN CONTRACT
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OAI	OUTSIDE AIR INTAKE
OC	ON CENTER
OD	OVERFLOW DRAIN
P	PUMP
PC	PLUMBING CONTRACTOR
PH (Ø)	PHASE
PNL	PANEL
PRE	POWER ROOF EXHAUSTER
PRV	PRESSURE REDUCING VALVE
PSF	POUNDS/SQUARE FOOT
PSI	POUNDS/SQUARE INCH
PVC	POLYVINYL CHLORIDE
RA	RETURN AIR
RAD	RADIUS
RD	ROOF DRAIN
RE	RETURN EXHAUST
REF	RETURN EXHAUST FAN
REQ'D	REQUIRED
RF	RETURN FAN
RG	RETURN GRILLE
RHC	REHEAT COIL
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
RTU	ROOF TOP UNIT
SA	SUPPLY AIR
SECT	SECTION
SG	SUPPLY GRILLE
SF	SUPPLY FAN
SH	SHOWER
SK	SINK
SOVB	SHUT-OFF VALVE BOX
SQ	SQUARE
SS	SERVICE SINK
STL	STEEL
STRUCT	STRUCTURAL
SW	SAFE WASTE
SWSI	SINGLE WIDTH SINGLE INLET FAN
SYM	SYMMETRICAL
TA	TRANSFER AIR
TC	TEMPERATURE CONTROL
TCC	TEMPERATURE CONTROL CONTRACTOR
TD	TRENCH DRAIN
TG	TRANSFER GRILLE
TPV	TRAP PRIMER VALVE
TS	TAMPER SWITCH
TYP (T/)	TYPICAL
UH	UNIT HEATER
UL	UNDERWRITER'S LABORATORY
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
UV	UNIT VENTILATOR
V	VOLTS
VAV	VARIABLE AIR VOLUME BOX
VD	VOLUME DAMPER
VERT	VERTICAL
VT	VITRIFIED TILE
VTR	VENT THRU ROOF
W	WATTS
W/	WITH
WC	WATER CLOSET
WCO	WALL CLEANOUT
WH	WALL HYDRANT
WP	WEATHERPROOF
YH	YARD HYDRANT
XFMR	TRANSFORMER

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REV SCHEDULE

#	COMMENT	DATE
1	Permit Resubmission	08.20.18
		01/10/19

PROJECT NAME / LOCATION

STEAK 44

CAMELBACK VILLAGE CENTER,
5101 NORTH 44TH STREET,
PHOENIX, ARIZONA 85018

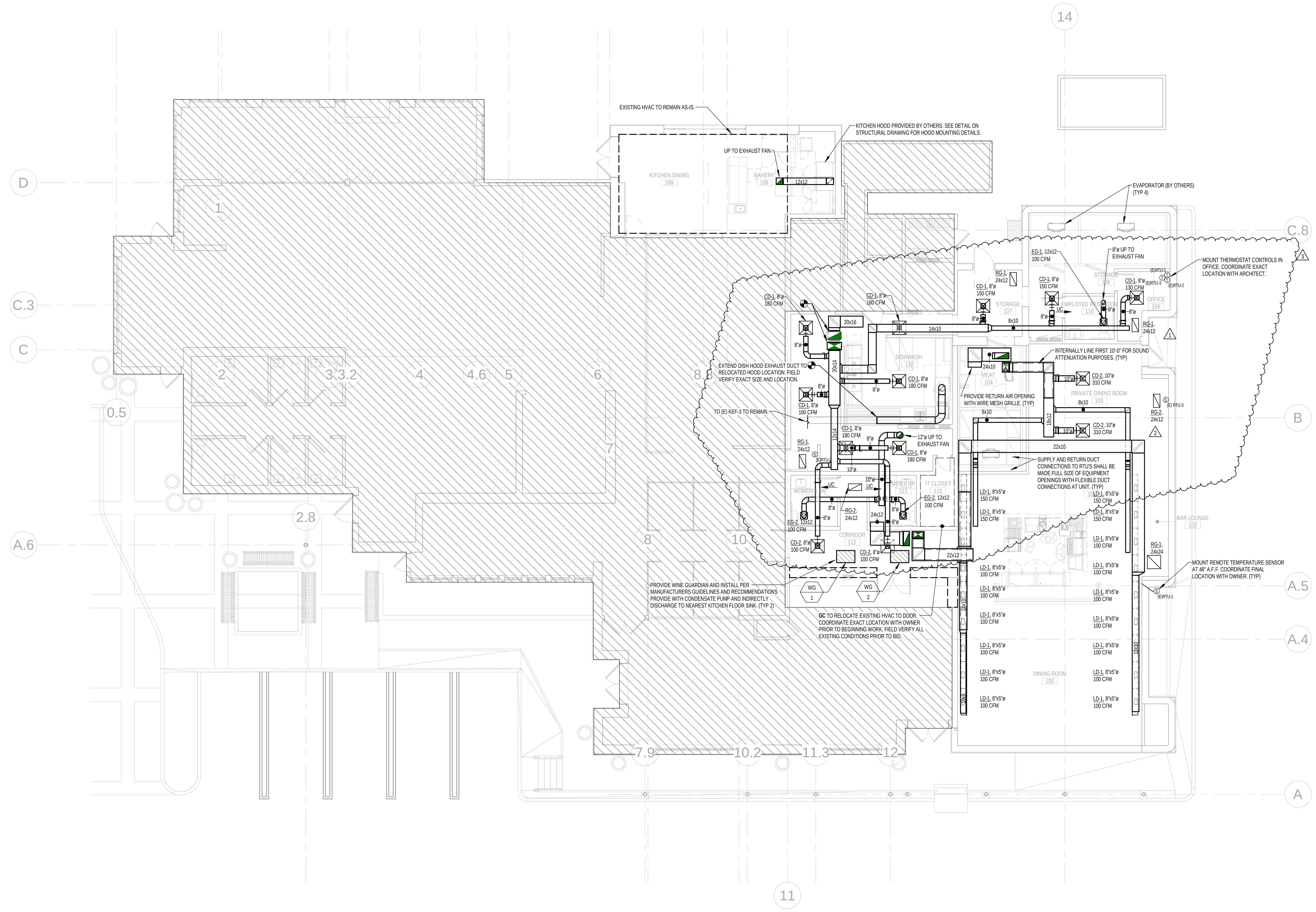
PROJECT INFORMATION

DATE: 2018-06-15
PROJECT NO: 2771-18
DRAWN BY: TBA

ISSUE FOR CONSTRUCTION

M-001

MECHANICAL GENERAL NOTES AND LEGENDS



DESIGN OF THE NON-DUCTED RETURN AIR PLENUM CEILING IS BASED ON THE REQUIREMENT THAT ALL MATERIALS IN THE RETURN AIR PLENUM CEILING ARE ALL LABELED AS PLENUM RATED AND MEET THE FLAME & SMOKE SPREAD REQUIREMENTS FOR PLENUM INSTALLATION AND THE APPROVAL OF A RETURN AIR PLENUM FROM THE LANDLORD. IF THE ABOVE CONDITIONS CANNOT BE MET, THIS CONTRACTOR SHALL STATE THE AMOUNT TO BE ADDED TO HIS BASE BID FOR A TOTALLY DUCTED RETURN AIR SYSTEM.

THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL EXTENT OF THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION AND PROPER INSTALLATION OF ALL MECHANICAL SYSTEMS. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY OFFSETS AND FITTINGS WHICH MAY BE REQUIRED DUE TO SPACE CONSTRAINTS OR OTHER CONDITIONS.

CONTRACTOR SHALL FIELD VERIFY ALL EXISTING FIELD CONDITIONS PRIOR TO BEGINNING WORK. HOLD ALL NEW DUCTWORK AS TIGHT TO STRUCTURE ABOVE AS POSSIBLE.

MAINTAIN MINIMUM 10' FROM ALL BUILDING INTAKES AND EXHAUST

CONTRACTOR SHALL MAINTAIN ALL REQUIRED SERVICE CLEARANCES ON EQUIPMENT PER MANUFACTURER INSTALLTION GUIDELINES AND RECOMMENDATIONS. CONTACT ENGINEER OF RECORD IMMEDIATELY WITH ANY CONFLICTS.

THE MECHANICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALUMINUM EXHAUSTDUCTWORK FOR DISHWASHER HOOD. M.C. SHALL PROVIDE AND INSTALL GALV. RIGIDDUCT FOR RESTROOM EXHAUST DUCTWORK.

REFER TO KITCHEN VENDOR DRAWINGS FOR BALANCING AIRFLOW TO KITCHEN HOODS.

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#	COMMENT	DATE
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2	Construction Set	08.30.18
3	DETAILS & HVAC REDESIGN REV.3	01/10/19

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ISSUE FOR CONSTRUCTION

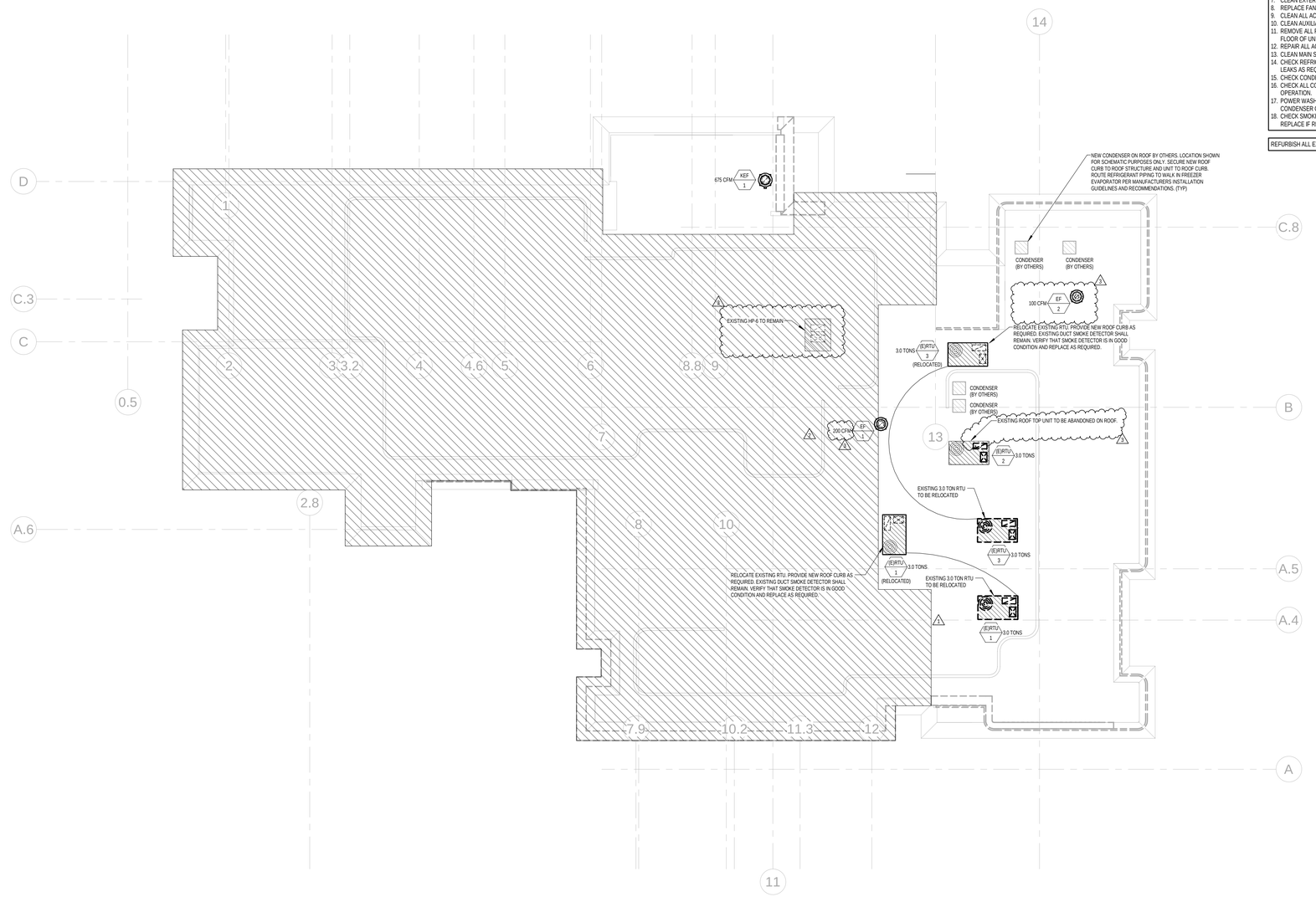
M-100

MECHANICAL FLOOR PLAN

EXISTING RTU REFURBISH REQUIREMENTS:

1. MECHANICAL CONTRACTOR SHALL REFURBISH EXISTING RTU TO LIKE NEW CONDITION.
2. REPLACE FILTERS.
3. LUBRICATE FAN AND SHAFT BEARINGS.
4. CLEAN FAN WHEEL.
5. RECALIBRATE AND CLEAN OUTSIDE AIR DAMPER AND LINKAGE.
6. RECALIBRATE AND CLEAN RETURN AND RELIEF AIR DAMPER AND LINKAGE.
7. CLEAN EXTERIOR FINS.
8. REPLACE FAN MOTOR BELTS.
9. CLEAN ALL ACCESS SECTIONS.
10. CLEAN AUXILIARY DRAIN PAN.
11. REMOVE ALL FOREIGN DEBRIS, VACUUM AND CLEAN INTERIOR FLOOR OF UNIT.
12. REPAIR ALL ACCESS DOORS AS REQUIRED.
13. CLEAN MAIN SUPPLY AND RETURN AIR DUCTS.
14. CHECK REFRIGERANT LEAKS AND CHARGE UNIT. REPAIR LEAKS AS REQUIRED.
15. CHECK CONDENSER FAN MOTOR FOR PROPER OPERATION.
16. CHECK ALL CONTACTS, RELAYS AND CONTROLS FOR PROPER OPERATION.
17. POWER WASH AND CHEMICALLY CLEAN EVAPORATOR AND CONDENSER COILS.
18. CHECK SMOKE DETECTOR FOR PROPER OPERATION, REPLACE IF REQUIRED.

REFURBISH ALL EXISTING RTUS TO LIKE NEW CONDITION.



MECHANICAL ROOF PLAN
1/8" = 1'-0"

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ISSUE FOR CONSTRUCTION

M-101

MECHANICAL ROOF PLAN

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VENTILATION AIR REQUIREMENT

HVAC UNIT	AREA SERVED	OCCUPANT LOAD	REQUIRED VENTILATION	O.A. REQUIRED (CFM)	O.A. SUPPLIED (CFM)	REMARKS
(E)RTU-1	DINING 100 (LOWER)	17 (820 SF)	7.5 CFM/PERSON 0.18 CFM/SF	275	275	PER ASHRAE STANDARD 62.1-2016
(E)HP-6 3	OFFICE 105	1 (66 SF)	5 CFM/PERSON 0.06 CFM/SF	9	10	PER ASHRAE STANDARD 62.1-2016
	STORAGE 106	0 (156 SF)	7.5 CFM/PERSON 0.12 CFM/SF	19	19	PER ASHRAE STANDARD 62.1-2016
	STORAGE 107	0 (73 SF)	7.5 CFM/PERSON 0.12 CFM/SF	9	10	PER ASHRAE STANDARD 62.1-2016
	DISHWASH 110	6 (578 SF)	7.5 CFM/PERSON 0.12 CFM/SF	115	115	PER ASHRAE STANDARD 62.1-2016
	WOMENS 111	0 (52 SF)	0 CFM/PERSON 0.06 CFM/SF	3	5	PER ASHRAE STANDARD 62.1-2016
	MENS 113	0 (52 SF)	0 CFM/PERSON 0.06 CFM/SF	3	5	PER ASHRAE STANDARD 62.1-2016
	EMPLOYEE RR 114	0 (42 SF)	0 CFM/PERSON 0.06 CFM/SF	2.5	5	PER ASHRAE STANDARD 62.1-2016
	CORRIDOR 112	0 (184 SF)	0 CFM/PERSON 0.06 CFM/SF	11	11	PER ASHRAE STANDARD 62.1-2016
(E)RTU-3	PRIVATE DINING 103	16 (361 SF)	7.5 CFM/PERSON 0.18 CFM/SF	185	187	PER ASHRAE STANDARD 62.1-2016
	DINING 100 (UPPER)	13 (325 SF)	7.5 CFM/PERSON 0.18 CFM/SF	156	158	PER ASHRAE STANDARD 62.1-2016

NOTE:
ASHRAE 62.1-2016 ITEM 6.2.2.1 BREATHING ZONE OUTDOOR AIR FLOW (CFM) Vbz = RpPz+RaAz

WHERE
Az = ZONE FLOOR AREA
Pz = POPULATION
Rp = TABLE 6.1 OUTDOOR AIR PER PERSON
Ra = TABLE 6.1 OUTDOOR AIR PER AREA

1

FAN SCHEDULE

MARK		MANUFACTURER	MODEL No.	SERVICE	TYPE	CAPACITY (CFM)	STATIC PRESSURE (WC")	DRIVE	MOTOR HP	ELECTRICAL VOLT.	PH.	OPER. WT. (LBS)	REMARKS
EF	1	GREENHECK	GB-071	RESTROOM	ROOF	200	0.4	BELT	1/6	120	1	55	1,2
EF	2	GREENHECK	GB-071	RESTROOM	ROOF	100	0.3	BELT	1/6	120	1	55	1,2

REMARKS:
1. ACCEPTABLE MANUFACTURERS; LOREN COOK, TWINCITY.
2. CONTROL WITH ROOM LIGHT SWITCH

KITCHEN EXHAUST FAN SCHEDULE (BY OTHERS)

MARK		MANUFACTURER	MODEL No.	SERVICE	TYPE	CAPACITY (CFM)	RPM	MOTOR HP	STATIC PRESSURE (WC")	ELECTRICAL VOLT.	PH.	FLA	OPER. WT. (LBS)	REMARKS
KEF	1	CAPTIVE AIRE	DU33HFA	HOOD	ROOF	675	1281	0.333	0.350	120	1	4.4	67	1

REMARKS:
1. REFER TO K.E.C. DRAWINGS FOR FINAL SPECIFICATION.

EXISTING ROOFTOP AIR CONDITIONING UNIT SCHEDULE (GAS-FIRED)

MARK		NOMINAL TONS	MANUFACTURER	MODEL No.	SERVICE	SUPPLY AIR (CFM)	MIN. OUTDOOR AIR (CFM)	ELECTRICAL MCA	MOCP	VOLT.	PH.	REMARKS
(E)RTU	1	3.0	CARRIER	50TFQD04	TENANT	1400	275	17.80	20	208	3	1,2,3
(E)RTU	3	3.0	CARRIER	50TFQD04	TENANT	1220	345	17.80	20	208	3	1,2,3

REMARKS:
1. ROOF CURB.
2. SMOKE DETECTOR IN RETURN AIR INTAKE (IF NEEDED).
3. PROVIDE WITH NEW DISCONNECT SWITCH AND 115 V GFI CONVENIENCE RECEPTACLE.

GRILLE AND DIFFUSER SCHEDULE

MARK		MANUFACTURER	MODEL No.	FRAME OR BORDER TYPE	MODULE SIZE	FINISH	REMARKS
CD	1	TITUS	TMS	LAY-IN	24x24	PER ARCH	1,2
CD	2	TITUS	TMS	SURFACE	24x24	PER ARCH	1,2,4
EG	1	TITUS	50F	LAY-IN	SEE PLAN	PER ARCH	1,2
EG	2	TITUS	50F	SURFACE	SEE PLAN	PER ARCH	1,2,4
LD	1	TITUS	ML-39	SURFACE	4'-0"	PER ARCH	1,2,3,4
RG	1	TITUS	50F	LAY-IN	SEE PLAN	PER ARCH	1,2
RG	2	TITUS	50F	SURFACE	SEE PLAN	PER ARCH	1,2

REMARKS:
1. ALL CEILING DIFFUSERS ARE 4-WAY THROW UNLESS INDICATED OTHERWISE ON PLAN.
2. ACCEPTABLE MANUFACTURERS; PRICE, TUTTLE AND BAILEY, KRUEGER, NAILOR, ANEMOSTAT.
3. 2-SLOT / 1" SLOT WIDTH WITH CONTINUOUS PLENUM.
4. PROVIDE WITH YOUNGS REGULATORS.

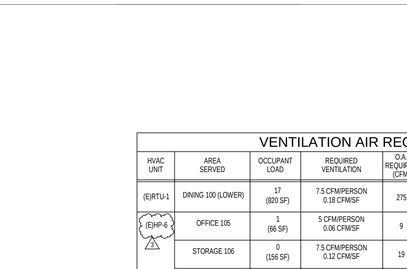
2

WINE GUARDIAN SCHDEULE

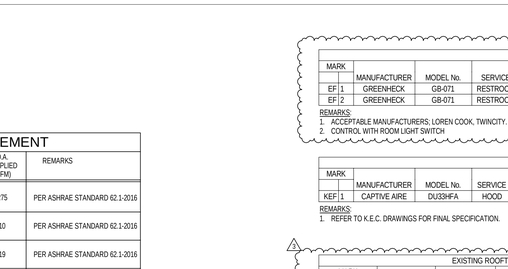
MARK		MODEL No.	ELECTRICAL MCA	MOCP	VOLT.	PH.	OPER. WT. (LBS)	REMARKS
WG	1	D088	11.80	20	208	1	130	1
WG	2	D088	11.80	20	208	1	130	1

REMARKS:
1. SUSPENDED ABOVE CEILING.

ROUND DUCT TAKE-OFF DETAIL
N.T.S.

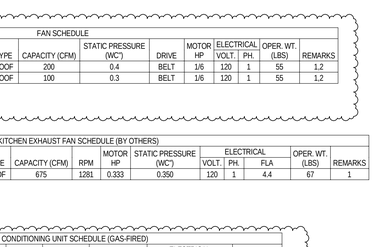


CEILING DIFFUSER CONNECTION DETAIL
N.T.S.



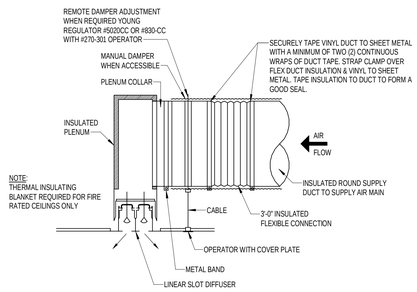
NOTES:
1. FOR UNITS NOT SUPPLIED WITH SMOKE DETECTORS INSTALL SMOKE DETECTORS, PROVIDED BY THE ELECTRICAL CONTRACTOR, IN DUCTWORK WHERE INDICATED ON PLANS.
2. PROVIDE 1" ACOUSTICAL DUCT LINING IN SUPPLY AND RETURN DUCT FROM UNIT CONNECTION TO POINTS INDICATED ON PLANS.
3. TRANSITION SUPPLY AND RETURN UNIT CONNECTIONS TO SIZES INDICATED ON PLANS.

ROOFTOP UNIT INSTALLATION
N.T.S.

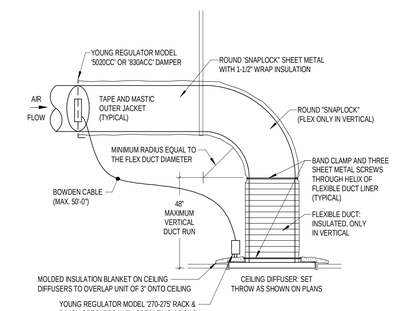


NOTE:
MECHANICAL SUBCONTRACTOR SHALL FURNISH ROOF OPENING SIZES & LOCATIONS, FOR STRUCTURAL SUPPORT FRAMING BY GENERAL CONTRACTOR

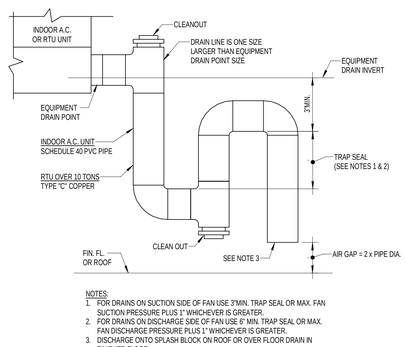
ROOFTOP UNIT CURB DETAIL
N.T.S.



LINEAR DIFFUSER MOUNTING DETAIL
N.T.S.

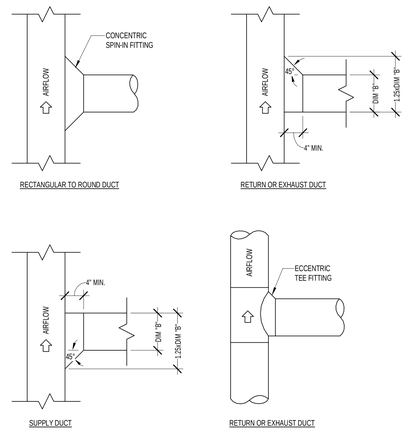


CEILING DIFFUSER CONNECTION DETAIL
N.T.S.



NOTES:
1. FOR DRAINS ON SUCTION SIDE OF FAN USE 3"MIN. TRAP SEAL OR MAX. FAN SUCTION PRESSURE PLUS 1" WHICHEVER IS GREATER.
2. FOR DRAINS ON DISCHARGE SIDE OF FAN USE 6" MIN. TRAP SEAL OR MAX. FAN DISCHARGE PRESSURE PLUS 1" WHICHEVER IS GREATER.
3. DISCHARGE ONTO SPLASH BLOCK ON ROOF OR OVER FLOOR DRAIN IN FINISHED FLOOR.

CONDENSATE DRAIN ROOF/FLOOR
N.T.S.



DUCT BRANCH TAKE-OFF DETAILS
N.T.S.

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ISSUE FOR CONSTRUCTION

M-200

MECHANICAL SCHEDULES AND DETAILS

Section 200500 - General Requirements

A. General

1. Specifications are applicable to all contractors and/or subcontractors for all mechanical systems in Divisions 01, 20, 21, 22, and 23.
2. This contractor is also referred to the architectural, structural, electrical and all other drawings and specifications pertinent to this project and fully coordinate with all other trades, owner and architect requirements. All of the above mentioned drawings and specifications are considered a part of the contract documents.
3. Conform to all Instructions to Bidders, general and special conditions of contract as specified by architect and/or owner.
4. Refer to "Alternate Proposals" for possible changes affecting the extent of this section of work.
5. Before submitting a bid, each contractor is requested to visit the job site to familiarize themselves with construction condition, check facilities and conditions and make all necessary observations and measurements. Note conditions under which work is to be performed and take all items into consideration in bid. No consideration will be given for his failure to do so.
6. Systems are to be complete and workable in all respects, placed in operation and properly adjusted.
7. Each contractor shall provide for his own clean-up, removal and legal disposal of all rubbish daily.
8. Each contractor shall protect his work, his existing and adjacent property against weather.
9. Each contractor shall protect his work, materials, apparatus and fixtures from damage. Any work damaged by failure to provide protection required, shall be removed and replaced with new material at the contractor's expense.
10. Each contractor must confirm all utility company requirements and connection points in field, prior to starting work. Each contractor shall include cost of utility companies work in their bid.
11. Each contractor must confirm size, location and materials at point of tie in connections in the field prior to rough-in of new work.
12. Arrange for and obtain owner's and insurance representative's permission for any service shutdowns.
13. Each contractor shall be solely responsible for construction means, methods, sequences of construction and the safety of workmen.
14. No piping, ductwork, wiring, etc., shall be installed or routed above or below electrical panels and equipment, through elevator equipment rooms or elevator shafts or stairways unless these items serve these areas only.
15. All contractors shall coordinate with the electrical contractor and obtain a written approval identifying the electrical characteristics of all mechanical equipment prior to ordering of equipment. No additional payment will be made for lack of contractor coordination of electrical characteristics.
16. Each contractor shall include modifying existing conditions to complete the project. During construction the contractors may uncover an existing condition that will have to be modified. Any such work which comes under the jurisdiction of this contractor shall be done by this contractor without extra cost to the owner and project.
17. Work related to the existing building shall be coordinated to minimize interference or interruption of normal building use by the owner. Refer to architectural plans for phasing requirements.
18. Ceiling grid systems shall not be supported from ductwork, heating or plumbing lines or any other utility lines, and vice versa. Each utility and the ceiling grid system shall be a separate installation and shall be independently supported from the building structure - concrete, steel or masonry. Where interferences occur, in order to support ductwork, piping, ceiling grid systems, etc., trapeze type hangers or supports shall be employed which shall be located so as not to interfere with access to such mechanical equipment as valves, regulators, mixing boxes, fire dampers, etc.

B. Work Coordination and Scope

1. Each contractor under this division shall familiarize himself with the work to be done under other divisions of this specification and their related drawings and shall so coordinate and schedule his work as not to cause delays or interference with the work of others. Such coordination and scheduling shall accomplish the installation of mechanical and plumbing equipment and piping with a minimum of cutting through masonry and other adjustments.
2. Work included under this division shall consist of furnishing all materials, supplies, equipment, tools, transportation and facilities and performing all labor and services necessary for the complete installation of the mechanical systems of plumbing, fire protection, heating, ventilating, air conditioning, and specialty systems.
3. The contractor under this division shall report discrepancies in the work of others which affect his work. Any changes made necessary by failure or neglect to report such discrepancies shall be made by and at the expense of the contractor of this division. Obtain written instructions for changes necessary to accommodate work of others.
4. The contractor under this division shall be responsible for proper size and location of anchors, chases, recesses, opening, etc., required for the proper installation of his work.
5. The division of responsibility under separate mechanical, fire protection and plumbing contracts for tie-in points shall be as follows:
   a. The plumbing contractor shall provide domestic water and gas to within five feet (5'-0") of equipment connection furnished by the mechanical or electrical contractor, final connection by mechanical or electrical contractor. On the water lines, the plumbing contractor shall provide the shut-off valve, check valve, backflow preventor and pressure regulator. On the gas lines, the plumbing contractor shall provide the shut-off valve and pressure regulator.
   b. Plumbing contractor shall run the gas, water, sanitary and storm to 5'-0" outside the building or to points as noted on the drawings.
   c. Fire protection, plumbing and mechanical contractor shall provide sleeves to the general contractor for placement in floors, walls, etc. and coordinate such location. The plumbing contractor shall be responsible for flashing at vent roof terminals.
   d. The fire protection, plumbing and mechanical contractor shall check with the architectural drawings concerning the test borings to determine areas of rock which should be included in his excavation work. Failure to adjust for rock conditions shall not warrant cause for additional compensation.
   e. The plumbing contractor shall rough-in and connect all other fixtures and equipment where shown on the drawings but not previously mentioned. Provide with shut-off valves and p-traps with clean-out plug.
   f. The plumbing contractor shall provide gas, cold water and drain for the emergency generator and install valves, etc. Generator furnished by the electrical contractor.
   g. Unless responsibility to provide or furnish is otherwise stated on the electrical or mechanical drawings and electrical and mechanical specifications the contractor, under these divisions shall provide motors, special controls, disconnects, transformers, starters and relays as required for the proper operations of all equipment furnished under this division. All electrical equipment shall conform to requirements set forth under the electrical division and be suitable for operation on 60 cycle current available at the site.
   h. All motors 1/3 HP and smaller shall be single phase motors, 1/2 HP and larger, shall be three phase motors except where otherwise specified. Thermal overload protection for all motors shall be provided. Combination fused disconnect and magnetic line starters with auto-off-test switch shall be provided for all three-phase motors. Thermal overload relays shall be sized for 115 percent of full load motor current. For motors with VFD; motors shall be inverter duty motors that meets current "MG 1 Part 31" specifications. Motors to have a minimum of 20:1 turn down ratio. Motors over 20 Hp shall have shaft ground rings. The installation of all motors, starters and other electrical work under this mechanical division shall be done so as to conform with the National Electric Code. Each motor shall be of squirrel cage type, open-drip proof, normal starting torque, having ball bearings unless otherwise specified. For manufacturers that use PMAC motors, this contractor shall supply VFD's to operate motor.
6. Each contractor shall provide OSHA approved handrail (Guard) system for all roof mounted equipment within 10'- 0" of roof edge where the roof edge does not have a 42" high parapet or higher.

C. Codes, Permits, Standards and Regulations

1. Contractors shall install work in full accordance with rules and regulations of all applicable codes (local, city, county, state, national codes, NFPA, OSHA, etc.), government regulations, utility company requirements, and applicable standards having jurisdiction over premises. This shall include safety requirements of the state department. Do not construe this as relieving contractor from compliance with any requirements of specifications which are in excess of code requirements and not in conflict therewith.
2. Contractors shall secure and pay for all fees, permits, and certificates of inspection incidental to this work required by foregoing authorities. Arrange for all required inspections and approvals.
3. Contractor shall be responsible for payments to all public utilities for work performed by them in connection with provision of service connections required under this division of specifications.
4. Deliver all permits and certificates to architect in duplicate.

D. Design Drawings

1. The design drawings, as submitted, are diagrammatic and are not intended to show exact location of equipment, piping and ductwork unless dimensions are given. Piping and ductwork are to be installed along the general plans shown on the drawings while conforming to actual building conditions. Each contractor shall confirm all dimensions by field measurement.
2. Before entering into a contract, the successful bidder may be required to submit satisfactory evidence to show that the manufacturer of all parts of the equipment offered have been regularly engaged in the manufacture of such equipment for three (3) years and have not less than three (3) installations of a similar type which have been in successful operation under conditions similar to those specified for not less than two (2) years.
3. All equipment, piping and material specified herein after as shown on the drawings shall be furnished and installed by the contractor, unless specifically indicated to the contrary. Installation shall comply with all required "Building Codes" and "Reference Standards."
4. If this contractor proposes to install equipment requiring space conditions other than those as specified and/or shown on the design drawings, or to rearrange the equipment, he shall assume full responsibility and submit drawings for the rearrangement of the space and shall obtain the full approval of the architect prior to start of work.
5. The exact locations for fixtures, equipment and piping which is not covered by drawings shall be obtained from the architect or his representative in the field and the work shall be laid out accordingly.
6. Drawings and specifications are intended to supplement one another. Any materials or labor called for in one but not the other shall be furnished as if both were mentioned in the specifications and shown on the drawings.

E. Base Bid Equipment, Materials and Substitutions

1. All equipment and materials shall be new, free of defects and UL labeled.
2. Base bid manufacturers are included in the specification or listed in schedules on the drawings. All other manufacturers are considered substitution.
3. The name or make of any article, device, material, form of construction, fixture, etc., stated in this specification, whether or not the words "or approved equal" are used, shall be known as a "standard".
4. All cost shall be based on "standards" specified.
5. The equipment schedules on the drawings indicate manufacturer and their equipment model numbers that this design has been based on. Each contractor is required to bid upon the basis of design and furnish the makes specified.
6. Where more than one make or name is mentioned as being acceptable, it shall be understood that only the name or make referring to the manufacturers model numbers or sizes shall be considered the "Specified Standards." It shall be further understood that other makes and names, even though mentioned, have not been checked for detail and that their size and arrangement are the contractor's responsibility the same as a proposed substitute item. The use of other manufacturer's equipment that is listed as acceptable alternates that entails general trades, structural, mechanical, electrical, etc., revisions is this contractor's responsibility to provide revisions. Any additional cost of such changes shall be paid by the contractor submitting the acceptable alternates which necessitates changes in installing such submitted alternate equipment, even though such costs may be part of another division of work.
7. Bids concerning the use of substitute products must be accompanied by complete specifications and performance characteristic covering these products. Contractor shall provide all available test data and experience records which may be helpful to the architect in evaluating the quality and/or suitability of alternate products.
8. Contractor is also invited to bid on any other similar products the contractor desires to propose as substitutions, stating any difference in cost (add or deduct from base bid cost) for each proposed substitution on the substitution sheet. If the architect decides to accept any of the proposed substitutions, proper notations thereof shall be made in the written contract. Where several makes are mentioned in the specifications and the contractor fails to state that he prefers a particular make in his bid, the owner shall have the right to choose any of the makes mentioned without change in price. No consideration will be given to proposals for alternative products unless submitted with the original bids.
9. Substitutions are subject to the approval of the owner. If a substitution is submitted, it is the contractor's responsibility to evaluate it and certify that the substitution is equivalent in all respects to the base specifications.
10. If substitutions are approved, notify all other contractors, subcontractors, etc., affected by the substitution and fully coordinate with them. Any costs resulting from substitution, whether by this contractor or others, shall be the responsibility of and paid for by the substituting contractor. Approved shop drawings do not absolve this contractor from this responsibility.
11. All equipment shall be installed in full accordance with the manufacturer's data and installation instructions and service clearances. It is this contractor's responsibility to check and confirm these requirements prior to starting of any work.

F. Warranty

1. Fully warrant all materials, equipment and workmanship and the successful operation of all equipment and apparatus installed by this contractor for one (1) year from date of final acceptance.
2. Extend all manufacturers' warranties to owner; including five (5) year compressor and ten (10) year heat exchanger extended warranty on HVAC equipment to include material and labor.
3. Repair or replace without material and labor charge to the owner all items found defective during the warranty periods. In the case of replacement or repair due to failure within the warranty period, the warranty on that portion of the work shall be extended for a minimum period of one (1) year from the date of such replacement or repair.

G. Shop Drawing Submittals

1. Submit shop drawings for mechanical, plumbing, fire protection, and control systems; including but not limited to sheetmetal, plumbing fixtures and equipment with adequate details and scales to clearly show construction. Indicate the operating characteristics for each required item. Clearly identify each item on the submittal such as mark, location and use, using the same identification as provided on the construction documents.
2. Sheetmetal and fire protection shop drawings shall be fully dimensioned and coordinated based on field verified building dimensions and clearances and architectural ceiling layouts. Indicate structural systems, lighting, ductwork and piping at all critical locations.
3. Contractor shall review and indicate his approval of each shop drawing prior to submittal for review. Shop drawings will not be reviewed by the engineer unless the contractor's approval is noted. Do not start work or fabrication until shop drawings have been reviewed by the engineer and returned to the contractor.
4. Submittals will be reviewed only for general compliance with the contract documents and not for dimensions or quantities. The architect and engineer will make every effort to detect and correct errors, omissions, and inaccuracies in such drawings, but the failure to detect errors, omissions, and inaccuracies shall not relieve the contractor of responsibility for the proper and complete installation in accordance with the intent of the contract documents. The submittal review shall not relieve the contractor of responsibility for purchase of any item in full compliance with the contract documents or its complete and proper installation.
5. Where submittals vary from the contract requirements, the contractor shall clearly indicate on submittal or accompanying documents the nature and reason for the variations.
6. Each manufacturer or his representative must check the application of his equipment and certify at time of shop drawing submittal that the equipment specified has been properly applied and can be installed, serviced and maintained where located on the drawings. Advise engineer in writing with submittal drawings of any potential problems. The manufacturer shall be responsible for any changes that might be necessary because of physical characteristics of equipment that have not been called to the engineer's attention at the time of submittal.
7. Submit a minimum of one (1) print and an electronic "pdf" of shop drawings to the architect. The architect and engineer shall review and return a pdf. The contractor shall distribute copies as required to properly conduct the work, including requirements of the operating manual.

H. Record Drawings

1. Each contractor or subcontractor shall keep one (1) complete set of the contract drawings and equipment submittals on the job site on which he shall regularly record any deviations or changes from such contract drawings made during construction. All recording shall be done in color ink.
2. These drawings shall record the installed location of all concealed equipment, piping, electric service, sewers, wastes, vents, ducts, conduit, etc., by measure dimensions to each such item from column centerlines or readily identifiable and accessible walls or corners of the building. Plans also shall show invert elevation of sewers and top elevation of all other below-grade lines.
3. Record drawings shall be kept clean and undamaged and shall not be used for any purpose other than recording deviations from working drawings and exact locations of concealed work.
4. After the project is completed, these drawings shall be scanned to an electronic "pdf" format and pdf and hard drawings shall be delivered to the architect in good condition, as a permanent record of the installation as actually constructed.

I. Supervision

1. The contractor shall have in charge of work at all times during construction a competent foreman or superintendent whose experience and background shall qualify him for the work to be performed under this division. Once assigned, the foreman or superintendent shall be retained until completion of the project and any consideration as to his removal on grounds of incompetence shall either be initiated by or referred to the architect for decision.

Section 200510 - Basic Materials and Methods

A. General

1. Provide all materials, labor, equipment, and accessories required to furnish and install the mechanical items identified in this section.
2. This section includes basic mechanical materials and methods to complement other division sections in this specification and requirements indicated on the mechanical drawings.

B. Interferences

1. Before installing any work, contractor shall see that it does not interfere with clearance required for finish on beams, columns, pilasters, walls, or other structural or architectural members, as shown on architectural drawings. If any work is so installed and it later develops that architectural design cannot be followed, contractor shall, at his own expense, make such changes in his work as architect may direct to permit completion of architectural work in accordance with plans and specifications.
2. Install additional offsets on piping or ductwork where required to obtain maximum headroom or to avoid conflict with other work without additional cost to owner.
3. Report any interferences between work under this division and that of any other contractors to architect as soon as they are discovered. Architect will determine which equipment shall be relocated, regardless of which was first installed, and his decision shall be final.

C. Protection of Work and Property

1. The contractor shall be responsible for safeguarding work, property, and facilities against damage, both his own as well as others with which he may come into contact in the performance of his work.
2. Stored materials shall be protected against damage from weather. Pipe, and duct openings shall be closed with caps or plugs during installation. All fixtures and equipment shall be covered and protected against damage. Any materials or equipment damaged at any stage in the construction shall be replaced or repaired. Final completion, all work shall be in a clean and unblemished condition.
3. During construction, all return air ductwork and transfer air openings serving new and existing air handling equipment and/or adjacent tenant spaces shall be protected. Openings which need to remain active shall be covered and protected with MERV 8 filtration media; openings which can remain inactive during construction shall be covered with plastic sheathing and sealed air tight. Filter media shall be replaced regularly as required during construction in order to ensure adequate airflow through all required active openings. In addition, at the end of each phase of construction and at the end of the construction project, all filtration media within each piece of equipment serving the space shall be replaced.

D. Supports and Hangers

1. Hangers and supports are to be provided to properly support, secure and align piping and to meet field conditions and as manufactured by Grinnell, Michigan Hanger or Caddy.
2. All hangers, brackets, clamps, etc., shall be of standard weight steel. Perforated strap hangers shall not be used in any work. When two or more pipes are run parallel, they may be supported on unistrut-type trapeze hangers. Other hangers for pipe 3" in size and smaller shall be clevis. For pipe transporting medium above 150 degrees F and 4" in size and above, use pipe roll. Each hanger is to be sized to include pipe insulation saddle for protection.
3. Where building service lines enter or leave building such as water, sewer, gas, etc., and are installed on filled earth, provide continuous support on a reinforced concrete beam furnished and installed under this division. Support beam on building and with vertical support down to foundation footing and on undisturbed earth at other end. Gas main shall enter building above grade.
4. All vertical piping passing through floors shall be supported at the floor by a riser clamp.
5. Isolate all copper lines form ferrous hangers or supports by using foil filler or vinyl tape.
6. Spacing to comply with ASHRAE standards and code requirements.

E. Pipe Sleeves, Floor and Ceiling Plates

1. All pipes passing through floors or masonry walls shall be provided with machine-cut schedule 40 pipe steel sleeves. The sleeves shall be so sized to allow at least 1/4" clearance between the inside sleeve wall and the pipe or insulation surface. Sheet metal sleeves shall not be used in this work. Pipe sleeves are to extend 2" above finished floor and sealed. Pipe sleeves are to be full wall thickness and sealed.
2. Unused sleeves shall be plugged and finished to match adjoining surface.

F. Escutcheons

1. Fit all pipe passing through walls, floors or ceilings in finished rooms with steel or brass escutcheons. Where surface is to receive a paint finish, make escutcheons prime painted; otherwise, make escutcheons nickel or chrome plated. Where piping is insulated, fit escutcheons outside insulation.

G. Pipe Identification and Tags

1. Identify each pipe, valve and controls in equipment rooms, above accessible ceilings and in accessible shafts.
2. Color code identification bands or marker backgrounds to identify contents of pipe with initials and direction of flow located near each valve and fitting, on both sides of pipe passing through walls and on long runs at not over 20'-0" intervals.
3. At place where pipe is to have marking, covered pipe shall be properly primed with clear lacquer. After marking is applied, coat with lacquer. Apply marking adjacent to valves and equipment at major changes in directions, where pipes pass through walls or floors.
4. Each piece of equipment shall be identified by a number, together with a brief description of its purpose, e.g. "Air Handling Unit - East Lobby." Identification shall be embossed or engraved plastic or stamped brass strips firmly attached to the equipment or adjacent wall at the obvious location. The lettering for such strips shall be not less than 1/2" high.
5. All valves shall be provided with brass numbered tags attached to handle with a brass chain or ring. Wiring of tags will not be acceptable. At the completion of the work, a reproducible valve schedule shall be provided. Three (3) copies of this shall be mounted in metal, glass covered frames where requested by the architect. The schedule shall give a description of the line or equipment controlled; the normal position, emergency and/or shutdown position and location given either by description or diagram.
6. All controls, starters, switches, etc, shall be identified by embossed stencil or engraved plate as to purpose and/or equipment controlled. Control wiring shall be identified with program number and device it services.

H. Access Panels

1. Each contractor shall be responsible for providing all required access panels necessary for his work. This includes any access panels required for HVAC, plumbing and fire protection. Each contractor shall also provide access panels for any existing conditions as required.
2. Refer to architectural drawings and specifications for type of access panel and coordinate locations prior to any work.
3. Contractor shall mark lay-in ceiling tiles, in a method approved by the architect, where access is required to such mechanical, plumbing, and fire protection equipment, valves, regulators, mixing boxes, fire damper, etc.

I. Expansion Joints

1. Expansion joints in piping for heating and domestic water system 2-1/2" and below shall be Flexicraft ML loop stainless steel for steel and copper pipe or Flexonics model H, stainless steel bellows, internal guides, anti-torque device for steel pipe and model HB, bronze bellows, internal guides, anti-torque device for copper pipe; end connections to match corresponding pipe construction.
2. Expansion joints in heating and domestic water systems 3" pipe size and above shall be flexonics corrugated bellows type with mated neck rings and control rings; allowable working pressure to be 300 PSIG at 850 degrees F. End connections to be flanged.
3. Pipe alignment guide to be steel spider (copper clad for copper pipe) housed in a steel sleeve with feet for attachment to structure.
4. Expansion loops shall be provided on all pipe runs over 100 ft in length. Size loop per manufacturer's recommendations or as scheduled.

J. Thermometers and Gauges

1. Pressure gauges shall be provided in pipe lines and at inlets and outlets to equipment as called for or specified. These shall be installed to indicate pressure changes across equipment only. This means that they must have connections installed as close as possible to equipment flanges. These shall be bourdon tube type with 3" minimum dial 1/4 male NPT connecion, steel cages with pressure ranges suitable for indicating the normal operating pressure at the two-third point of the scale range. Ashcroft, 3M or Taylor. Connections shall be made with shut-off cock and surge snubber.
2. Thermometers shall be a red mercury in glass-type with adjustable angle feature, 7" minimum scale length with range and bulb length suitable for the application and insertion well. These shall be located where they sense a true temperature and where they can be easily read and be installed with heat transfer grease.

K. Miscellaneous Steel

1. Furnish and install all miscellaneous steel required for supports, hangers, anchors, guides, etc., required for installation of equipment and materials furnished and installed under this division.

L. Painting

1. This contractor shall perform all painting incidental to this work.
2. All insulation shall be painted at the time of installation with one coat of Benjamin Foster "Lagtone" water base paint. At the completion of the work, all such insulation shall be given an additional coat of alkyd resin paint of a color to match existing building structure or as selected by the architect.
3. All uncovered black iron pipe, fittings, iron portions of valves, hangers, structural steel, expansion tanks, cooling tower sumps and all other black iron work shall be thoroughly cleaned and given two coats of alkyd resin paint of a color to match existing building structure or as selected by the architect.
4. All uncovered exposed sheet metal shall be thoroughly cleaned and neutralized and given two (2) coats of alkyd resin paint of a color to match existing building structure or as selected by the architect.
5. All painting shall be done with a brush or roller. Spray painting will be prohibited.
6. All finishing materials, thinners, etc., shall be the best quality, first line materials as manufactured by:
   a. E.I. Dupont De Nemours and Company
   b. Pratt and Lambert, Inc.
   c. The Glidden Company
   d. The Sherwin-Williams Company
   e. The Pittsburgh Plate Glass Company
7. All paint materials shall be delivered to the job in the manufacturer's original unopened and labeled containers, and they shall be used strictly in accordance with the manufacturer's directions.
8. This contractor shall submit a list of materials to the architect. The list shall state the branch names of the materials that the contractor intends to use. This list shall be secured from the paint manufacturer and shall be on his stationery.
9. The architect's approval must be secured before any painting work is started.

M. Clean-Up

1. Insofar as this contract is concerned, at all times keep premises and building in a neat and orderly condition: Follow explicitly any instructions of architect in regard to storing of materials, protective measures, cleaning-up of debris, etc.
2. Upon completion of work, this contractor shall thoroughly clean all apparatus furnished by him, pack all valves and thoroughly clean piping, fixtures and equipment removing all dirt, grease and oil.
3. Air systems shall not be operated without filters. Upon completion of work, replace all filters.

N. Operating and Maintenance

1. This contractor shall furnish competent personal instruction to the owner's operating personnel for a period of two (2) days in the proper operation of the heating and air conditioning equipment. He shall also supply the owner with copies of an operation manual containing the following:
   a. Step-by-step procedures for start-up and shut-down for each system and piece of equipment.
   b. Performance data, curves, ratings.
   c. Wiring diagrams.
   d. Manufacturer's descriptive literature.
   e. Automatic controls with diagrams and written description of operation.
   f. Manufacturer's maintenance and service manuals.
   g. Plumbing fixtures.
   h. Spare parts and replacement parts list for each piece of equipment.
   i. Name of service agency and installer.
   j. Final approved shop drawings.

Section 200523 - Piping and Valves

A. General

1. Furnish all material, labor, equipment, and accessories as required to install complete fire protection, plumbing, and HVAC piping systems as indicated on drawings and in these specifications.
2. Install in full accordance with local code requirements, see other specification section for additional requirements and install in accordance to manufacturer's recommendations and requirements.

B. Connections to Equipment Furnished by Others

1. Provide valved water and/or gas connection for equipment furnished by other contractors or owner.
2. Include accessories required by code, drawings and manufacturer's installation instructions.
3. Fully coordinate with lab equipment, pool equipment, kitchen equipment, and laundry equipment suppliers and confirm all rough-in requirements prior to starting work.

C. Installation

1. All piping shall be installed parallel with, or at right angles to, the building walls. All vertical risers shall be installed plumb and straight.
2. All piping shall be installed with pitch in the direction of flow of not less than 1" in 40', except as otherwise shown. It must be possible to drain every portion of the piping system.
3. Run lines as direct as possible avoiding unnecessary offsets. However, if offsets are required in order to obtain maximum headroom or to avoid conflict with other work, they shall be made as required or as requested by the architect without additional cost to the owner. The architect reserves the right to make minor changes in the location of piping and equipment during the roughing-in, without additional cost to the owner. All changes proposed by others shall be approved by the architect.
4. Lines shall be cut accurately to measurement at the site and worked into place without springing or forcing. Sufficient offsets, pipe loops, or expansion joints between anchor points shall be provided as needed, whether or not shown, to limit stresses and control movement of lines subject to the thermal expansion.
5. Before any piping is installed, it shall be up-ended and pounded to remove any foreign matter present, and shall be swabbed, if necessary, for thorough cleaning. After installation and before final connections made, all piping system shall be flushed with a material that is not injurious to either pipe or equipment. (See also "Tests and Adjustments.")
6. Pipe to be threaded shall be cut square and full threaded with clean-cut tapering threads and shall be reamed after threading. Also threaded connections shall be made with pipe thread compound applied to the wall threads only.
7. The edges of pipe to be welded shall be machine beveled wherever possible. Before welding, the surfaces shall be thoroughly cleaned. The piping shall be carefully aligned. No metal shall project within the pipe. Miltered joints are prohibited. Only factory formed fittings shall be used. Elbows shall be long radius type. Flanges shall be welding neck type. Miltering of the pipe to form elbows of the notching of straight runs to form the tee connection will not be permitted.
8. Unions or companion flanges shall be installed in all connections to equipment. Automatic valves, etc., as necessary to permit removal of equipment and specialities for servicing, repairing, or cleaning. It shall be possible to remove any piece of equipment by removing only one (1) or two (2) sections of piping.
9. Valves shall be provided in suitable locations at each time of equipment, branch circuit, riser, or section of piping as indicted or required for proper and safe operation of the system and to facilitate maintenance and/or removal of all equipment and apparatus. On horizontal pipe runs, install all valve stems vertically up where possible and in no case shall the stems be turned more than 90 degrees from the vertically up position.
10. Drain valves shall be provided at all low points, trapped section, and on the equipment side of all branch valves to permit draining of all parts of all liquid piping systems. These shall have hose ends. Drain piping shall be provided from pump glands, relief valves, etc., to spill at the floor over floor drains or other acceptable discharge points. The drain line shall terminate with plain, unthreaded end.
11. Taps (half couplings or tees) shall be provided as necessary to permit the installation of temperature control instruments, thermometers, pressure gauges, air vents, etc.
12. Connections between copper piping and screwed ferrous equipment connections or screwed ferrous piping systems shall be made as follows:
   a. For stationary non-rotating, non-vibrating equipment connections- dielectric unions.
   b. For rotating or vibrating equipment connection- cast brass adapter and bronze flanges with dielectric separation of flanges and bolts.
   c. Connections between copper piping and ferrous equipment flanges or flanged ferrous piping systems shall be made using bronze companion flange with dielectric separation of flanges and bolts.
   d. Brass or bronze valves in ferrous piping will not require dielectric separation.
13. All pressure piping systems shall be installed to conform to the requirements of the state's pressure piping system.
14. All excavations for installation of pipe shall be open trench work and shall be kept open until piping has been inspected, tested, and accepted.
15. All piping passing thru cast-in place concrete construction shall be sleeved to provide a minimum of 1/2" annular space around entire pipe to be sleeves. Space between sleeve and pipes in foundation walls shall be tightly caulked with lead and oakum or mechanical seal to give a waterproof penetration.
16. Any piping resting on or coming in contact with building structure shall be insulated at that point to prevent telegraphing of sound.
17. Any metal piping laid in corrosive fill shall be encased in concrete or in split tile. All sewers 14'-0" below finish grade shall be encased in concrete.
18. Threaded joints shall conform to American Taper Pipe Thread ASA-B2.1-1960. All burrs shall be removed, pipe ends shall be reamed or filed to size of bore, and all chips removed. Pipe cement shall be used only on male threads.
19. Unions shall have metal seats for drainage systems and metal to metal ground seats on water system.
20. Furnish and install gate valve and drip valve at the base of all new domestic, chilled and heating water risers, in branches to sill valves, toilet rooms, and other fixture groups. Plumbing fixtures shall have wheel or screwdriver stops as specified.
21. All water piping shall be rigidly supported and shall not be loose or shaky. Water hammer arrestor shall be installed in vertical upright position.
22. Allow 1-1/4" per 100' of length for expansion in domestic hot water lines.
23. Nipples between copper and fixtures fittings shall be brass, not galvanized steel.
24. Mechanical joints for heating and chilled water piping can be Victaulic Style 77 standard or Gustin-Bacon No. L00 standard series.
    Or
    Mechanical joints for copper piping can be pressure-seal-joint fittings.

D. Sanitary and Storm Sewers

1. Install sanitary and storm sewers, stacks, vents, drains, etc., as indicated on the drawings.
2. All drainage and vent piping shall be constructed and run as direct as possible; shall be protected from contact with slag or cinders and, wherever practicable, shall be located so as to be accessible for inspection. The actual runs and locations of drains, soil waste, and leader piping shall be installed as to meet with the various conditions at the building and any work necessary to conceal pipes or clear pipes of other trades shall be done as directed by the architect.
3. Sewers to be pitched a minimum of 1/4" per foot for 3" sizes and under and 1/8" per foot for 4" sizes and larger or to grades indicated on drawings.
4. All pipe lines shall be correctly aligned before joints are made. All changes of direction in drainage and vent piping shall be made by means of "Y" branches and 1/6, 1/8, or 1/16, bends. No lines shall be run with unnecessary bends or offsets and where changes in direction are unavoidable; they shall be made by use of proper fittings. Single and double sanitary tees, 1/4 bends and 1/8 bends may be used in vertical sections when direction of flow is from horizontal to vertical. Changes in direction and branch connections shall be made with approved drainage fittings compatible with the piping system material in which it is installed.
5. Install cleanouts at base of each vertical waste and rainwater stack, each change in a direction of piping greater than 45 degrees or as shown on drawings, and within 5' of main sewer after exiting the building. Cleanouts on underground lines shall extend up flush with finished floor or grade. Provide cleanouts not over 50'-0" center along straight runs. Cleanouts shall be size of pipe to which it is installed up to 6" in diameter. Pipe over 6" in diameter shall have a 6" cleanout.
6. Vent terminals shall be terminated at least 12" above roof. Each vent terminal shall be made water tight with the roof by using sheet copper (8 ounces PSF) with base not less than 16" diameter and collar full height of pipe or rubber boot pipe flashing. Where vents are 4" or larger, flashing may be turned over into top of pipe without gap. Furnish flashing to general contractor for building into roofing material 23. Interior openings through walls, floors, and ceilings shall be sealed vermin proof.
7. All fixtures and sanitary drains shall be vented as indicated on drawings and in accordance with code. Vent pipes, where not vertical, shall have continuous slope.
8. Openings in drainage and vent pipes shall be properly plugged when work is not in progress.
9. Roof drains shall be provided with a flashing rig and a 30" X 30" X 4 lb. lead flashing properly fastened to the flashing ring.
10. Storm and sanitary sewers shall be laid with full length of each section resting on a solid bed. Where necessary to obtain a firm support, the pipe shall be bedded on select material and thoroughly tamped. Pipe shall be laid starting at the up grade and spigot end of bell and spigot pipe pointing in the direction of flow. As pipe is laid, care shall be exercised to keep interior of pipe clear of foreign matter. Where trenching for pipe is excessively wide, the contractor shall, at his own expense, embed the pipe in concrete to support the added load of backfilling.
11. PVC piping shall not be installed unless permitted by code and shall not be installed in return air plenums.
12. Sanitary/storm sewer and vent material shall be as follows:
   a. Below grade sanitary and storm inside building
      12.1. Service weight - cast iron pipe ASTM A-74-82 with ASTM C-564-80 neoprene compression joints or no-hub with clamps.
      12.1. PVC-DWV plastic ASTM D-1785 with ASTM D-2665 DWV solvent weld socket fittings.
   b. Above grade sanitary/storm sewer and vent material shall be as follows:
      12.1. No-hub cast iron pipe CISPI 1-301-78.
      12.2. PVC-DWV plastic ASTM D-1785 with ASTM D-2665 DWV solvent weld socket fittings.
      12.3. 1-1/4" and smaller, SCH. 40 galvanized steel pipe ASTM A-120-83 with cast iron screwed fittings ANSI B-16.22 1983.
   c. Site sanitary and storm sewers
      12.1. No-hub cast iron pipe CISPI 1-301-78.
      12.2. PVC-DWV plastic ASTM D-1785 with ASTM D-2665 DWV solvent weld socket fittings.
      12.3. Up to 15" - PVC plastic ASTM D-3034 SDR 35 with ASTM D3212 gasket joints.
      12.4. 18" and over - reinforced concrete pipe (RCP) ASTM C 76-83 with ASTM C 443-79 rubber gasket joints.

E. Domestic Water Piping

1. Install domestic water piping as indicated on drawings. Include all fittings, valves, hangers, and other accessories including water meter and backflow preventer. Extend domestic water piping to all fixtures and equipment required for complete installation.
2. Include unions, or other disconnect means, stops or valves for isolation of fixtures and equipment. Valves to be fully compatible with piping for service intended as manufactured by Nibco, Crane or Milwaukee. Include hose or drain valves at low points where fixtures cannot be used for drainage.
3. Install shock absorbers at each quick closing fixture and where required to prevent water hammer as manufactured by J.R. Smith, Sioux Chief or Zurn.
4. Hangers on insulated pipe to be outside of insulation, sized accordingly with a sufficient saddle to protect insulation as manufactured by Grinnell or Michigan.
5. Domestic water piping shall be as follows:
   a. 4" and smaller above grade - Type "L" hard copper ASTM B 88-832 with wrought copper fittings ASTM B 16.22 1980 and non-lead or antimony solder joints.
   b. 2" and smaller above or below grade - PEX tube and fittings with stainless steel crimp rings. No joints for below grade installation.
   c. 2" and smaller above ground - CPVC, Schedule 40; socket fittings and solvent cement joints.
   d. Domestic water (within building) is 5" above, galvanized steel pipe, galvanized C.I. or M.I. fittings or stainless steel pipe and fittings, and screwed or mechanical joint.
   e. Below grade - type "K" soft copper without joints.
   f. Domestic water (outside building) is 3" and above, AWWA H3-C1.2 ductile iron cement lined iron cement lined pipe, AWWA H3-C1.2 ductile fittings, and compression or mechanical joint.
6. Flush, vent and sanitize all water piping with chlorine as required per AWWA, local building department and health department codes.
7. Domestic hot and cold water piping under concrete floor to be covered with sand so that piping will not become embedded in the floor slab.
8. All piping under concrete floor shall be type "K" soft copper, continuous. No splices or fittings will be allowed.
9. Extreme caution must be taken so that no copper piping and insulation under concrete floors becomes crushed, cut, split, or deformed during the pouring of the floor slab.
10. Joints between copper pipe to screwed pipe joints shall be made by use of brass or copper converter fittings.

F. Gas Piping

1. Install gas piping in accordance to National Gas Code, utility companies' requirements and local codes.
2. Include meter and regulator and connect to all gas using equipment.
3. Equipment connections at each unit shall include gas valve, union, dirt leg, and reducer to unit connection size.
4. Construct concrete base to below frost line for meter installation.
5. All gas piping shall conform to recommended practice and regulation of the NFPA, Gas Company, the state code, and local codes.

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REV SCHEDULE

#	COMMENT	DATE
		01/10/19

PROJECT NAME / LOCATION

STEAK 44

CAMELBACK VILLAGE CENTER,
5101 NORTH 44TH STREET,
PHOENIX, ARIZONA 85018

PROJECT INFORMATION

DATE: 2018-06-15
PROJECT NO: 2771-18
DRAWN BY: TBA

ISSUE FOR CONSTRUCTION

M-300

MECHANICAL SPECIFICATIONS

6. Gas piping shall be as follows:
   a. Above-grade inside or outside building, low pressure. (up to 2 lbs)
      6.1. Schedule 40 seamless black steel pipe, beveled ends.
      F.a. 2" and smaller - screwed fittings, wrought iron.
      F.b. 2 1/2" and larger - welded fittings, black steel.
   b. Inside building, medium pressure (up to 10 lbs)
      6.1. Schedule 40 black steel with welded black steel fittings.
   c. Below grade outside building, low and medium pressure gas service
      6.1. Polyethylene plastic ASTM D-2513 with stab couplings or fusion weld joints.
   d. Below grade, high pressure service 60 PSI and over
      6.1. Schedule 40 black steel coated and wrapped with welded black steel fittings. Install cathodic protection anode on service line.
   e. Valves shall not be located above accessible ceiling spaces, whether or not such spaces are used as a plenum.
   f. Exterior exposed bare steel pipe shall be painted with a primer and two (2) coats or rust inhibitive paint.
   g. All welding shall be performed by state certified welders.
   h. All piping in non-accessible spaces shall have welded joints.

G. Gas Valves
1. Gas valves 2" and smaller shall be 175# WOG, cast iron, screwed body pattern. Valves shall be UL listed for gas service. Valves shall be Dezurik Series 425 with "RS-49" plug, seals, and level handle.
2. Gas valves 2-1/2" thru 4" shall be 175# WOG, cast iron, flanged body pattern. Valves shall be UL listed for gas service. Valves shall be Dezurik Series 425 with "RS-49" plug, seals, and level handle.

H. Fire Protection Piping
1. See Division 21, "Fire Protection Systems".

I. Firestopping
1. See Section 200510, "Basic Materials and Methods".

Section 200593 (15950) - Testing, Adjusting and Balancing

A. General
1. After installation, check all equipment and perform start up in accordance with the manufacturer's instructions.
2. All piping shall be tested and free of leaks as required by the local authority having jurisdiction.
3. Work that is scheduled to be concealed or insulated shall remain uncovered until required tests have been completed. If the construction schedule requires, arrange for tests on sections of the system at a time.
4. Balance all systems, calibrate controls, check for proper operation and sequence under all conditions and make all necessary adjustments.
5. Instruct owner in operation of systems and submit operating and maintenance manual for all equipment and systems.
6. Submit air and water balance report from independent AABC or NEBB certified subcontractor for all air and water systems per AABC or NEBB standards.
7. Submit duct leakage test report from independent AABC or NEBB certified contractor.
   a. Test shall be performed prior to attaching flexible duct to VAV box or other terminal equipment for a VAV system. Leakage to be less than 1 percent of design CFM with system tested at 8" W.C.
8. Before start-up, the HVAC water systems shall be cleaned as follows:
   a. Heating Water Systems: Fill entire system and add commercial chemical cleaning agent at the minimum rate of two (2) pounds per 100 gallons of system water. Operate heating system for four (4) hours. Vent system during cleaning, drain system to remove all foreign matter; remove and clean all strainers. Fill system and add chemical treatment after analysis of system water is made.
   b. Chilled Water System: Same as heating water except operation time to be six (6) hours.
   c. Steam Generating Equipment: After completion of the installation, the system is to be properly filled with water and a suitable chemical cleaner and boiler for a minimum of 18 hours to remove oil and grease. After boilout, the system shall be drained, refilled and flushed, inspected for cleanliness and refilled.
9. When the contractor is ready to run capacity tests, he shall notify the architect. When this notice is given, the architect will assume that the contractor has made preliminary tests and is satisfied that the plant will develop specified and guaranteed capacities. It will be the contractor's responsibility to furnish any and all instruments required to obtain test data which shall include thermometers, electric meters, pressure gauges, etc.
10. Work under this division of the specifications shall not be considered complete until the contractor has obtained required inspection, performance tests, made necessary adjustments and has submitted satisfactory evidence of the architect or his representative will make spot checks to determine the accuracy and completeness of final adjustments. Should spot checks indicate more than a reasonable deviation from design requirements, the contractor shall repeat tests and adjustments to the satisfaction of the engineer.
11. After or during one complete heating and cooling season, the contractor shall make any minor adjustments that may be necessary to insure uniform temperatures throughout the spaces.
12. Test results shall be submitted in quadruplicate to the architect.
13. In order to properly balance all air handling equipment the T&B contractor shall adjust all sheaves or provide new sheaves as required.

B. Balancing, Start Up and Instructions
1. After equipment is placed in operation, systems shall be balanced to within 10 percent of design flow with report submitted to owner. Balancing shall be performed by an independent AABC or NEBB certified contractor.
2. Balance the air systems prior to balancing hydronic, steam, and refrigerant systems.
3. Test, adjust, and balance cooling systems during summer season and heating systems during winter season. Balance systems when the outside air conditions are within 5 degrees F wet bulb temperature of the maximum summer design condition and within 10 degrees F dry bulb temperature of the minimum winter design condition.
4. Start up and place all systems in operation and tag all switches and controls with permanent labels.
5. Instruct owner on proper operation and preventative maintenance of system.

C. Piping: Testing to be done by the contractor.
1. All piping shall be given the following pressure test without appreciable pressure drop: recording line charts shall be used for all pressure testing.

SERVICE	TEST MEDIUM	MIN. PRESSURE	TIME (HOURS)
Fire	Water	125 psi	6
Underground Water	Water	125 psi	AWWA Procedure
Cold Water	Water	125 psi	24
Hot Water	Water	125 psi	24
Re-circulated Hot Water	Water	125 psi	24
*Gas, Natural	Nitrogen Gas Co. Rules		24
Air	Air	125 psi	12
Sanitary & Storm Sewer	As per State Plumbing Code or Local Authority		24
Water Service Piping	Water	150 psi	6
Fire Protection	See Fire Protection Section		6

*A minimum notice of 48 hours shall be given to the architect prior to purging of any gas lines. Purging shall be to the outside of building at a safe location.

2. During the final inspection of the building, the contractor may be asked to remove at least one (1) water closet in the presence of the architect so that it can be checked for a proper installation. If the one (1) toilet is found to be installed in a defective manner, the contractor shall remove and properly reinstall all toilets.
3. Care shall be exercised in installation of air piping so as not to allow contamination.
4. Minor leaks in welded joints shall be corrected by chipping out the weld and rewelding. A general sweating of a weld joint will be considered sufficient cause for rejection. Defects that may develop in screwed joints under test shall be corrected by replacing the fitting or thread or both. Caulking of defective threaded joints will not be permitted.
5. During the testing period, this contractor shall maintain on the job a competent individual thoroughly familiar will all phases of plumbing for as long as may be required to thoroughly adjust all of the systems and to demonstrate to the architect that they are functioning properly.
6. Adjust all flush valves and balancing valves for proper flow.
7. All hydrostatic and/or air tests shall be made before piping is concealed or covered. This contractor shall be responsible for completely draining the systems after hydrostatic tests are performed. Any damage from freezing prior to acceptance of the completed installation shall be repaired at the sole expense of the contractor.
8. All materials and installation under the plumbing system shall be inspected by the inspector to insure compliance with requirements of the plumbing code.
9. This contractor shall notify the plumbing inspector whenever work is ready for test and inspection.
10. This contractor, when work for the plumbing permit is issued and completed, shall request final inspection, such request shall be made before the building is occupied or used, not more than thirty (30) days after completion of the work.
11. Before approving the plumbing system, the plumbing inspector may require that the system in whole or part be tested to prove sufficiency, all equipment, material, power and labor necessary for inspections and test shall be supplied by the plumbing contractor.
12. All piping of plumbing system shall be tested with water or air per testing schedule.
   a. Drainage system water test- provide fitting at property line or termination point for purpose of test plug. Water test shall be applied to entire system or by section. When tested in sections, at least the lower twenty (20) feet of the next section above shall be retested so that every section tested shall have at least a twenty (20) foot head test. Hold without pressure loss for fifteen (15) minutes.
   b. Drainage system air test- attach air apparatus to suitable opening, close all other inlets and outlets, then force air into the system until there is uniform pressure, sufficient to balance a column of mercury 10" in height or five (5) pounds gauge pressure on the entire system. Hold without pressure loss for fifteen (15) minutes.
   c. No part of system shall be covered before inspection is made and approved. If covered before test, contractor shall pay for cost of uncovering so test can be made and accepted.
   d. Defective work or materials shall be replaced and inspection and tests repeated within three (3) days.
13. Certificates of approval of satisfactory completion and final inspection shall be obtained by the plumbing contractor, and one copy of each approval shall be given to the architect.
14. Damages which result from breakage or faulty installation shall be the responsibility of the plumbing contractor.
15. After the system has been in service for a two-week period and again before the system is turned over to the owner, all dirt pockets, traps, and strainers shall be cleaned, removed, and reinstalled.

D. Water Using Equipment: All water using equipment, such as cooling coil and convertors, shall be balanced to obtain the required water pressure drop and flow. This contractor shall list the flow rate and required pressure drop and the observed pressure drop for each piece of equipment.

E. Pumps: For each pump, the contractor shall list all the pump design data and shall obtain by measurement and furnish to the architect the pump motor voltage, amperage, and pump heads with no water flow and with full water flow.
1. Submit four (4) copies of manufacturer's pump curves for each pump indicating operating points.

F. Air Handling Equipment: For each piece of air handling, this contractor shall list the data of the fan, motor, and drive and shall obtain by measurement and furnish to the architect the fan speed, motor voltage, operating amps, for cfm and static pressure as determined from the manufacturer's fan cures, and shall also determine the fan cfm by means of a velocity traverse which shall be taken a minimum of three (3) fan diameters from fan outlet. Before running any tests, the contractor shall have installed all the components of the system and shall insure the cleanliness of the filters.

G. Diffusers, Registers, Grilles: After completion of the air distribution systems and final adjustments, the contractor shall adjust all dampers and air supply, return and grilled outlets so that each outlet handles its proper quantity of air. Supply registers and diffusers shall be adjusted to provide for the proper throw and a uniform distribution pattern.
1. For supply and return air registers, the velocity shall be measured with a heated wire resistance type anemometer held 1" from the face of the register; the air velocity shall be the average of velocity readings taken at points no more than 6" apart. The area shall be the net core area of the supply register.
2. Test readings shall be taken for each supply, grille and diffuser. For each of these units, obtain and furnish information on manufacturer, testing equipment used, procedure followed, location, size, average, velocity, gross and net core areas, observed CFM, and specified CFM. Separate tabulations shall be furnished for each manufacturer, each system and each type of register, grille, and diffuser.

H. Mixing Dampers: Mixing dampers shall be adjusted on the basis of the temperature of the mixed fresh and return airstream.
The minimum fresh air damper position shall be set to obtain a mixed air temperature determined from the following equation:
Mixed Air Temperature:
(Outside Air Temp.) x (Min. Percent Fresh Air) +
(Return Air Temp.) x (1- Min. Percent Fresh Air)
Percentage of air quantity shall be expressed as a fraction of the total air supply.

I. Holes in ducts and casings used for static pressure and velocity readings shall be provided with removable closures.

J. During the testing period, this contractor shall maintain on the job a competent individual thoroughly familiar with all phases of air conditioning, including refrigeration, temperature control and distribution, for as long a period as may be required to thoroughly adjust all of the systems and to demonstrate to the architect that they are functioning properly.

K. The testing and balancing engineer shall, as part of his work, perform a "Spot" Re-check balancing conditions between thirty (30) to ninety (90) days after both summer and winter balancing operations at which time a representative of the temperature control manufacturer capable of performing adjustments to his system shall accompany the balancing engineer. This operation shall include a check of space temperature, calibration of controls, pump and fan performance, and the necessary adjustments thereto.

Section 200700 - Insulation

A. General
1. Furnish all material, labor and equipment as required to install complete plumbing and HVAC insulation as indicated on mechanical drawings and in these specifications.
2. Install in full accordance with manufacturer's recommendations.

B. Scope: This contractor shall furnish and install all insulation necessary to the project and in accordance with the following schedule. All insulation and accessories used in an air plenum space, and all duct covering and lining regardless of physical location, shall have a composite (insulation, jacket, and adhesive) fire and smoke hazard rating as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding a flame spread twenty-five (25) and smoke developed fifty (50). All other areas shall have insulating materials and accessories on pipes and vessels rated at a flame spread twenty-five (25) and smoke developed one hundred fifty (150) as tested by the same procedure. All calcium silicate shall be asbestos free.

C. Workmanship:
1. All insulation shall be installed over clean, dry surfaces, insulation must be dry and in good condition. Wet or damaged insulation will not be acceptable. No insulation shall be applied prior to pressure test completion of the respective piping and/or duct system.
2. All pipe insulation shall be installed with joints butted firmly together. All valves and fittings shall be insulated using mitered sections of insulation equal in density and thickness to the adjoining insulation, or with an insulation cement equal in thickness to the adjoining insulation or premolded insulated fittings. The insulation applied to the valves and fittings shall be covered with the same type of covering as used on the pip insulation. No staples.
3. All insulation ends shall be tapered and sealed regardless of services.
4. Rigid duct insulation shall be impaled over welded pins and secured with white insulation caps. All seams shall be firmly butted and sealed with white pressure sensitive vapor barrier tape. No staples.
5. Wrap around duct insulation shall be applied with all joints butted firmly together. Insulation shall be cemented to the surface with fireproof adhesive applied in 6" wide strips on 12" centers. All joints in the insulation covering shall be sealed with adhesive. Where ducts are over 24" wide, the ductwrap shall be additionally secured to bottom of rectangular or oval ducts with mechanical fasteners on 16" centers to prevent sagging. Vapor barrier shall be legibly printed by the manufacturer to show nominal thickness and type of insulation.
6. Ductliner insulation shall be applied with joints precoated with adhesive and butted firmly together. Lining shall be cemented to ductwork with a minimum of seventy-five (75) percent coverage of fire resistant adhesive. Mechanical fasteners on 16" centers and adhesive shall be used when duct within exceeds 12" or when duct height exceeds 24".
7. All ductwork in the mechanical rooms is to be considered as "exposed ductwork," i.e. supply, return, relief, and outdoor air.
8. All round diffuser duct drops connected to lined ductwork shall be insulated the same as "ductwork" schedule non-lined.
9. All flexible elastomeric insulation shall have all fittings, butt ends, and seams sealed with vapor barrier adhesive.
10. All insulated, exposed piping shall include a 0.020" thick vinyl jacket to an elevation of 8' above the floor line. This jacket is in addition to the normal finish for the respective service.

D. Plumbing Insulation (as manufactured by Owens Corning, Knauf or Schuller)
1. Insulate all above grade hot, hot water return, and cold water piping with 1" thick molded fiberglass having an all service jacket.
2. Insulate all above-grade, horizontal air conditioning condensate floor drains and waste lines, overflow roof drains and piping, roof drains and pipes, rain conductors and roof drain sumps with 1" thick molded fiberglass having Type ASJ jacket and manufactured by Owens-Corning Fiberglass Company.
3. Include insulation of fittings and valves. Keep vapor barriers intact. Apply to manufacturer's recommendations.
4. Handicapped lavatory insulation - insulate all exposed waste and water supply piping under lavatory with safety covers per ADA requirements as manufactured by Plumberex Specialty Products, McGuire, or Truebro.
5. Repair sections of existing piping insulation damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.
6. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

E. HVAC Insulation (as manufactured by Owens Corning, Knauf, Schuller, Armstrong, or Rubatex)
1. Insulate all non-lined supply, return, and exhaust ducts with 1-1/2" thick foil faced reinforced kraft jacket, fiberglass duct wrap fully secured to duct. Lap and tape seams and secure tightly to the ducts with wire or stick pins. Exposed ductwork in conditioned spaces without ceilings shall not be insulated. Ductwork in ceiling plenum space shall be insulated.
2. All insulation to be applied in full accordance with the manufacturer's recommendations and comply with 25/50 flame and smoke hazard ratings per ASTM E-84, NFPA 255 and UL 723.
3. Insulate refrigerant suction and hot gas line with 1" elastomeric foam insulation with joints and seams sealed vapor tight.
4. Insulate low pressure steam (15# and lower) and condensate piping with smaller 1" thick, and pipes 4" and larger, 1-1/2" thick molded fiberglass insulation, pipe 3".
5. Insulate medium pressure steam (16# to 150#) piping with molded fiberglass insulation, pipes 4" and smaller 2" thick, and 5" and larger 2-1/2" thick.
6. Insulate hot and chilled water heating piping with 1" thick molded fiberglass insulation. Hot water pipe over 5" shall have 1-1/2" thick insulation.
7. Insulate condenser water piping on systems where the loop temperature may drop below 60 degrees F with 1" thick molded fiberglass insulation. Insulate all tower water piping with 2" thick molded fiberglass insulation and aluminum roll jacketing.
8. Insulate air conditioning condensate drain piping with 1" thick molded fiberglass insulation.
9. Insulate exhaust ducts for kitchen hoods with 1" thick insulating wool rated for 1000 degrees F or Firemaster Ductwrap as manufactured by 3M. Provide removable sections at duct cleanout panels.
10. Insulate single wall boiler breeching inside the building with a 3" thick calcium silicate with field applied 8-1/2 oz. glass cloth lagging wrap.
11. Insulate single wall hot water flues inside the building with a 2" thick calcium silicate with field applied 8-1/2 oz. glass cloth lagging wrap.
12. Insulate hot water tanks, converters, cold water storage tanks, chilled water pumps and chilled water air separators with a 2" thick fiberglass service board with field applied 8-1/2 oz. glass cloth lagging wrap. Devices may be insulated with 2" thick flexible elastomeric insulation. All cold water devices shall have a vapor seal pump.
13. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance including metal vessel covers, fasteners, flanges, chilled water pumps, frames, and accessories.
14. Repair damaged sections of existing mechanical insulation damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and seal over existing.
15. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

Section 211000 - Fire Protection Systems

A. General
1. Furnish all labor, materials and equipment as required to install a complete fire protection system for project.
2. See Division 20 for General Requirements.
3. Field-verify sizes and location of existing sprinkler piping before fabrication of new.
4. This contractor shall be responsible for the removal and reinstallation of existing ceiling tiles, as required, for the installation of work shown in areas where existing ceilings are to remain. See architectural drawings for areas where existing lay-in ceiling tiles are to remain.
5. This removal and reinstallation of existing lay-in ceiling tiles shall be the responsibility of the fire protection contractor (under the supervision of the general contractor) as required to perform his work. Any damage to existing ceiling tiles or supports shall be the responsibility of the general contractor. Ceiling tiles may be left out of the ceiling areas under construction only if stored in areas as directed by the owner so as not to hinder the daily operations of the building's occupations.
6. This contractor shall modify and relocate sprinkler piping and provide new sprinkler piping and heads, as required, to accommodate new mechanical work in full compliance with NFPA 13. This contractor shall also perform hydraulic calculations for sprinkler piping in the remodeled areas in accordance with NFPA 13.

B. Design Basis
1. Design basis for system shall be per NFPA 13 (latest edition) building code requirements, local water department, local fire department, state fire marshal, local code, and owner and owner's fire insurance underwriter requirements.
2. System shall be hydraulically calculated as required by code.
3. Pipe sizes indicated on drawing are approximate and shall be verified per the contractor's hydraulic calculations.

C. Drawings and Calculations
1. Contractor shall prepare submittal drawings and hydraulic calculations for space in accordance with owner's insurance company, building department, and local fire authority requirements, tenant's requirements for design density, whichever is most stringent.
2. Contractor shall perform a flow test on city water main and submit data with calculations.
3. It is the fire protection contractor's responsibility to verify each tenant's design density with agreed upon lease documentation and that tenant's prototype or insurance underwriters requirements.
4. Contractor and designer shall be state certified.
5. Coordinate layout and installation of sprinklers with ductwork and equipment above ceilings and other construction that penetrates ceilings, including but not limited to light fixtures, speakers, HVAC equipment, doors, and partition assemblies. No sprinkler piping shall be routed beneath equipment above any ceilings that must be dropped directly down for service, repair, or replacement.
6. Examine areas and conditions under which fire protection materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer. Schedule rough-in installations with installations of other building components.
7. Shop drawing reveiw does not relieve fire protection contractor from responsibility to meet each tenant's requirements for sprinkler coverage.
8. Fire protection contractor is responsible for verifying any high pile storage requirements of future tenants and providing an incoming sprinkler service size and risers to meet the requirements for adequate sprinkler coverage.

D. Piping
1. All piping shall be installed in accordance with NFPA 13 and local code requirements.
2. Fire protection piping shall be as follows:
   a. Inside building - pipe and tubing shall be steel, CPVC plastic or copper in accordance with NFPA requirements.
   b. Piping shall match existing building standards.
   c. Contractor shall arrange with owner and insurance underwriter prior to shut down of existing systems.
   d. Flush all piping upon completion of project and test per NFPA requirements.
   e. No piping shall be installed at locations subject to freezing unless under dry type system.
3. Excavation and backfill - see Section 200510, "Basic Materials and Methods".

E. Sprinkler Heads
1. Sprinkler heads shall be UL listed, match existing building standards and be manufactured by Tyco, Reliable, Victaulic, or Viking.
2. Sprinkler heads shall be as follows:
   a. Areas with exposed structure
      2.1. Upright - rough brass.
   b. Areas with ceilings
      2.1. Recessed Pendent - chrome or white plated with matching two (2) piece, semi-recessed escutcheon.
      2.2. Concealed - brass finish with off-white ceiling cover plate.
      2.3. Sidewall - chrome or white plated with matching, two (2) piece, semi-recessed escutcheon.
3. Install concealed heads with white flush mounted cover plate in sales area.
4. Install higher temperature sprinkler heads where required by code or application.
5. Sprinkler heads shall be located in the center of ceiling tiles or the center of an area of a 24"x24" tile section. See architectural ceiling plans.
6. Submit samples of sprinkler heads to Architect prior to fabrication of any piping when available.
7. Install inspector's test connection with valve and terminate drain through exterior wall with test fitting and splash block.

F. Valves
1. Install all valves as required by NFPA 13, UL or FM listed and as manufactured by Grinnell, Hammond, Milwaukee, FPP1, or Nibco.
2. All shut-off valves shall be fitted with tamper switches by fire protection contractor and wired by electrical contractor. Tamper switches shall be as manufactured by Notifier, Potter, or Viking.
3. Install flow switch in riser as manufactured by Notifier, Potter, or Viking and wired by electrical contractor.
4. Install UL listed alarm check valve with all required trim, including water motor alarm bell and drains as manufactured by Tyco, Reliable, Vitaulic, or Viking.
5. Install wall mounted indicator valve as manufactured by Potter Roemer, Croker, or Elkhart and approved by local authorities.
6. Install double check detector assembly backflow preventer, as required by local water purveyor and as manufactured by Watts, Zurn, Conbraco, or Ames.
7. Fire department connection includes nameplate, caps and chains, and check valve with 1/2" automatic ball drip piped to floor drain as manufactured by Potter Roemer, Croker, or Elkhart. This shall be installed per local fire department specifications.

G. Extra Materials
1. Valve wrenches: furnish to owner, two (2) valve wrenched for each type of sprinkler head installed.
2. Sprinkler heads and cabinets: furnish two (2) extra sprinkler heads of each style included in the project. Furnish each style with its own sprinkler head cabinet and special wrenches.
3. Obtain receipt from owner that extra stock has been received and give architect a copy of this receipt.

I. Firestopping
1. See Section 200510, "Basic Materials and Methods".

Section 230900 (15900) - Instrumentation and Controls

General
1. Furnish and install complete temperature control for all HVAC systems.
2. Provide new control devices including thermostats, humidistats, damper operators, motors, temperature sensors, staging relays, and other related devices for a complete operational system per the operating sequence and industry standards.
3. Mount all controls furnished as accessories to equipment and provide all control wiring required for proper operation. All wiring shall be in conduit per N.E.C. and local code requirements.
4. Mechanical contractor shall install all duct-mounted smoke detectors. Electrical contractor shall furnish and wire photo-electric duct smoke detectors at each unit to shut down fan upon activation. Detector shall be located in the supply/return air duct downstream/upstream of the unit connection. Detector will have manual reset and will activate a local alarm panel.

A. Rooftop Heating and Cooling Units RTU
1. Each rooftop heating and air conditioning unit (RTU) shall be energized to operate from a programmed occupancy schedule via a programmable space temperature sensor, furnished by the unit manufacturer, and installed by the controls contractor. RTU's occupancy schedule may be manually overridden by a manual override switch located integral with or adjacent to space temperature sensors. Override switch shall energize respective RTU for a two (2) hour (adjustable) time period.
2. During the occupied cycle, as indexed by the programmable space sensor, each unit shall operate to supply a constant volume of air for cooling and heating at a temperature controlled by a factory-installed, microprocessor-based controller. The microprocessor controller shall operate air-side economizer and stages of DX cooling and gas-fired heating to maintain the supply air temperature required by the space temperature sensor. For RTU-1 only, microprocessor controller shall control RTU's internal exhaust fan.

Sequence of Operations
ROOFTOP AIR HANDLING UNITS
1. Rooftop Unit (EXISTING RTU)
   a. Wall-mounted thermostat furnished as accessory to unit shall sequence heating and cooling. Provide with sub-base to manually select heating, cooling, fan on-off, auto operation.
   b. Unit shall operate in occupied or unoccupied modes based upon time clock sequence as determined by owner.
   c. Unoccupied mode - The supply fan will be off, the outdoor air damper will go to 100% closed position and unit will cycle on with call for heating or cooling.
   d. Occupied mode - The supply fan shall run continuously, the outdoor air damper will open to the minimum air position and the unit will go into the heating or cooling mode, based upon room thermostat setpoint temperature.
   e. Upon a call for cooling, and the outdoor air temperature is 55 degrees F. (adjustable) or cooler, the unit shall go into economizer mode. If the outdoor air temperature is greater than 55 degrees F. (adjustable), the outside air damper shall go to minimum position, and the compressors will be energized.
   f. Upon a call for heating, the gas burner shall fire.
   g. A low temperature thermostat will de-energize the supply fan and close the outside air damper if the mixed air temperature is sensed at 40 degrees F or colder.
   h. A duct mounted, photoelectric smoke detector (furnished by electrical contractor and installed by mechanical contractor) shall shut down the unit, close the outside air damper and send a signal to the fire alarm panel when activated. Both safeties will require manual reset, and will activate an alarm at the local control panel.

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REV SCHEDULE

#	COMMENT	DATE
		01/10/19

PROJECT NAME / LOCATION

STEAK 44

CAMELBACK VILLAGE CENTER,
5101 NORTH 44TH STREET,
PHOENIX, ARIZONA 85018

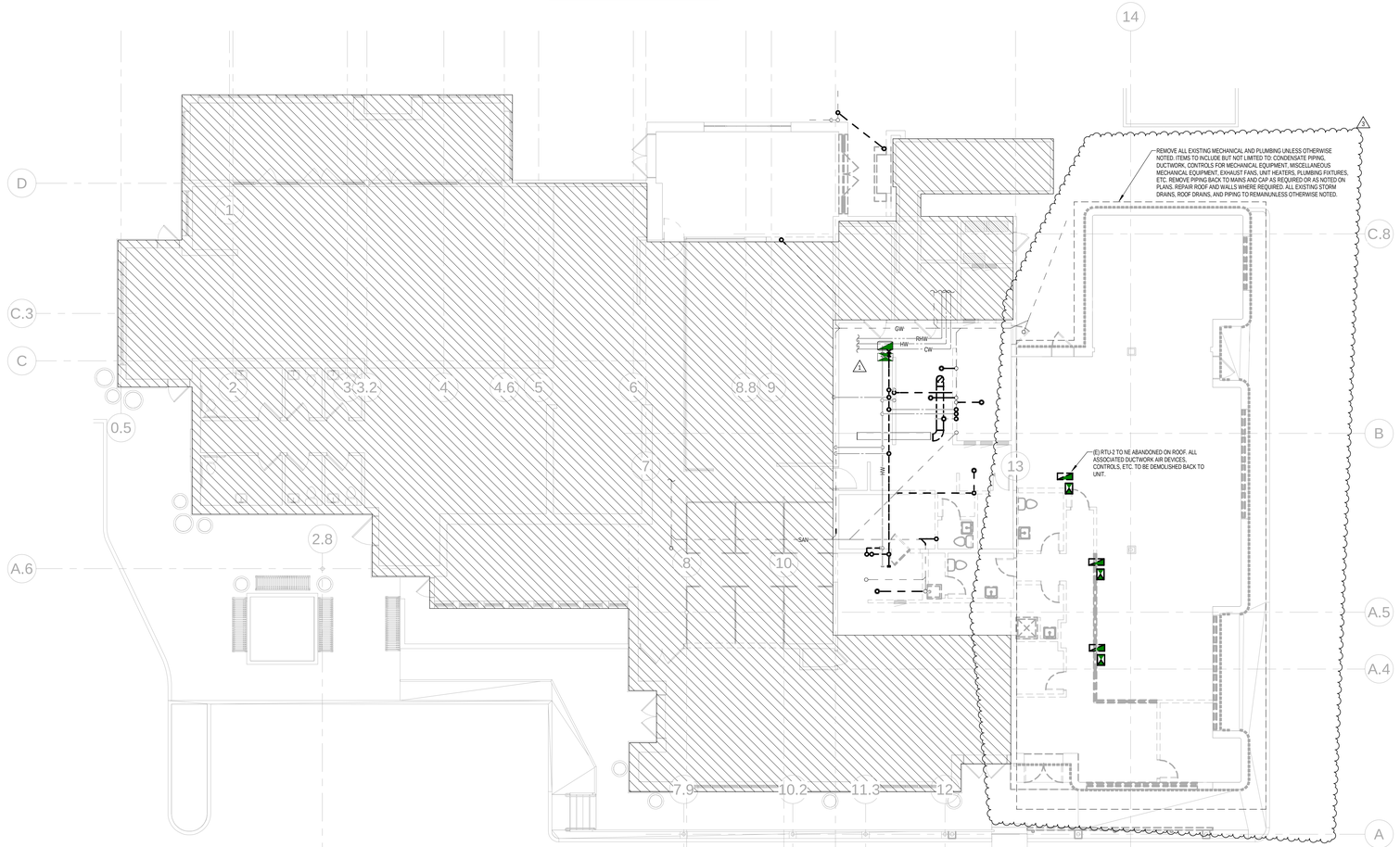
PROJECT INFORMATION

DATE: 2018-06-15
PROJECT NO: 2771-18
DRAWN BY: TBA

ISSUE FOR CONSTRUCTION

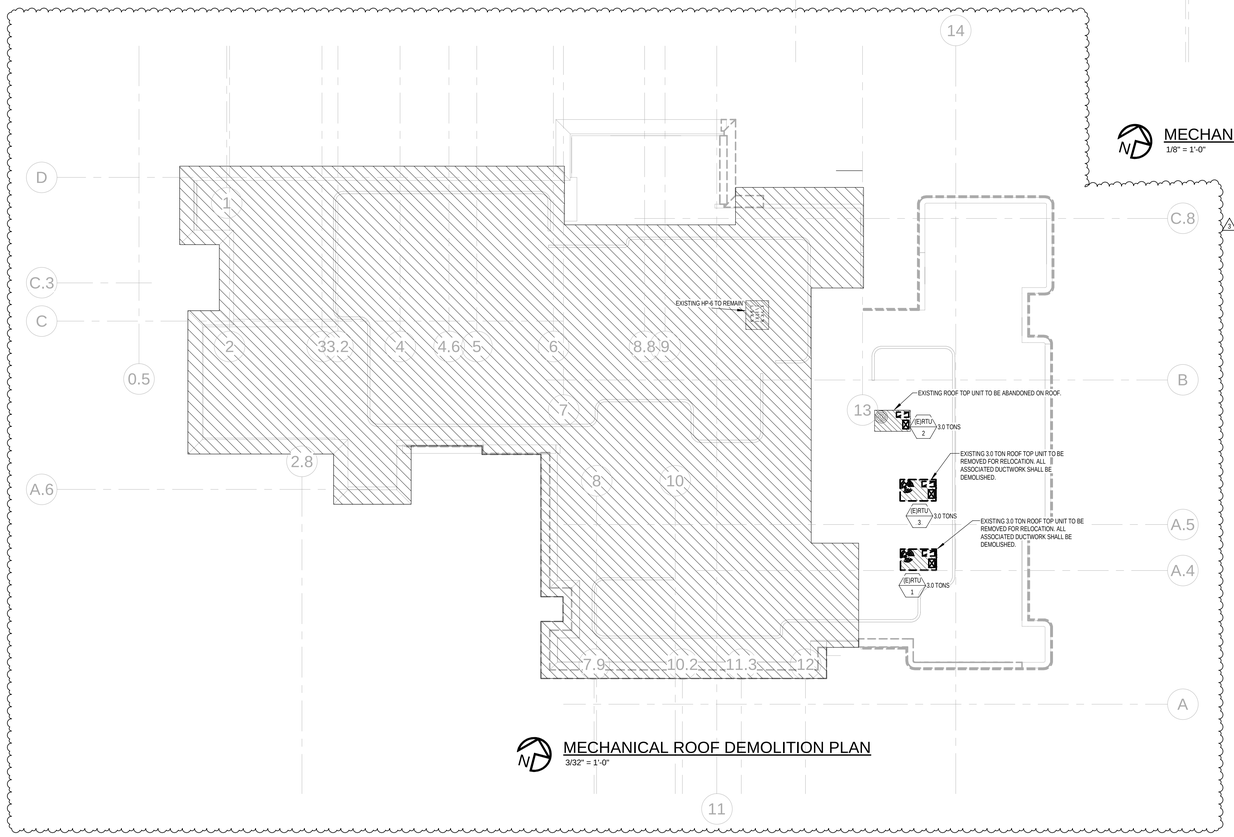
M-301

MECHANICAL SPECIFICATIONS



MECHANICAL DEMOLITION PLAN

1/8" = 1'-0"



MECHANICAL ROOF DEMOLITION PLAN

3/32" = 1'-0"

HVAC DEMOLITION NOTES

1. IN EVERY INSTANCE OF DEMOLITION AND/OR REMODELING, THE M.C. SHALL FIGURE A COMPLETE JOB AS NONE OTHER SUHAL BE ACCEPTED.
2. THE DRAWINGS ARE TO BE USED ONLY AS A GUIDELINE FOR DEMOLITION. THE M.C. MUST VISIT THE SITE PRIOR TO BIDDING TO VERIFY ALL WORK REQUIRED FOR A COMPLETE JOB AND INCLUDE THE COST OF SUCH WORK IN HIS BID.
3. EXISTING MATERIALS SHALL BE TURNED OVER TO THE OWNER. IF NOT REQUIRED BY OWNER, THE MECHANICAL CONTACTOR SHALL REMOVE THESE MATERIALS FROM THE PREMISES.
4. THE CONTRACTOR SHALL VISIT THE SITE & BECOME FAMILIAR WITH ALL EXISTING SYSTEMS & MATERIALS WHICH MUST BE REMOVED TO ACCOMMODATE NEW CONSTRUCTION. REMOVE ALL AIR TERMINALS, EXHAUST FANS, DUCTWORK, CONTROLS, HANGERS, INSERTS, GRILLES, ETC., UNLESS INDICATED TO REMAIN. PATCH ALL EXISTING WALLS OR FLOORS WHERE DUCT OR PIPE PENETRATIONS HAVE BEEN REMOVED TO MATCH EXISTING, UNLESS SPECIFICALLY NOTED TO BE PATCHED BY OTHERS. LEGALLY DISPOSE OF ALL EQUIPMENT, DUCTWORK, PIPING, ETC., WHICH IS REMOVED, EXCEPT ANY ITEMS SPECIFICALLY DESIGNATED BY OWNER TO BE SALVAGED. REMOVE & PLACE DESIGNATED SALVAGED EQUIPMENT IN A LOCATION DIRECTED BY THE OWNER.
5. REMOVE ALL MECHANICAL EQUIPMENT, NOT OTHERISE INDICATED TO REMAIN, INCLUDING ALL PIPING, CONTROLS & MOUNTING BRACKETS. CAP CONCEALED PIPING BEYOND EXISTING FINISHED SURFACES. PATCH & SEAL ALL PENETRATIONS TO MATCH EXISTING.
6. EXISTING EQUIPMENT, PIPING OR OTHER PLUMBING RELATED EQUIPMENT THAT CONTAIN PCB'S, MERCURY, OR OTHER HAZARDOUS WASTE SHALL BE DISPOSED OF PROPERLY PER ALL EPA AND OTHER APPLICABLE GUIDELINES. CONTRACTOR SHALL NOTIFY ARCHITECT IF ASBESTOS IS FOUND.
7. LOTS AND STREETS SHALL BE MAINTAINED FREE OF DIRT AND DEBRIS DURING CONSTRUCTION.
8. MECHANICAL CONTRACTOR TO CONFIRM ALL EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF DEMOLITION - REPORT ANY DISCREPANCIES TO THE ARCHITECT IMMEDIATELY.

PLUMBING DEMOLITION NOTES

1. IN EVERY INSTANCE OF DEMOLITION AND/OR REMODELING, THE P.C. SHALL FIGURE A COMPLETE JOB AS NONE OTHER SHALL BE ACCEPTED.
2. THE DRAWINGS ARE TO BE USED ONLY AS A GUIDELINE FOR DEMOLITION. THE P.C. MUST VISIT THE SITE PRIOR TO BIDDING TO VERIFY ALL WORK REQUIRED FOR A COMPLETE JOB AND INCLUDE THE COST OF SUCH WORK IN HIS BID.
3. THE P.C. SHALL BE RESPONSIBLE TO REMOVE ALL EXISTING EQUIPMENT AND RELATED PIPING, INSULATION AND HANGERS, ETC.. ALL PIPING FROM DEMOLISHED EQUIPMENT AND/OR FIXTURES SHALL BE REMOVED. ALL EXPOSED UNUSED PIPING SHALL BE REMOVED. PIPING THAT PASSES THROUGH THE SLAB OR WALL SHALL BE CUT BELOW OR FLUSH WITH THE FINISHED FLOOR OR WALL. PATCHING SHALL BE BY G.C..
4. THE P.C. SHALL MAINTAIN SERVICES TO ALL EXISTING EQUIPMENT TO REMAIN, OR ANY OTHER EQUIPMENT UNAFFECTED BY DEMOLITION, BASED ON THE PHASING PLAN. THIS REQUIREMENT INCLUDES BUT IS NOT LIMITED TO THE FOLLOWING WATER SERVICE. GAS SERVICE. SANITARY SEWERS AND STORM SEWERS
5. ANY EXISTING PIPING AND OR MECHANICAL DEVICES BEING DISTURBED BY THE WORK SHALL BE REWORKED BY THIS CONTRACTOR AS REQUIRED TO RETURN IT TO ITS FORMER EXISTING OPERATING CONDITION.
6. ANY PIPING FEEDING THROUGH EQUIPMENT BEING RELOCATED, REWORKED, OR ABANDONED AND SERVING OTHER AREAS SHALL BE MAINTAINED AS REQUIRED.
7. THE P.C. SHALL DISCONNECT AND REMOVE WATER SERVICE AND GAS SERVICE TO ALL MECHANICAL AND STORE EQUIPMENT BEING REMOVED AS A RESULT OF THE REMODELING.
8. EXISTING MATERIALS SHALL BE TURNED OVER TO THE OWNER. IF NOT REQUIRED BY OWNER, THE PLUMBING CONTACTOR SHALL REMOVE THESE MATERIALS FROM THE PREMISES.
9. EXISTING EQUIPMENT, PIPING OR OTHER PLUMBING RELATED EQUIPMENT THAT CONTAIN PCB'S, MERCURY, OR OTHER HAZARDOUS WASTE SHALL BE DISPOSED OF PROPERLY PER ALL EPA AND OTHER APPLICABLE GUIDELINES.
10. LOTS AND STREETS SHALL BE MAINTAINED FREE OF DIRT AND DEBRIS DURING CONSTRUCTION.
11. PLUMBING CONTRACTOR TO CONFIRM ALL EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF DEMOLITION - REPORT ANY DISCREPANCIES TO THE ARCHITECT IMMEDIATELY.
12. PLUMBING CONTRACTOR TO COORDINATE ALL DEMOLITION WITH ALL OTHER TRADES PRIOR TO COMMENCEMENT OF DEMOLITION.
13. REMOVE ALL EXISTING MECHANICAL AND PLUMBING UNLESS OTHERWISE NOTED. ITEMS TO INCLUDE BUT NOT LIMITED TO: CONDENSATE PIPING, DUCTWORK, CONTROLS FOR MECHANICAL EQUIPMENT, MISCELLANEOUS MECHANICAL EQUIPMENT, EXHAUST FANS, UNIT HEATERS, PLUMBING FIXTURES, ETC. REMOVE PIPING BACK TO MAINS AND CAP AS REQUIRED OR AS NOTED ON PLANS. REPAIR ROOF AND WALLS WHERE REQUIRED. ALL EXISTING STORM DRAINS, ROOF DRAINS, AND PIPING TO REMAINUNLESS OTHERWISE NOTED.

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REV SCHEDULE

#	COMMENT	DATE
1	Permit Resubmission	08.20.18
3	DETAILS & HVAC REDESIGN REV.3	01/10/19

PROJECT NAME / LOCATION

STEAK 44

CAMELBACK VILLAGE CENTER,
5101 NORTH 44TH STREET,
PHOENIX, ARIZONA 85018

PROJECT INFORMATION

DATE: 2018-06-15
PROJECT NO: 2771-18
DRAWN BY: TBA

ISSUE FOR CONSTRUCTION

MP-100

MECHANICAL DEMOLITION PLAN