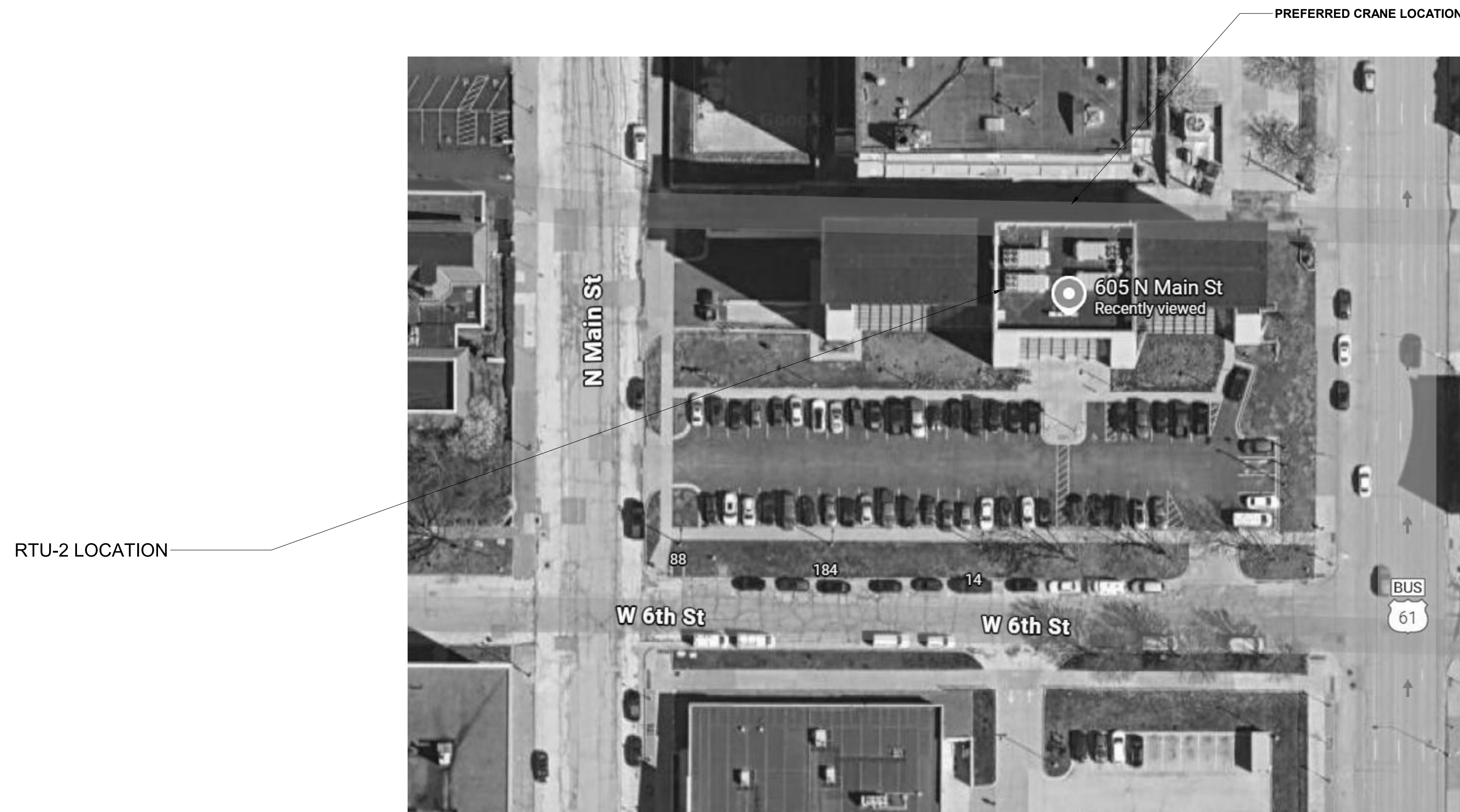


# DEPARTMENT OF CORRECTIONS - SEVENTH DISTRICT RTU-2 REPLACEMENT DAS PROJECT NUMBER 9491.00

## COVER SHEET

### SHEET INDEX

SHEET NUMBER	SHEET DESCRIPTION
MC	COVER SHEET
ME000	MECHANICAL AND ELECTRICAL GENERAL NOTES AND SYMBOLS
ME108	ROOF PLAN - MECHANICAL AND ELECTRICAL
M300	MECHANICAL DETAILS AND SCHEDULES



Project No: 25294

Date: 12/12/25

100% CD

#	Revision	Date

Drawing Name:  
COVER SHEET

Drawing #:

# MC

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

*Chad Bass* 12/15/2025  
(signature) (date)

CHAD D. BASS, P.E.  
License Number : 21397  
My license renewal date is December 31, 2025  
Pages or sheets covered by this seal: \_\_\_\_\_

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

*Eric Heynen* 12/15/2025  
(signature) (date)

ERIC HEYNEN, P.E.  
License Number : P24706  
My license renewal date is December 31, 2025  
Pages or sheets covered by this seal: Divisions 26, 27, and 28.

### MECHANICAL - GENERAL NOTES

- COORDINATE MECHANICAL AND ELECTRICAL WORK WITH ALL OTHER TRADES. BEGIN INSTALLATION AND ROUGH-IN AFTER COORDINATION WITH ALL TRADES ASSOCIATED WITH THE INSTALLATION IS COMPLETE. COORDINATE BUILDING STRUCTURE, ARCHITECTURAL ASSEMBLIES, SHEET METAL, ALL PIPING SYSTEMS, LIGHT FIXTURES, CONDUITS, CABLE TRAYS, ETC. REFER TO ALL GENERAL, MECHANICAL, AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR THIS PROJECT. CONTRACTOR IS RESPONSIBLE FOR REWORK ASSOCIATED WITH FAILURE TO COORDINATE.
- INCORPORATE MECHANICAL SPECIFICATIONS, DRAWINGS, STATE AND LOCAL CODES, AND OWNER STANDARDS INTO WORK.
- CREATE OPENINGS IN THE BUILDING THAT ARE REQUIRED TO REMOVE EXISTING ITEMS AND TO BRING IN NEW EQUIPMENT. PATCH ALL OPENINGS CREATED AND FINISHED WITH MATERIALS TO MATCH EXISTING CONDITIONS. INCLUDE THIS WORK IN BID.
- ON COMPLETION OF THE INSTALLATION, COOPERATE WITH THE OWNER TO PROVIDE TESTING, ADJUSTING, AND BALANCING TO OBTAIN PROPER OPERATION OF ALL EQUIPMENT AND SYSTEMS. PROVIDE ALL FACILITIES AND EQUIPMENT AND COMPLETE ALL TESTS REQUIRED FOR ADJUSTMENTS AND BALANCING TO ESTABLISH THE PROPER PERFORMANCE OF EQUIPMENT.
- PROVIDE WARRANTIES FOR ALL EQUIPMENT AND INSTALLATION PER THE CONTRACT DOCUMENTS. CONDITIONING REFRIGERATION SYSTEMS SHALL BE WARRANTED FOR A MINIMUM OF 5 YEARS, PARTS ONLY, NON-PRORATED, FROM THE DATE OF OCCUPANCY OR SUBSTANTIAL COMPLETION, OR WHICHEVER OCCURS FIRST. THE WARRANTY SHALL COVER COMPRESSORS, EVAPORATORS, CONDENSER COILS, HIGH AND LOW SIDE PIPING, AND PIPING SPECIALTIES INCLUDING EXPANSION AND SOLENOID VALVES, RELIEF VALVES, FILTER-DRYER, AND SIGHT GLASSES. PRESSURE GAUGES AND PRESSURE SWITCHES ARE NOT UNDER THE EXTENDED WARRANTY EXCEPT FOR LOSS OF REFRIGERANT AND CONSEQUENTIAL DAMAGE TO THE SYSTEM WHICH WILL BE AN EXTENDED WARRANTY OBLIGATION. ALL DEFECTS THAT BECOME APPARENT WITHIN THE WARRANTY PERIOD SHALL BE REPAIRED BY THE MECHANICAL CONTRACTOR AS DIRECTED BY THE ENGINEER THROUGH THE OWNER'S REPRESENTATIVE. WARRANTY DOES NOT OBLIGATE THE MECHANICAL CONTRACTOR TO REPAIR DAMAGE RESULTING FROM THE OWNER'S ACCIDENT, IMPROPER OPERATION, OR FAILURE TO PROVIDE MAINTENANCE. WARRANTY COVERS DEFECTIVE MATERIAL AND INSTALLATION. REFER TO SPECIFICATIONS FOR ADDITIONAL DETAILS AND OTHER WARRANTY INFORMATION.

### MECHANICAL - DEMOLITION NOTES

- MECHANICAL DEMOLITION DRAWINGS SHOWING EXISTING CONDITIONS HAVE BEEN PREPARED BASED ON NON-DESTRUCTIVE FIELD OBSERVATION AND AS-BUILT DRAWINGS PROVIDED BY THE OWNER. FIELD VERIFY EXISTING SYSTEMS BEFORE BEGINNING WORK. NOTIFY ARCHITECT/ENGINEER IF EXISTING CONDITIONS ARE MATERIALLY DIFFERENT THAN THOSE SHOWN ON THE PLANS.
- BE FAMILIAR WITH EXISTING MECHANICAL SYSTEMS THAT WILL BE AFFECTED BY THE DEMOLITION WORK. OBTAIN PERMISSION FROM THE OWNER'S REPRESENTATIVE TO SHUT OFF SERVICES OR SYSTEMS THAT AFFECT AREAS BEYOND THE LIMITS OF THE IMMEDIATE DEMOLITION AREA. INFORM THE OWNER'S REPRESENTATIVE OF THE REASON FOR AND DURATION OF THE SHUTDOWN. MINIMIZE IMPACT TO OTHER AREAS. PROCEED WITH THE SHUT-DOWN AFTER PERMISSION FROM THE OWNER IS GRANTED.
- REMOVE EQUIPMENT, DUCTWORK THAT ARE INDICATED TO BE REMOVED IN A TIMELY MANNER IN ACCORDANCE WITH THE GENERAL DEMOLITION SPECIFICATIONS. COORDINATE WITH THE OWNER AND OTHER CONTRACTORS.
- UNLESS EQUIPMENT TO BE REMOVED IS NOTED AS OWNER'S SALVAGE, DISPOSE OF EQUIPMENT AND/OR MATERIALS INDICATED TO BE REMOVED PROMPTLY.

### HVAC - NOTES

- COORDINATE WORK WITH ALL OTHER TRADES AS DESCRIBED IN MECHANICAL GENERAL NOTE #1.
- PROVIDE A COMPLETE HVAC SYSTEM, INCLUDING SUPPLY, RETURN, EXHAUST, AND VENTILATION DUCTWORK, MECHANICAL EQUIPMENT, SUPPORTS, AND ALL APPURTENANCES. INSTALL ALL EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS. INSTALL SYSTEM TO MEET ALL CITY AND STATE CODES AND REQUIREMENTS.
- DRAWING PLANS, SCHEMATICS, AND DIAGRAMS INDICATE GENERAL LOCATION AND ARRANGEMENT OF DUCT SYSTEM. INDICATED DUCT LOCATIONS, CONFIGURATIONS, AND ARRANGEMENTS WERE USED TO SIZE DUCTS AND CALCULATE FRICTION LOSS FOR AIR-HANDLING EQUIPMENT SIZING AND FOR OTHER DESIGN CONSIDERATIONS. INSTALL DUCT SYSTEMS AS INDICATED UNLESS DEVIATIONS TO LAYOUT ARE APPROVED BY ARCHITECT/ENGINEER.
- ALL DUCT DIMENSIONS INDICATED ARE INTERIOR FREE AREA DUCT DIMENSIONS AND DO NOT INCLUDE INSULATION REQUIREMENTS.

### MECHANICAL ABBREVIATIONS

ABSOR	ABSORPTION	FT	FINTUBE
ACU	AIR CONDITIONING UNIT	FTG	FOOTING
AD	ACCESS DOOR OR AREA DRAIN	GA	GAGE
AFF	ABOVE FINISHED FLOOR	GAL	GALLON
AFG	ABOVE FINISHED GRADE	GALV	GALVANIZED
AHJ	AIR HANDLING UNIT	GC	GENERAL CONTRACTOR
AV	AIR VENT	GW	GREASE WASTE
BOT	BOTTOM	GPH	GALLONS PER HOUR
BTU	BRITISH THERMAL UNIT	GPM	GALLONS PER MINUTE
BTUH	BTU PER HOUR	HR	HOUR
BV	BALL VALVE	HTG	HEATING
CA	COMPRESSED AIR	HB	HOSE BIBB
CB	CATCH BASIN	ISP	INTERNAL STATIC PRESSURE
CENT	CENTRIFUGAL	JR	JANITOR RECEPTOR
CFM	CUBIC FEET PER MINUTE	LAV	LAVATORY
CI	CAST IRON	LDBT	LEAVING DRY BULB
CL	CENTER LINE	TEMP	TEMPERATURE
COND	CONDENSATE	LWT	LEAVING WATER
CO	CLEAN OUT	TEMP	TEMPERATURE
CONC	CONCRETE	LWBT	LEAVING WET BULB
CONTR	CONTRACTOR	TEMP	TEMPERATURE
CP	CONDENSATE PUMP/CIRC. PUMP	MB	MOP BASIN
CU	COPPER	MBH	1000 BTUH
CUH	CABINET UNIT HEATER	MC	MECHANICAL CONTRACTOR
CWP	CIRCULATING WATER PUMP	MECH	MECHANICAL
DDC	DIRECT DIGITAL CONTROLS	MH	MANHOLE
DN	DOWN	NTS	NOT TO SCALE
DR	DRAIN	OA	OUTSIDE AIR
DS	DOWNSPOUT	OD	OVERFLOW ROOF DRAIN
EA	EXHAUST AIR	PC	PLUMBING CONTRACTOR
EAT	EXHAUST AIR TEMPERATURE	PC	POUNDS PER SQUARE INCH
EC	ELECTRICAL CONTRACTOR	PRV	POWER ROOF VENTILATOR
EDBT	ENTERING DRY BULB TEMPERATURE	PRV	PRESSURE REDUCING VALVE
EEM	EMERGENCY EYE WASH	PV	PRESSURE VENT
EF	EXHAUST FAN	PVC	POLYVINYL CHLORIDE
EJ	EXPANSION JOINT	RA	RETURN AIR
EQUIP	EQUIPMENT	RD	ROOF DRAIN
ESE	EMERGENCY SHOWER/EYEWASH	RH	RELATIVE HUMIDITY
EST	EXTERNAL STATIC PRESSURE	RTU	ROOF TOP UNIT
EWBT	ENTERING WET BULB TEMPERATURE	RVT	ROOF VENT TERMINATION
EWC	ELECTRIC WATER COOLER	SK	SINK
EWT	ENTERING WATER TEMPERATURE	SA	SUPPLY AIR
EX	EXISTING	SH	SHOWER
EXH	EXHAUST	SO	STORM OVERFLOW
EXP	EXPANSION	ST	STORM
FAI	FRESH AIR INTAKE	TCC	TEMPERATURE CONTROL CONTRACTOR
FCU	FAN COIL UNIT	TYP	TYPICAL
FD	FLOOR DRAIN	UH	UNIT HEATER
FDC	FIRE DEPARTMENT CONNECTION	UR	URINAL
FLEX	FLEXIBLE	UV	UNIT VENTILATOR
FLR	FLOOR	VA	VENTILATION AIR
FPM	FEET PER MINUTE	VTR	VENT THROUGH ROOF
FPS	FEET PER SECOND	WB	WALL BOX - CONDENSATE
FS	FLOOR SINK	WC	WATER CLOSET
FSEC	FOOD SERVICE EQUIPMENT CONSULTANT	WHA	WATER HAMMER ARRESTOR
		WH	WATER HEATER

### PIPING LEGEND - PLUMBING

G NATURAL GAS

### PIPE FITTINGS

SINGLE LINE	DOUBLE LINE
ELBOW	ELBOW
ELBOW - DOUBLE BRANCH	ELBOW - DOUBLE BRANCH
ELBOW - OUTLET DOWN	ELBOW - OUTLET DOWN
ELBOW - OUTLET UP	ELBOW - OUTLET UP
ELBOW - LONG RADIUS	ELBOW - LONG RADIUS
ELBOW - SHORT RADIUS	ELBOW - SHORT RADIUS
45° ELBOW	45° ELBOW
TEE - VENT	TEE - VENT
TEE - SANITARY	TEE - SANITARY
TEE - OUTLET DOWN	TEE - OUTLET DOWN
TEE - OUTLET UP	TEE - OUTLET UP
TEE - SIDE OUTLET DOWN	TEE - SIDE OUTLET DOWN
TEE - SIDE OUTLET UP	TEE - SIDE OUTLET UP
CROSS - VENT	CROSS - VENT
CROSS - SANITARY	CROSS - SANITARY
LATERAL	LATERAL
TEE - SINGLE SWEEP "COMBO WYE"	TEE - SINGLE SWEEP "COMBO WYE"
REDUCER - CONCENTRIC	REDUCER - CONCENTRIC
REDUCER - ECCENTRIC	REDUCER - ECCENTRIC
CAPPED CONNECTION	CAPPED CONNECTION
FLANGED CONNECTION	FLANGED CONNECTION

\*\*NOTE: ALL SYMBOLS MAY NOT APPLY TO THIS PROJECT\*\*

### GENERAL SYMBOLS

	EXISTING = HALFTONE LINEWORK
	NEW = DARK LINEWORK
	DEMO = DASHED DARK LINEWORK
	NEW CONNECTION POINT
	POINT OF DISCONNECT
	KEYNOTE
	EQUIPMENT IDENTIFICATION TAG
	DETAIL DRAWING REFERENCE TAG, SIM-SIMILAR, TYP-TYPICAL, OPP-OPPOSITE SHEET REFERENCE
	SECTION CUT REFERENCE TAG, SIM-SIMILAR, TYP-TYPICAL, OPP-OPPOSITE SHEET REFERENCE
	INTERIOR ELEVATION DRAWING REFERENCE TAG

### POWER SYMBOLS

	DUPLEX GFCI WEATHER RESISTANT RECEPTACLE WITH WEATHER-PROOF IN-USE COVER, TAMPER-RESISTANT, WALL MOUNT
	EQUIPMENT CONNECTION. REFER TO EQUIPMENT CONNECTION SCHEDULE FOR CONNECTION TYPE. REFER TO PANEL SCHEDULES FOR GFCI PROTECTION WHERE REQUIRED
	SAFETY DISCONNECT SWITCH
	PANELBOARD - SURFACE MOUNTED

### FIRE DETECTION AND ALARM SYMBOLS

	FIRE ALARM CONTROL PANEL + EMERGENCY COMMUNICATIONS PANEL
	DUCT SMOKE DETECTOR
	SMOKE DAMPER
	COMBINATION FIRE/SMOKE DAMPER
	ADDRESSABLE INPUT MODULE; FS - SPRINKLER WATER FLOW SWITCH, TS - TAMPER SWITCH, PIV - POST INDICATOR VALVE
	ADDRESSABLE OUTPUT MODULE; SD - FAN SHUT DOWN RELAY, AM - AUDIO MUTE

### CODE NOTES - ELECTRICAL

- PROVIDE ELECTRICAL INSTALLATION IN ACCORDANCE WITH ALL LOCAL, STATE, AND NATIONAL CODES.
- THE CURRENT ADOPTED EDITION OF THE ELECTRICAL CODE IS THE STANDARD FOR THE ELECTRICAL INSTALLATION. VERIFY WITH LOCAL OFFICIALS WHEN PERMITS ARE OBTAINED. NOTIFY DESIGN TEAM OF ANY DISCREPANCIES BETWEEN THE PROJECT MANUAL OR DRAWINGS AND THE GOVERNING CODE.
- INSTALLATION SHALL FOLLOW REQUIREMENTS OF THE ADAAG - AMERICANS WITH DISABILITIES ACT.
- REFER TO PROJECT MANUAL AND PROJECT CODE REVIEW SHEET FOR LIST OF APPLICABLE CODES.
- PER NEC EVERY CIRCUIT AND CIRCUIT MODIFICATION SHALL BE LEGIBLY IDENTIFIED AS TO ITS CLEAR, EVIDENT AND SPECIFIC PURPOSE OR USE. CONTRACTOR TO PROVIDE FINAL CIRCUIT IDENTIFICATION FOR ALL NEW AND MODIFIED CIRCUITS AT PROJECT COMPLETION.

### GENERAL NOTES - ELECTRICAL

- COORDINATE LOCATION/INSTALLATION OF MECHANICAL AND ELECTRICAL WORK WITH ALL OTHER TRADES. BEGIN INSTALLATION AND ROUGH-IN ONLY AFTER PROPER AND TIMELY COORDINATION WITH ALL TRADES ASSOCIATED WITH THE INSTALLATION IS COMPLETE. COORDINATE WITH BUILDING STRUCTURE, ARCHITECTURE, MECHANICAL SHEET METAL, ALL PIPING SYSTEMS, LIGHT FIXTURES, CONDUITS, CABLE TRAYS, EQUIPMENT ACCESS/CLEARANCE, ETC. REFER TO ALL GENERAL, MECHANICAL, AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR THIS PROJECT. CONTRACTOR IS RESPONSIBLE FOR REWORK OF INSTALLED EQUIPMENT RESULTING FROM INSUFFICIENT COORDINATION.
- ELECTRICAL DRAWINGS ARE ONLY A PORTION OF THE COMPLETE SET OF PLANS AND CONTRACT DOCUMENTS. THE ELECTRICAL SCOPE OF WORK IS DEFINED BY THE COMPLETE SET OF CONTRACT DOCUMENTS. THIS INCLUDES BUT IS NOT LIMITED TO REFERENCING ARCHITECTURAL PLANS FOR DIMENSIONS AND DETAILS. EQUIPMENT PLANS FOR ROUGH-IN REQUIREMENTS, MECHANICAL PLANS FOR EQUIPMENT SIZES AND LOCATIONS.
- PROVIDE A DEDICATED GREEN INSULATED GROUND CONDUCTOR TO ALL DEVICES. DO NOT USE CONDUIT SYSTEM AS THE ONLY EQUIPMENT GROUNDING METHOD.

Project No: 25294

Date: 12/5/25

100% CD

#	Revision	Date

Drawing Name:  
**ROOF PLAN - MECHANICAL AND ELECTRICAL**

Drawing #:  
**ME108**

**GENERAL NOTES:**

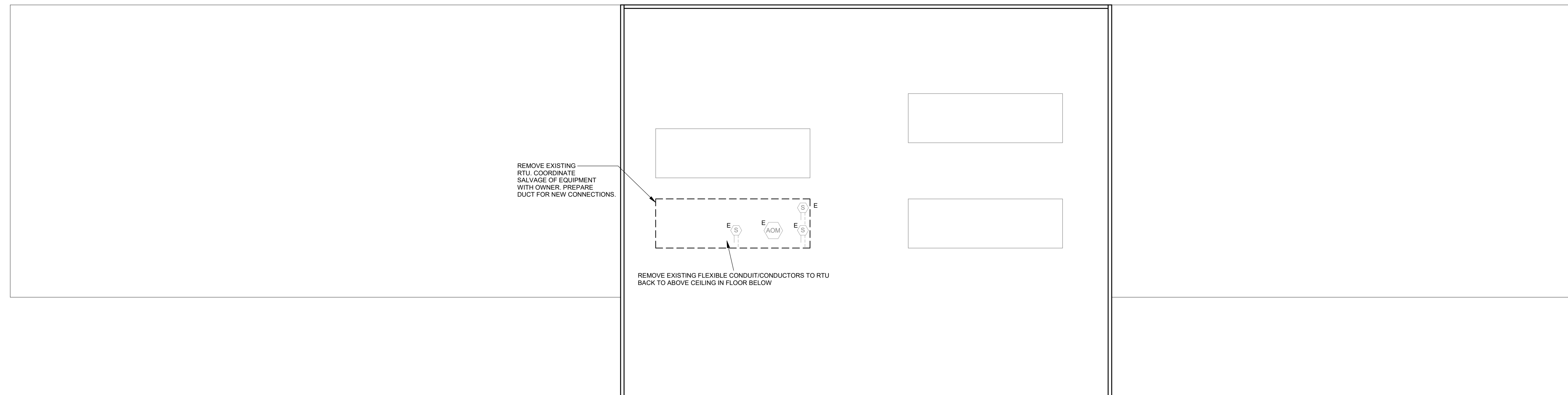
- A. REFER TO M000 FOR GENERAL NOTES & SYMBOLS.
- B. REFER TO M300 FOR MECHANICAL DETAILS AND SCHEDULES.

**ELECTRICAL SCOPE OF WORK:**

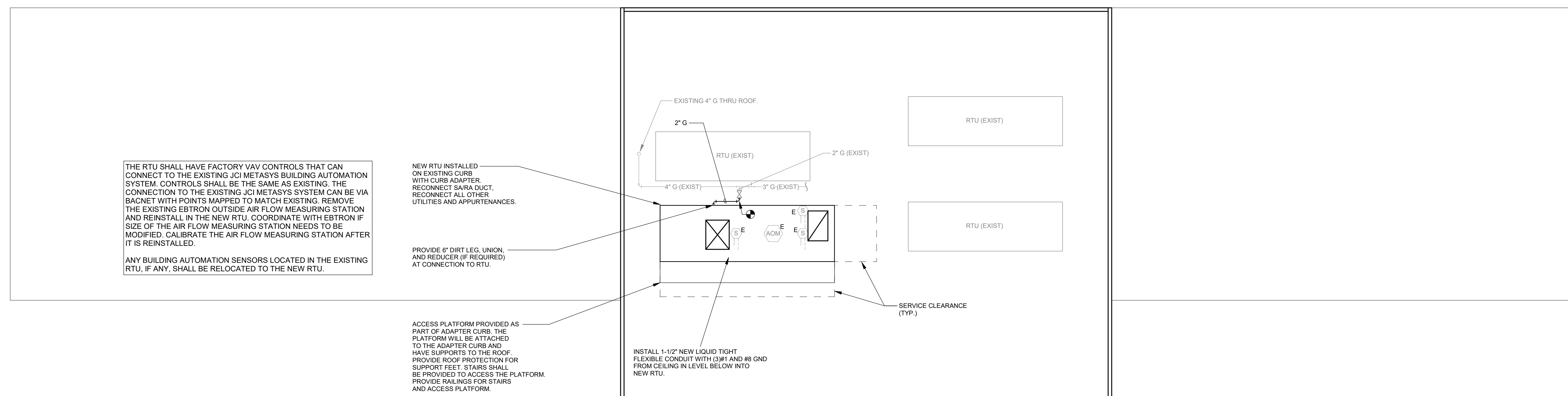
- A. EXISTING BREAKER FEEDING RTU-2 IS 125A FROM PANEL DPN7.
- B. EXISTING CONDUCTORS NOTED ON PREVIOUS DRAWINGS ARE (3) #1 AND (1) #8 GND IN 1-1/2" CONDUIT. EC TO VERIFY SIZING AND INSTALL NEW CONDUCTORS TO MATCH THIS SIZE FOR EXTENSION TO NEW UNIT.
- C. EXISTING RTU INCLUDES OVERCURRENT PROTECTION ON UNIT. NEW UNIT WILL ALSO REQUIRE INTEGRAL OVERCURRENT PROTECTION.
- D. EXISTING UNIT IS SHUTDOWN WITH DUCT SMOKE DETECTORS. DETECTORS ARE TO REMAIN INTACT AND FIRE ALARM TO BE INTEGRATED INTO THE NEW RTU. EXTEND EXISTING CONDUIT AND CONDUCTORS FOR THE FIRE ALARM AS NECESSARY FOR EXTENSION OF THE CURB AND NEW UNIT.

**ELECTRICAL DEMOLITION NOTES**

- A. DEMOLITION DRAWINGS PRESENT LAYOUT OF EXISTING CONDITIONS AND MAJOR MECHANICAL/ELECTRICAL ITEMS. FIELD VERIFY EXISTING CONDITIONS AND BECOME FAMILIAR WITH EXISTING ELECTRICAL SYSTEM AND DEMOLITION SCOPE BEFORE WORK BEGINS.
- B. REMOVE ELECTRICAL FACILITIES AND CLEAR THE AREA TO RECEIVE THE NEW WORK.
  - a. IDENTIFY THE LOCATION OR ITEMS SERVED FOR ALL DISCONNECTED BRANCH CIRCUITS. BEFORE DEMOLITION, MAINTAIN CIRCUITS SERVING AREAS BEYOND THE DEMOLITION AREA.
  - b. KEEP EXISTING SYSTEMS OPERATIONAL DURING ALL PHASES OF CONSTRUCTION UNLESS NECESSARY FOR DEMOLITION.
  - c. OBTAIN OWNER'S PERMISSION TO SHUT OFF SERVICES OR SYSTEMS WHICH MAY AFFECT OTHER AREAS BEYOND DEMOLITION AREA. INFORM OWNER AS TO THE REASON FOR AND THE DURATION OF THE SHUTDOWN.
  - d. REPAIR AT CONTRACTORS EXPENSE ANY DAMAGED CONDUIT OR WIRE NOT IDENTIFIED FOR DEMOLITION.
  - e. INSTALL BLANK COVERPLATES/COVERS OVER OPENINGS AT REMOVED DEVICE LOCATIONS.
- C. PLAN ABBREVIATIONS
  - E - EXISTING ITEM TO REMAIN
  - R - EXISTING ITEM TO BE REMOVED
  - RN - REPLACE EXISTING ITEM WITH NEW



1 ROOF PLAN - HVAC DEMOLITION  
1/8" = 1'-0"



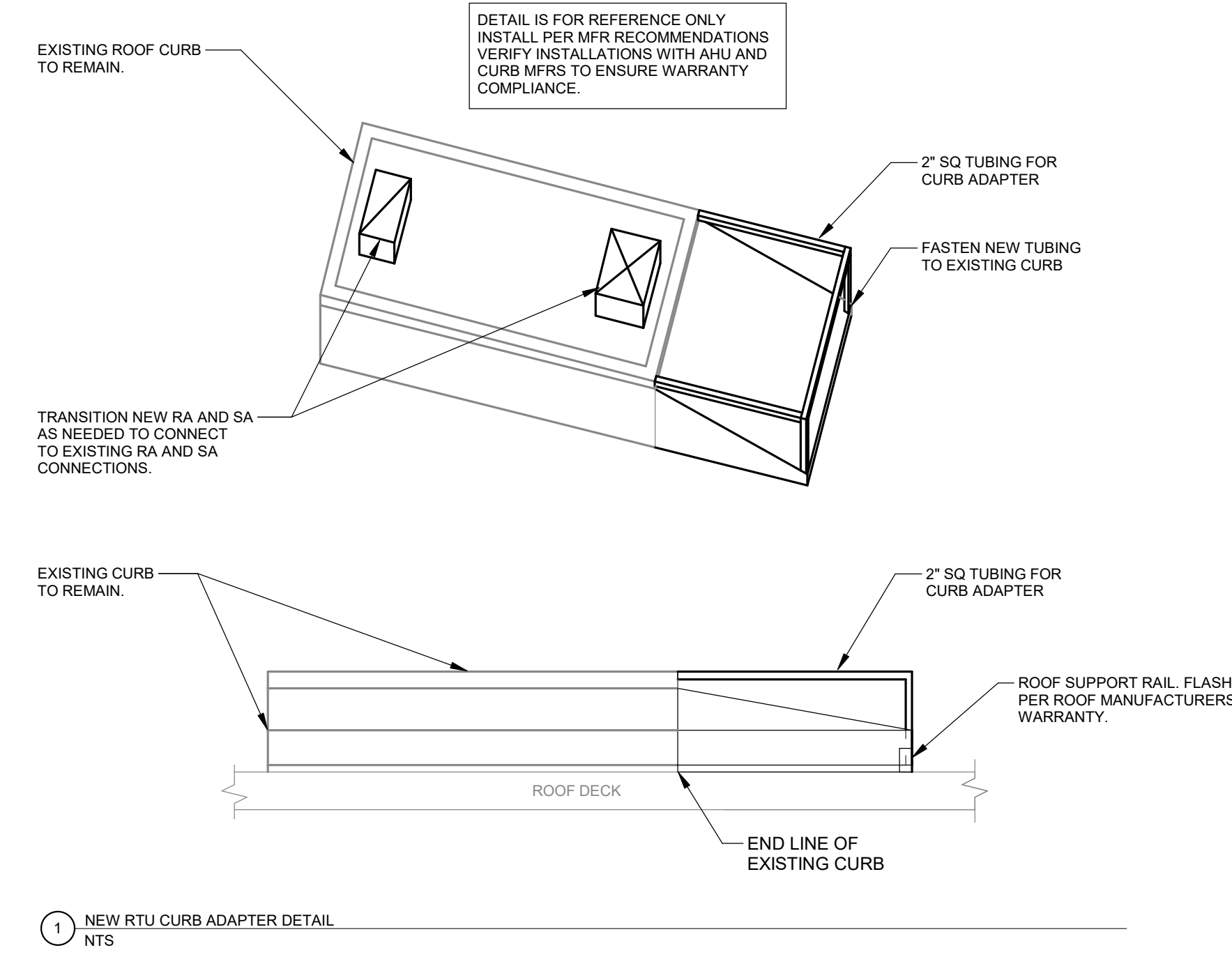
2 ROOF PLAN - MECHANICAL AND ELECTRICAL  
1/8" = 1'-0"

## AIR HANDLING UNIT (OUTDOOR)

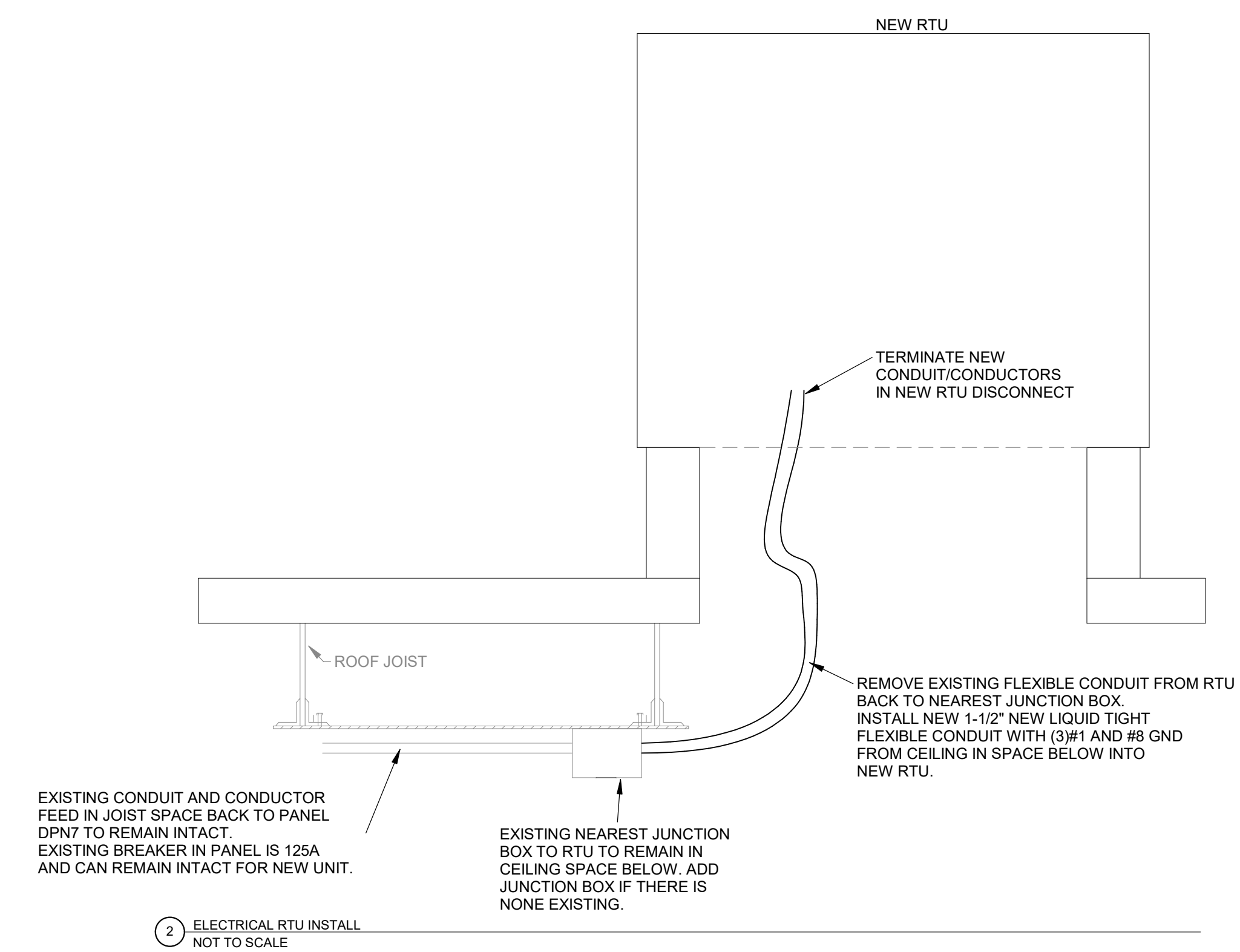
REFERENCE	RTU-2
MANUFACTURER	JCI
TYPE	OUTDOOR VAV
MODEL #	GVBAC-2B6MA-2A60A
SERVES	2ND, 3RD, 4TH (WEST) FLOORS
WEIGHT (LBS)	6,557
DIMENSIONS (LxDxH)	298" X 96" X 60"
<b>SUPPLY FAN</b>	
AIRFLOW (CFM)	8,000
ESP (IN. W.C.)	2.00
MOTOR HP	10
<b>EXHAUST FAN</b>	
AIRFLOW (CFM)	8,000
ESP (IN. W.C.)	1.0
MOTOR HP	7.5
<b>HEATING</b>	
TYPE	INDIRECT FURNACE - NAT. GAS
EAT (DB) °F	50
LAT (DB) °F	98.7
TURNDOWN	2 TO 1
CONTROL	MODULATING
INPUT CAPACITY (MBH)	500
OUTPUT CAPACITY (MBH)	405
OPERATING PRESSURE (IN. W.C.)	6-11" WC
<b>COOLING</b>	
TYPE	DX COIL WITH SPLIT CU
REFRIGERANT	R-454B
AMBIANT AIR TEMP (DB)	95
EAT (DB/WB) °F	79.8/65.9
LAT (DB/WB) °F	52.2/52.1
NET TOTAL CAPACITY (MBH)	310
NET SENSIBLE CAPACITY (MBH)	222
NUMBER OF STAGES	11
1ST STAGE COMPRESSOR TYPE	SCROLL
<b>FILTERS</b>	
RETURN TYPE	MERV8
<b>ELECTRICAL DATA</b>	
VOLTAGE - PHASE	480/3
MCA	89
MOCP	100
NOTES	1,2,3, 4

**NOTES:**

1. THE RTU SHALL HAVE FACTORY VAV CONTROLS AND BE CONNECTED TO THE EXISTING JCI METASYS BUILDING AUTOMATION SYSTEM.
2. REFER TO SPECIFICATIONS FOR FILTER REQUIREMENTS.
3. PROVIDE WITH FUSED DISCONNECT SWITCH.
4. PROVIDE CONVENIENCE OUTLET.



1 NEW RTU CURB ADAPTER DETAIL  
NTS



2 ELECTRICAL RTU INSTALL  
NOT TO SCALE